Immediate Response of Bats to Prescribed Fire and Impact of Experiences on Women's Self-Image in Natural Resources Professions

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IMMEDIATE RESPONSE OF BATS TO PRESCRIBED FIRE AND IMPACT OF EXPERIENCES ON WOMEN’S SELF-IMAGE IN NATURAL RESOURCES PROFESSIONS

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
Wildlife and Fisheries Biology

by
Zebria Hicks
May 2023

Accepted by:
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ABSTRACT

To inform use of prescribed fire management practice in the southeastern US, we studied its impact on bats, which are important and at-risk species. We evaluated if prescribed fire had a positive, neutral, or negative effect on bat activity in the two weeks following the burns. We recorded bat activity after prescribed burns in February and March 2022 in northwestern South Carolina in select hardwood and pine stands and control sites ≥ 500 m from burn boundaries. We measured insect abundance, canopy cover, basal area, and understory density at each site. We recorded 687 passes during our 45-day study period. Big brown/silver-haired bats and Seminole/eastern red bats’ activity significantly decreased as canopy cover increased and were significantly influenced by the interaction of stand type and treatment. *Myotis*/tricolored bat species activity was not significantly impacted by any of our factors. There was no linear relationship between total or species activity and nights post burn; however, there was greater activity on control sites on the first night following burns, and activity peaked on burned sites roughly one week following burns. Our findings suggest that bats’ responses to prescribed fire were more dependent upon vegetation structure and composition than burning itself.

Women may disengage from or leave their positions in Natural Resources due to experiences with their peers, students, mentors, or supervisors. This potentially contributes to the continued male domination of these fields. We conducted informant-led interviews to understand if women in Natural Resources experienced benefits or challenges in their careers due to being women. Participants were selected using
researchers’ social networks, searching of organization and university directories, and snowball sampling. We conducted 44 interviews of women in various fields and stages of their careers between 2017 and 2022. Themes that emerged from our interviews were: Diversity and Equity, Respect Topics, Support, Culture and Inclusion, and Intersectionality. We found that challenges were more prevalent and women’s experiences in their Natural Resources careers can impact their personal and professional lives through changing their self-image, or how they view their personal appearance, capabilities, and how they present themselves. We believe that this case-study can act as a basis for future quantitative studies on the same topic to implement interventions for supporting and retaining women in these fields.
DEDICATION

For my mother, aut viam inveniam aut faciam
ACKNOWLEDGMENTS

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INTRODUCTION

Traditionally, wildlife management was primarily focused on maintaining or increasing yield of game species (Dunlap 1988). This goal was supported by the large portion of stakeholders and professionals in these fields that enjoyed recreational or subsistence hunting. Over time, however, more attention and resources have been devoted to conservation of non-game species. Rather than being managed for harvest, non-game species are conserved for species survival purposes and ecosystem services. Concern for beneficial species with declining populations makes way for studies like ours, investigating the immediate response of bats to prescribed fire. Many bat species in South Carolina are species of concern or species that may be listed on the Endangered Species Act (USFWS 2022). As such, it is important to understand how commonly used land management practices can potentially influence bats’ survival.

Natural Resources positions, such as wildlife managers and foresters, are often held by men; this may make it difficult for women to join and remain in such fields. Following legal actions to increase workplace diversity in the United States, interventions have been implemented to increase the number of women and other minorities working in Natural Resources (Davidson & Black 2001; Kuhns et al. 2002). However, efforts to increase the presence of minorities do not always translate to support systems to retain these individuals (Crandall et al. 2021). This often leads to women trying to work in a system and environment that was not designed for them, which can result in lower retention of women (Mitchell et al. 2001). This inspired our case-study interested in the experiences of women working in or retired from Natural Resources. Using qualitative
inquiry allowed us to be exposed to a large range of responses from participants.
Understanding and validating women’s first-hand experiences can support the next steps
to address challenges for women in Natural Resources.

We are not suggesting that women and bats have the same, or even similar,
difficulties, however, the reasons for their difficulties may be similar: they exist within a
system that was not designed with them in mind. Bats are non-game species in a formerly
game species-driven world and women are working in environments that were designed
for a male-centric workforce. Despite their differences, the goal of my research was to
inform how these challenges are addressed in the future. For bats, understanding if
prescribed fire negatively impacts them can inform how management practices are
performed. For women professionals in Natural Resources, understanding what
challenges are present can assist in finding actions to address them.
References


CHAPTER ONE
IMMEDIATE RESPONSE OF BATS TO PRESCRIBED FIRE

Introduction

Fire is an important disturbance that has historically shaped ecosystems in North America. Ignited naturally by lightning or other forces, fire spread is dependent on wind speed and direction, fuel connectivity, and fuel’s moisture content. Fire is typically distinguished by severity, return interval, and intensity (Wheelan 1995). Management has changed the type and frequency of fire across the United States (Agee & Skinner 2005) and changing climate is expected to contribute to continued fluctuations in the future (Stephens et al. 2013).

People have manipulated the frequency and severity of fire disturbance in North America to achieve several goals for centuries. Native Americans extensively used fire to prepare or maintain land for agriculture, pest control, and improved hunting conditions (Brose et al. 2001; Ryan et al. 2013). However, after European settlement changed land usage practices, such as keeping livestock and harvesting timber (Cooper 1960; Brose et al. 2001), fire suppression has altered dominant plant species in certain landscapes since it has favored more competitive, shade-tolerant species (Hiers et al. 2007; Harrington et al. 2003). Consequently, since the 1960s, prescribed fire has been implemented with other techniques, such as thinning, to mimic conditions prior to fire suppression (Stephens & Ruth 2005). Prescribed fire is used for fuel and understory clutter reduction, opening the canopy, and forest restoration (Wheelan 1995).
Fire spreads differently depending on many factors, including plant species present (Rogers et al. 2015). Fire spreads more quickly in coniferous forests due to the trees’ flaky bark combined with other understory vegetation that make a ladder for fire to travel to the tree canopy. Deciduous trees on the other hand, have higher moisture content in leaves and higher canopy base, resulting in lower efficiency of ladder fuels and slowing fire spread. These factors, as well as soil composition, fuel moisture, and weather conditions are considered when planning prescribed burning to plan for where and when to set fires.

Fire can directly or indirectly affect wildlife populations (Harper et al. 2016). Direct effects on wildlife include direct mortality from flames or smoke inhalation and species that live or forage in leaf litter, such as eastern diamondback rattlesnakes (Crotalus adamanteus), can be at higher risk (Engstrom 2010). Indirect effects include changes in habitat and food availability. Species that can be indirectly affected by fire include red-cockaded woodpeckers (Leuconotopics borealis), which can benefit from clearing of midstory vegetation that decreases competition for roost trees and allows them ease of access to other trees for foraging (James et al. 2001). Changes in food availability following fire can lead to changes in behavior of some species, such as white-tailed deer (Odocoileus virginianus), that modify their diet until regeneration of hard mast (Lewis et al. 2012), and western slimy salamanders (Plethodon albagula) that retreat below ground and increase distance travelled to forage (O’Donnell et al. 2016). Prescribed fire’s ability to make large scale changes to the landscape makes it an efficient management tool, but
application for wildlife habitat goals, such as bats, should be informed by behavioral and population responses.

Bats contribute to the ecosystems they inhabit in several ways, including pollination, insect pest control, and seed dispersal (Boyles et al. 2011; Riberio Mello et al. 2011; McCracken et al. 2012). However, many bat species are species of concern or endangered. Bats can be directly or indirectly affected by fire disturbance just like other wildlife species (Boyles & Aubrey 2005). Since silver-haired bats (*Lasionycteris noctivagans*) roost in tree cavities (Kunz & Lumsden 2003) and eastern red bats (*Lasiurus borealis*) have been found to roost in leaf litter during winter (Mormann & Robbins 2007), these species could be at risk of direct morality due to fire. Indirect effects of fire on bat include changes in the forest environment, such as opening the canopy, reduction of midstory clutter, and increase in insect availability (Lacki et al. 2009). For example, bats often forage in open habitats, which allows for improved maneuverability and fewer obstacles for echolocations calls (Broders et al. 2004). Many studies have found bats to have neutral or positive responses to fire (Loeb & Waldrop 2008; Armitage & Ober 2012; Buchalski et al. 2013; Cox et al. 2016) and very few studies have found negative response by bats to fire (Loeb & Blakey 2021). However, the time that studies are conducted in relation to fire disturbance can influence these results.

Fire can affect bats differently depending on when it occurs in their life cycle. Bats use varying lengths of torpor, the longest being hibernation, to survive the colder months by reducing energy expenditure (Geiser 2021). Not all bats hibernate and species that migrate to or reside in warmer climates in winter may only use short bouts of torpor
or continue to forage during winter (Geiser 2021). On the other hand, bats that do hibernate in winter may do so in caves or mines as well as trees (Newman et al. 2021) or leaf litter (Hein et al. 2008). Bats that hibernate in these locations may be more susceptible to direct mortality from fires occurring in fall, winter, and spring. In addition, it is important for bats to have access to large quantities and high quality food during fall and spring. In the fall, this food allows individuals to build up fat stores to sustain them during hibernation or periods of cold weather. In the spring, individuals must replenish themselves after minimal or discontinued foraging. Many studies have been conducted on bat activity in the summers following fires (e.g., Armitage & Ober 2012; Braun de Torrez et al. 2018; Austin et al. 2018, 2020; Johnson et al. 2019). However, few studies have been conducted evaluating activity in the fall and spring following a fire (Braun de Torrez et al. 2018; Cox et al. 2016) or immediately following the fire disturbance (Braun de Torrez et al. 2018; Broken-Brown et al. 2020; Geluso 2022).

To better understand the immediate impact of prescribed fire on bat activity during some of these critical time periods, we studied bat responses to prescribed fires immediately following late winter/early spring prescribed fires in northwestern South Carolina. We collected bat acoustic data for two weeks following prescribed burns in the Andrew Pickens Ranger District of the Sumter National Forest. Our first objective was to test if prescribed fire had a positive, neutral, or negative effect on overall bat activity. We predicted prescribed fires that caused significant changes in vertical structure would have a positive effect on bat activity due to increased availability of open foraging habitat. Our second objective was to determine if activity of species groups were positively, neutrally,
or negatively affected by fire. We predicted that larger bat species would show a positive response to prescribed fire when there was significant reduction in understory clutter due to increased maneuverability. We also predicted that prescribed fire would have a neutral effect on the activity of smaller bat species that are more clutter-adapted. Our third objective was to investigate which factors contributed to bat responses to prescribed fire. Factors that we included were stand type, forest structure (canopy cover, understory density, and basal area), and insect abundance. We predicted that insect availability would be related to greater total activity due to increased foraging opportunity. We also predicted that lower understory density and canopy cover would be related to greater activity in larger bat species due to decreased clutter allowing increased maneuverability and foraging success. Our fourth objective was to examine the difference in bat activity over time following the burn. We predicted that activity would be greatest immediately following the burn and decline over time.

Methods

Study Sites

This study was conducted on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County in northwestern South Carolina. Data were collected following planned burns completed between February 8, 2022, and March 15, 2022. The burn units in this district are composed primarily of pine, oak, and other hardwood species. Conifer species included shortleaf pine (*Pinus echinata*), white pine (*P. strobus*), pitch pine (*P. rigada*), Virginia pine (*P. virginiana*), and hemlock (*Tsuga caroliniana*). Hardwood species include chestnut oak (*Quercus prinus*), scarlet oak (*Q. coccinea*),
white oak (Q. alba), black oak (Q. veutina), and northern red oak (Q. rubra). From 2012 to 2022, average daily temperatures in February ranged from 3 to 12 °C with average lows between -2 and 7 °C and average highs between 7 and 12 °C and total precipitation between 2.5 and 33 cm. Average temperatures in March for the same time frame ranged from 7 to 15 °C with average lows between 2 and 11 °C and average highs between 13 and 22 °C and total rainfall between 5 and 25 cm. Average temperatures in April for this time frame ranged from 15 to 18 °C with lows between 8 and 11 °C and highs between 21 and 24 °C and total precipitation from 5 and 22 cm. During our data collection in February 2022, average daily temperature was 9 °C, with an average high of 14 °C and average low of -2 °C and total precipitation of 18 cm. In March 2022, the average daily temperature was 12 °C with average high of 18 °C, average low of 7 °C, and total precipitation of 20 cm. Average temperatures in April 2022 were 16 °C with average high of 22 °C and average low 9 °C and total precipitation of 5 cm.

We used ArcGIS to generate random points in each burn unit between 50 m and 100 m from roads, a distance that enabled ease of access to sites and minimized the effect of roads on data collection. We randomly selected one point in stands dominated by hardwood trees (referred to as “hardwood stands”) and pine trees (referred to as “pine stands”) for each burn unit. If more than one point was generated for a stand type in a burn unit, a random number generator was used to select one site. We also generated random points at least 500 m outside of burn unit boundaries to be control points for burned sites. Control points were also located within 50 m and 100m from the nearest roads. We matched control points as closely as possible to treatments sites using
characteristics such as forest type, age, and elevation. Overall, we had one hardwood and one pine study site for each treatment, giving us a total of four study sites per burn unit.

We collected data from six burns conducted between February and March 2022 at the following burn units: Buzzard’s Roost, Crane Mountain, Hickory Flat, Rich Mountain, Turkey Ridge, and Yellow Branch. We collected data at burned and control sites for hardwood and pine stands at all units except for Rich Mountain, which only had hardwood treatment and control sites and due to issues with the detector, we only collected data for hardwood treatment and control sites in the Yellow Branch unit. Unlike other sites, Turkey Ridge was burned in two parts, with the second section being burned a few days following completion of the first section. We only used data that were collected after completion of the second section burn in our analysis. Hickory Flat and Yellow Branch were burned in late February, with all other burns occurring in early to mid-March.

_Bat Activity_

We recorded bat calls using Anabat Express (Titley Scientific, Columbia, Missouri) ultrasonic detectors. We attached detectors to 3.7 m poles and placed them at the randomly selected points. Detectors faced the nearest open area at the study site. We scheduled detectors to record from 30 minutes prior to sunset to 30 minutes following sunrise, typically from around 1800 to 0600 each night, depending on the time of year. We placed detectors as soon after burn completion as possible, typically within one to two days, and they remained for 14 days, except for Crane Mountain, for which we did
not collect data until 11 days following burn completion. Our methods were approved by the U.S. Forest Service Institutional Animal Use and Care Committee (#2022-001).

We used a customized filter in AnalookW to remove noise files. We categorized files as containing bat calls if they had pulses with minimum, maximum, and average frequencies between 15 and 300 kHz and durations between 1.8 and 40 ms. The total number of files that passed the filter restrictions were used as our index of total activity per site. Files that passed the filter were then input into Kaleidoscope Pro (version 5.4.8) to automatically identify species. Signal parameters were frequencies between 12 and 120 kHz, with pulse lengths between 2 and 500 ms, and having a minimum of 5 pulses. Species found in our region included in auto identification were: Townsend’s big-eared bat (*Corynorhinus townsendii* as a substitute for *C. rafinesquii*), big brown bats (*Eptesicus fuscus*), eastern red bats (*Lasiurus borealis*), hoary bats (*L. cinereus*), silver-haired bats (*Lasionycteris noctivagans*), Seminole bats (*L. seminolus*), small-footed bats (*Myotis leibii*), little brown bats (*M. lucifugus*), northern long-eared myotis (*M. septentrionalis*), evening bats (*Nycticeius humeralis*), tricolored bats (*Perimyotis subflavus*), and Mexican free-tailed bats (*Tadarida brasiliensis*). We manually vetted all calls based on characteristics such as call frequency and shape. If we disagreed with an auto ID, we either reclassified it as the proper species or as NoID.

Due to our relatively small sample size, we grouped species for analysis as follows: big brown bats and silver-haired bats (EPFU/LANO), Seminole bats and eastern red bats (LABO/LASE), and tricolored bats and *Myotis* spp. (MYSP/PESU). We determined bat species groups based on species aspect ratio and wing loading, which is
indicative of a species’ maneuverability. As a result, we believed these species would respond similarly to change in vertical structure. In addition to physical attributes, species were also grouped due to lack of confidence distinguishing between calls. MYSP/PESU represent smaller, more clutter-adapted group and EPFU/LANO are larger, less clutter-adapted bat species; LABO/LASE are edge species that fall somewhat between the two groups in size and maneuverability.

**Insect Abundance**

We attached 15 x 20 cm, dual-sided, yellow sticky traps (Gideal) to 2.4 m tall shepherd’s hooks and placed them 10 m north of detectors. We chose this distance to minimize the influence of proximal, captive food availability on detector recordings. We collected sticky traps during regular detector maintenance. After we collected sticky traps, we counted the number of insects. Due to disruptions by weather conditions, we were unable to collect sticky traps from the following sites: Rich Mountain, Yellow Branch, Hickory Flat pine sites, and Hickory Flat hardwood burned site.

**Vegetative Data**

We took canopy cover photos 1 m north of each detector using a Canon EOS Rebel SL3 camera with Rokinon Aspherical Fisheye lens. We took three images with varying exposures to obtain the best contrast for analysis. We used ImageJ v. 1.53t (U.S. National Institute of Health, Bethesda, Maryland) to calculate the percent canopy cover for all three images at each site. The average percent canopy cover for all three images was used as the canopy cover for each site. At each location, we walked a 35 m transect in a north to south orientation with the detector as the midpoint. On this transect, we
counted all stems with a diameter between 2.5 and 7.6 cm within 1 m of the transect. We estimated basal area using a variable radius plot and a Jim Gen Cruz-All. We then multiplied the total by the factor of 10 to calculate basal area.

**Statistical Analyses**

We used JMP Pro 16 software to conduct all analyses for this study.

*Vegetative Data and Insect Abundance*

To determine if there was a significant different in vegetative data and insect abundance between treatments and stand types, we used a two-way analysis of variance with an interaction for mean canopy cover, mean understory density, mean basal area, and mean insect abundance.

*Bat Activity*

We used a mixed effects analysis of variance to examine factors affecting total bat activity. Due to limited sample size, not all interactions were able to be included in the overall model. Therefore, we first included the main effects of stand type, treatment, stand type x treatment, canopy cover, understory density, basal area, and insect abundance, then determined which additional interactions to include in the overall model by testing the effects of individual covariates and their interactions with stand type, treatment, and stand type x treatment. We included covariate interactions that were significant ($P \leq 0.05$) in the final model. The final model for total bat activity included stand type, treatment, stand type x treatment, insect abundance, canopy cover, basal area, understory density, stand type x treatment x understory density, and site as a random effect. We used the same procedure for determining which covariates to include in the
final models for each species group as we did for total bat activity. The final model for MYSP/PESU and LABO/LASE included stand type, treatment, stand type x treatment, understory density, basal area, and canopy cover as covariates. The model for EPFU/LANO included stand type, treatment, stand type x treatment, understory density, basal area, canopy cover, and stand type x treatment x understory density as factors. Due to limited sample size, we were unable to include insect abundance in species group models, however, when insect abundance and its’ interactions with stand type, treatment, and stand type x treatment were tested separately, none were significant for any species group.

We used Tukey HSD pairwise comparisons to investigate differences for total bat activity and species groups when main factors or their interactions with stand type or treatment were significant.

Activity Over Time

For total bat activity and species groups, we created models following the same methodology that we used to create activity models, however we used number of nights post burn and its interactions as covariates instead of vegetative and insect covariates. We included the number of nights post burn and any of its interactions with stand type, treatment, or stand type x treatment that were significant ($P \leq 0.05$) in the final model. The final model included stand type, treatment, stand type x treatment, and nights post burn as covariates with Site as a random effect. We collected data for four nights of the two-week window for Crane Mountain, while we collected data for 11, 12, and 13 nights.
at Hickory Flat, Turkey Ridge, and Rich Mountain, respectively. We collected data for the full fourteen days at Buzzard’s Roost and Yellow Branch sites.

**Results**

**Vegetative Data and Insect Abundance**

Neither stand type, treatment, nor their interaction had a significant influence on mean canopy cover, mean understory density, mean basal area, or mean insect abundance (Table 1.1). However, control sites regardless of stand type tended to have greater canopy cover and basal area than treatment sites (Figure 1.1).

**Bat Activity**

We recorded 867 bat passes during our 45-day study period. Of these passes, 554 were on pine sites (491 on pine burned and 63 on pine control) and 313 were on hardwood sites (96 on hardwood burned and 217 on hardwood control). A total of 587 passes were recorded on burn sites compared to 280 on control sites. We identified a total of 264 passes to species with 169 identified as EPFU/LANO, 69 as LABO/LASE, and 26 as MYSP/PESU.

Total bat activity was not significantly influenced by stand type or treatment, but the interaction of stand type and treatment was significant (Table 1.2). Despite the apparent greater activity in pine burned than pine control sites, this difference was not statistically significant based on Tukey’s HSD test (Figure 1.2). Total activity significantly increased \( P \leq 0.05 \) as mean understory density increased \( \beta = 0.584 \pm 0.167 \). In addition, the interaction of stand type x treatment x mean understory density was significant. As understory density increased, total activity increased on hardwood
control and pine burned sites but did not change on hardwood burned or pine control sites (Figure 1.3).

Activity of EPFU/LANO was significantly greater in pine stands than hardwood stands (Table 1.2) and there was no significant effect of fire on EPFU/LANO activity. The interaction between treatment and stand type was significant with activity on pine burned sites significantly greater than hardwood control and hardwood burned sites but not significantly greater than pine control sites (Figure 1.4). EPFU/LANO activity significantly decreased as canopy cover increased ($\beta = -0.122 \pm 0.053$) and the interaction of stand type x treatment x understory density was significant with EPFU/LANO activity increasing with understory density on pine burned sites but not on other sites (Figure 1.5).

LABO/LASE activity was significantly greater in pine sites than hardwood sites ($P \leq 0.05$) but fire had no significant effect on LABO/LASE activity (Table 1.2); however, the interaction between stand type and treatment was significant. LABO/LASE activity was significantly higher on pine burned sites than hardwood burned sites, but there was no significant difference between pine burned and pine control or hardwood control sites (Figure 1.6). LABO/LASE activity significantly decreased with increasing canopy cover ($\beta = -0.0905 \pm 0.0342$)

None of the covariates in our models had a significant influence on MYSP/PESU activity (Table 1.2).

*Activity Over Time*

Number of nights post burn did not significantly impact total bat activity or any species group activity (Table 1.3). On the first night post burn, total activity was greater
on hardwood control sites than burn sites for either stand type (Figure 1.6). Activity on pine control sites remained relatively constant across the study period. Total activity on pine burned sites peaked between 7 and 10 nights post burn, but activity on hardwood burned sites did not peak until 12 nights post burn (Figure 1.7). EPFU/LANO and LABO/LASE activity followed the same trends as total activity on burned and control sites. MYSP/PESU remained relatively constant as nights post burn increased.

**Discussion**

Total bat activity was not significantly influenced by prescribed fire in the two weeks following fire disturbance. It is likely that the impact of fire on total bat activity was not significant because there was no significant difference in vegetative structure between burned and control sites. This is contrary to our predictions that prescribed fire would open the canopy and reduce understory density. Activity of less clutter-adapted species groups, EPFU/LANO and LABO/LASE, were significantly influenced by stand type and percent canopy cover but were not significantly affected by burning. This suggests that habitat structure had more influence on bat activity than fire disturbance (Ford et al. 2005). Overall, our findings align with previous studies showing bats’ positive or neutral response to fire (Loeb & Waldrop 2008; Armitage & Ober 2012; Buchalski et al. 2013; Cox et al. 2016).

Contrary to our expectations, vegetative structure did not differ significantly between our control sites and treatment sites. Clearing of the understory is dependent on several factors of both fire and adaptations of the vegetation (Waldrop et al. 1987; Zwolinski 1990). Because we did not have vegetative data for sites prior to burns, it is
unclear the degree to which prescribed burns impacted vertical structure during our study period. However, the similarities in canopy cover and understory vegetation for treatment and control sites lead us to believe that fires were not severe enough to reduce understory clutter or create canopy openings to increase bats’ access to these habitats.

We found no significant difference in insect abundance between burned and unburned sites. It is possible that the regularity with which we collected sticky traps to track insect abundance was not frequent enough. Due to the time between collections, many traps were not recovered due to adverse weather conditions or being compromised by falling from the shepherd’s hooks.

We expected bats to be more active on sites with lower understory density and canopy cover due to most of species in our area preferring open habitat (Fenton 1997). Lower understory density reduces obstacles for bats’ echolocation calls and improves foraging efficiency (Arlettaz et al. 2008). EPFU/LANO and LABO/LASE activity decreased as canopy cover increased, which agreed with our expectations for these larger, open-foraging species (Ford et al. 2005; Blakey et al. 2017) Contrary to expectation, however, total activity increased as understory increased on hardwood control and pine burned sites. Bats have been found to travel or forage above the canopy (Menzel et al. 2000), which could still be recorded by our detectors. In this instance, the structure and density of the understory is less relevant to bat activity since individuals are flying above it.

Total activity was greater on pine sites than hardwood sites, likely due to greater activity of both EPFU/LANO and LABO/LASE, the most frequently recorded groups, on
these sites. Both of these species groups had greater activity on pine burned sites, which had lower canopy cover and basal area than other sites, despite the insignificant difference. These larger, less clutter-adapted species prefer to forage in more open habitat and are more likely to select habitat based on vegetative density and stand type (Brigham 1987; Armitage & Ober 2012; Loeb & Waldrop 2008). Our findings support the idea that vegetation and vertical structure are more important in predicting species’ responses following fire than fire characteristics alone (Taillie et al. 2021). Species’ roosting preferences can also contribute to these activity trends (Hein et al. 2005; Mormann & Robbins 2007; Perry et al. 2010; Layne et al. 2021), however our study focused on commuting and foraging behavior.

As expected, MYSP/PESU had a neutral response to prescribed burns. MYSP/PESU have lower aspect ratios and wing loading, which allow them better maneuverability in cluttered understory (Inkster-Draper et al. 2013; Norberg & Rayner 1987). Since there was no significant difference in vegetative structure between treatments, we do not believe there was any difference in habitat availability for this group. Based on existing studies, MYSP/PESU are likely only negatively impacted by stand replacing or high intensity fire, since these species do not typically forage in open areas that would be created by these burns (Burns et al. 2019; Ford et al. 2021; Johnson et al. 2009).

We did not see any significant change in total bat activity or the activity of any species groups in the two weeks following prescribed burns. The peak in activity on hardwood control sites on the first night following burns may have been the result of bats
leaving burned stands to avoid direct mortality from fire. However, we saw peaks in activity after the first week post burn for most other sites. Braun de Torrez et al. (2018), who conducted a similar study with Florida bonneted bats, found similar activity peaks. They considered the impact of insect availability following fires as a potential explanation for bat activity following fires based on findings of Swengel (2001).

**Conclusions**

Though we expected prescribed burning to reduce forest clutter and increase bat activity, we found no significant difference between vegetative data on treatment and control sites. Our findings suggest that fires that cause no significant reduction in forest vertical structure may not negatively impact bats even when conducted at the end of hibernation. Prescribed burning is a common management practice in the southeastern United States and our study provides land managers with further understanding of how wildlife species are impacted by this practice. More research should be conducted to better understand the short-term effects of late winter and fall fires on bat species due to how critical this time is in their life stages. This research is all the more important considering the many sensitive and potentially endangered bat species. In addition, due to variability of fire, research should be conducted to determine how immediate responses may change based on fire severity. We recommend a before-after-control-impact study design to further understand the influence of fire and better control for potential differences between sites.
References


Table 1.1 Two-way ANOVA results testing differences in mean canopy cover, mean basal area, mean understory, and mean insect abundance between stand types (hardwood and pine) and treatments (burned and control) on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina between February 2022 and March 2022.

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Table 1.2 Results of linear mixed-effects models for total bat activity and big brown and silver-haired bat (EPFU/LANO), eastern red and Seminole bat (LABO/LASE), and *Myotis* spp. and tricolored bat (MYSP/PESU) activity in February-March 2022 on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina.

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Table 1.3 Results of linear mixed-effects models for total bat activity and big brown and silver-haired bat (EPFU/LANO), eastern red and Seminole bat (LABO/LASE), and *Myotis* spp. and tricolored bat (MYSP/PESU) activity in relation to stand type, treatment, and time since fire over the 14-day study period following six burns conducted between February 2022 and March 2022 on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina.

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Figure 1.1 Mean canopy cover (a), mean basal area (b), mean understory density (c), and mean insect abundance (d) by stand type (hardwood and pine) and treatment (burned and control) on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina following burns conducted February 2022 and March 2022. Error bars represent 1 standard error.
Figure 1.2 Least squares mean estimates ± 1 S.E. for total bat activity by stand type (hardwood and pine) and treatment (burned and control) on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina in February 2022 and March 2022. Bars with the same letter are not significantly different.
Figure 1.3 Influence of stand type (hardwood or pine), treatment (burned or control), and mean understory’s three-way interaction on total bat activity collected from February 2022 until March 2022 on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee Country, South Carolina. Total bat activity increased with mean understory in hardwood control sites (A) and pine burned sites (D) but understory density having a neutral effect on total bat activity for hardwood burned (B) and pine control sites (C).
Figure 1.4 Least squares mean ± 1 S.E. estimates for big brown and silver-haired bats (EPFU/LANO) group by stand type (hardwood and pine) and treatment (burned and control) on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina in February 2022 and March 2022. Bars with the same letter are not significantly different.
Figure 1.5 Influence of stand type (hardwood or pine), treatment (burned or control), and mean understory’s three-way interaction on big brown and silver-haired bats (EPFU/LANO) activity collected from February 2022 until March 2022 on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee Country, South Carolina. EPFU/LANO activity increased with mean understory in hardwood control sites (B) and pine burned sites (C) but understory density having a neutral effect on total bat activity for hardwood burned (A) and pine control sites (D).
Figure 1.6 Least squares mean ± 1 S.E. estimates for eastern red and Seminole bats (LABO/LASE) group activity by stand type, hardwood and pine, and treatment, burned and control, on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina in February 2022 and March 2022. Bars with the same letter do not differ significantly.
Figure 1.7 Mean total bat activity across the fourteen nights following burns on pine sites (A) and hardwood sites (B) in February and March 2022 on the Andrew Pickens Ranger District of the Sumter National Forest in Oconee County, South Carolina.
CHAPTER TWO

IMPACT OF EXPERIENCES ON WOMEN’S SELF-IMAGE IN NATURAL RESOURCES PROFESSIONS

Introduction

Women make up almost half of the current workforce at large, but this equality is not found in all fields (International Labour Organization 2020; U.S. Bureau of Labor Statistics 2021). In the science, technology, engineering, and math (STEM) fields, women compose less than a quarter of the workforce (National Science Foundation 2017). The path from education to professional career is often described as a “pipeline” with many “leaks”, or places where people voluntarily or involuntarily leave their field. Often, the people lost at these leaks in the pipeline are women leading to the gender disparity we see in many professions (Pell 1996; Blickenstaff 2005). In Natural Resources, a group of STEM fields, it is evident that women are “leaking” out of the pipeline between undergraduate and graduate school as well as at the stage of entering the workforce after their graduate career (Hodgdon 1980; Blickenstaff 2005; Agee & Li 2018). This gender inequity can arise from several factors, such as gender bias, lack of role models, and the design of the system itself (Blickenstaff 2005; Beede et al. 2011).

Traditional gender roles are characterized by a dichotomy with males as the “breadwinner” and females as the “homemaker”. These gender roles continue to change with more women joining the workforce and the increase in dual-income households (Perrone et al. 2009). However, in the workforce gender expectations can negatively impact a woman’s ability to enter or thrive in a working environment (Perrone et al.
2009). This challenge may lead women to prioritize their personal over their professional life, further contributing to the “leaky pipeline”.

Women that continue from their education to the professional field must overcome gender biased hiring decisions. Despite shifts in demographics at the undergraduate and graduate level, fields of Natural Resources continue to be male-dominated (Thomas & Mohai 1995; Ceci & Williams 2011; Kern et al. 2015; Sharik et al. 2015). This suggests that there is a major leak in the pipeline for women in the transition from graduate studies to professional careers. Traditional jobs in Natural Resources, such as wildlife management and forestry, have been predominantly held by men, which has set a precedent that can prevent female applicants from being considered for employment in some fields (Samson et al. 2017). Some women navigate hiring inequity on their own, while some institutions have implemented interventions to balance hiring inequities (Devine et al. 2017). In other instances, a woman may not be considered for a position if there is potential for conflict between home and work responsibilities, despite the illegality of this action (Fredrikson et al. 2010).

Female professionals that are measured by male standards have more difficulty achieving success. Numerous studies document the lower rates of female senior authors and lower rates of funding awarded to females versus males (Pohlhause et al. 2011; Van der Lee & Ellemers 2015; Bendels et al. 2018; Witteman et al. 2019). That being said, to achieve the male standard of success, women typically work harder and often produce more publications (Winneras & Wold 1997). Schroeder et al. (2013) found there to be fewer women speakers at a specific biannual conference and reasoned that it could be due
not only to there being fewer females invited to speak, but also potentially due to fewer female professionals in the field or fewer women accepting invitations. Fewer female speakers, however, also means fewer visible role models and representation for future generations, which can also continue the underrepresentation of women in STEM fields (CAUT 2008; Madsen 2011; Cho et al. 2013).

Having relevant, similar identity role models can motivate one to pursue professional positions (Gibson 2004). The lack of female professionals in Natural Resources can potentially reinforce the idea that these positions are not available to women (Carrell et al. 2009). Visibility of female professionals to act as role models can help balance the gender demographic of the workforce in the future (Breda et al. 2020; Torres-Ramos et al. 2021). That is, young girls are more likely to pursue a field or position when they see women that they respect or admire in these spaces (Lockwood & Kunda 1997). However, there are less opportunities for female role models due to women composing less than half of the STEM workforce (National Science Foundation 2017). The male standard created by historically male-dominated fields can be difficult for women to attain without the same opportunities. If women are not afforded the same opportunities for advancement and success, there may be fewer women to set an example for future generations.

Due to challenges, which include gender bias, lack of role models, and design of the system, there are many reasons that women may simply choose to be less involved in their field or leave it entirely. Some of these reasons include prioritizing other life goals, disparity in pay, or lack of mentorship (Angus 1995; Kuhns et al. 2002; Krefting 2003;
Adamo 2013). Women that remain in their field experience varying levels of discrimination or harassment due to not conforming to gender expectations of the “ideal” candidate for a position (Davidson & Black 2001).

If applied properly, using the lens of female experiences in the workplace, qualitative inquiry can generate data to contextualize existing quantitative data and foster a more holistic understanding of the relationship between one’s gender and occupation. Qualitative inquiry is a study methodology that evaluates phenomena through the context of those experiencing them (Mayan 2009). Without inclusion of qualitative context, absence of formal sexual harassment complaints, for example, could be misinterpreted as absence of gender discrimination (Serio 2016). Qualitative inquiry’s focus on context is important for this study specifically to potentially understand the cause of fewer female professionals in Natural Resources.

**Goals and Objectives**

The purpose of this study was to understand the experiences of women in Natural Resources at the professional level. Better understanding of these experiences can further contextualize existing Natural Resources demographic statistics. Further, we aim to understand what factors are potentially perpetuating gender disparities in these fields. Using qualitative data collection allows for emphasis on first-person experiences to amplify the female voice. Quantitative evidence, in this instance, may have identified problems without context for reasonable methods to address them. We hope to inform future endeavors to address gender inequalities in Natural Resources.
Our first objective was to determine whether female professionals within Natural Resources experienced challenges in their careers due to being a woman. Secondly, in the same facet, we aimed to determine if female professionals within Natural Resources fields experienced any benefits in their careers due to being a woman. In pursuing these objectives, we also investigated commonalities in challenges and benefits women experienced.

Methods

Institutional Review Board Approval

This study was approved through Clemson University Institutional Review Board (IRB) with Approval #2018-016. In accordance with IRB guidelines, all researchers involved in this study underwent IRB training and were aware of their ethical responsibility to participants in this study. All informants participated in this study voluntarily with adequate information regarding potential implications of participation provided to them prior to interviewing. Each informant received an informed consent document outlining the goals of this study in addition to perceived risks or benefits associated with participation. Informants could choose to discontinue participation at any time.

Positionality

In the conscious effort to effectively communicate the experiences of participants, I must first acknowledge how my own identity may influence what data I am able to collect and how I interpret said data. For this, my positionality statement is as follows:
As a black woman working in a science field, I acknowledge that the intersections of my identity have contributed to my own experiences in the workplace. Having had negative experiences due to my identity can potentially manifest as projection of my experiences onto the data during analysis. Communicating with informants to clarify meaning during the interview process will limit my ability to make assumptions regarding discussed situations. However, I believe that my identity also places me in an advantageous position for collecting honest information and locating patterns between respondents. Use of intercoder reliability will strengthen analysis and reduce the impact of my personal biases.

Sampling

For this study, we defined Natural Resources as a group of fields relating to resources naturally occurring on earth, such as water, soil, forest, wildlife, or plants. This definition was gathered from majors included in Natural Resources majors at multiple institutions as well as goals, missions, and positions available in state and federal natural resource agencies.

Initial participants for this study included women in the social networks of the researchers, all of whom were in Natural Resource at some capacity. After initial participant selection, we used snowball sampling methodology to collect contact information for additional participants. In snowball sampling, recommendations for future participants were given by current participants at the conclusion of their interview. Using snowball sampling allowed us to expand our sample and receive contact information for potential informants that we may not have found otherwise. When
contacting these suggested participants, we did not disclose the recommender’s identity to maintain participant anonymity.

When I joined this project, we selected additional informants by searching directories of universities, government agencies, non-governmental and non-profit organizations for contact information of women currently working or having worked in Natural Resources professions. In addition to these directories, we found female professionals potentially interested in participating through social media groups, such as “Women in Wildlife Community” and “Women in Wildlife Photography”. Special attention was given to purposive sampling of minority women to increase racial and ethnic diversity in our sample.

**Interviews**

We conducted informant-led interviews that usually lasted between twenty and sixty minutes. However, a few interviews lasted up to two hours. We asked all participants to provide us with their background, such as their education, work history, or other information that they felt relevant to the study. After discussing their background, we asked participants the following questions:

1. What challenges have you experienced as a woman in your profession?
2. What benefits have you experienced as a woman in your profession?

For participants that had been in their field longer, we split these two questions into smaller time frames, (e.g., graduate or early career and established career). As the informant responded to these questions, the interviewer(s) took note of any follow-up questions that could further clarify responses, such as requesting examples or further
elaboration of topics mentioned. These follow-up questions were asked at the conclusion of the informant’s responses. The flexibility of this design avoids the rigidity of fixed interview questions and allowed us to focus on what the informant identified as important as well as encouraged elaboration on provided information. The data collected from using this design have a larger range of response than fixed interview questions and allowed informants to decide what experiences are discussed and emphasized rather than the researchers. We recorded all interviews using a voice recorder for later transcription.

We stopped conducting interviews prior to reaching saturation due to time constraints on our study. Saturation is commonly defined as the point where data collection is discontinued due to participants’ responses becoming repetitive or redundant (Glaser 1978). We may have reached early stages of saturation, however the broad nature of our questions allowed for a large range of responses. Ultimately, the uncertainty that we obtained all possible responses to our interview questions does not make the responses provided by our participants any less relevant or valid.

Transcription

We used saved audio recording to transcribe each interview. All dialogues from the recordings were documented. We used punctuation to convey cadence and pattern of speech (e.g., natural pauses represented with commas, longer pauses or “trailing off” represented with ellipses, and stutters represented with hyphens between words used). In each transcript, we started each person’s dialogue on a new line and denoted who was speaking with participants noted as “Respondent” and interviewers denoted as “Interviewer #”. When more than one interviewer was present, interviewers were
numbered in the order that they spoke in the interview, with the first interviewer to speak being “Interviewer 1”, the second to speak being “Interviewer 2” and so on. The original transcription was saved as a raw file in a word document.

After we transcribed the interview and saved the raw interview file, we reviewed the transcript and removed any identifying information. This included names mentioned, locations, and references to specific institutions or agencies. Identifying information was replaced with more generalized descriptions in brackets to maintain the statement’s meaning. To give context for analysis, we also included bracketed information to provide clarity or context. An example of a transcript with identifying information removed is: “So, when [supervisor] hired me, he specifically put [specific responsibilities] as part of my position description…I really didn’t have training.” (Participant 25).

Once we removed all identifying information, the anonymous transcript was provided to the participant for her review. At this time, informants were able to make any edits, additions, or removals that they desired to ensure that ideas and experiences were properly expressed.

We used inductive coding to generate codes from our transcripts during our analysis. Codes were titled using in vivo techniques as well as general concepts. We used this ground-up approach to group related nodes into sub-themes and related sub-themes into larger overarching themes. Participants’ quotes were included in any and all nodes, sub-themes, or themes to which the quote could pertain. These were organized in a hierarchy such that multiple nodes could be included in a sub-theme and multiple sub-themes could be included in a theme. Our themes are presented in our results as headings.
that are bold and underlined, our sub-themes are presented as bold headings, and nodes are presented as italicized headings.

**Information Storage**

All files relating to an interview, including the audio recording, raw transcript, and anonymous transcript were saved using only the informant’s participation number. All files relating to an informant were saved in a shared drive folder titled as their participant number as well. Only researchers actively involved in the study had access to this shared drive to ensure security of participant information. Only the primary investigator of this study, Dr. Shari Rodriguez, was aware of the identity of all participants.

**Results**

During our study period (2018 to 2022), we conducted 44 interviews of women from various fields and positions within or originating from countries in North America. Only 43 interviews were included in our analysis because we did not receive approval for one transcript. We found five major themes across responses to our questions: Diversity and Equity, Respect Topics, Support, Culture and Inclusion, and Intersectionality (Figure 2.1).

**Diversity and Equity**

A commonly discussed theme in our interviews were the challenges and benefits related to diversity and equity. We identified positive diversity as initiatives for inclusivity of various identities and negative diversity as discriminatory acts against someone based on their identities. We identified positive equity as actions that were
considered “fair” by participants in consideration of differences between individuals. Likewise, we defined negative equity as actions taken that are inconsiderate of individual’s differences or considered “unfair” by participants. The various sub-themes within Diversity and Equity were discussed with different frequency (Figure 2.2)

**Ageism**

The spectrum of ages present in the workforce can contribute to differing power dynamics and perceptions of workers. An early career challenge expressed by participants was being belittled or not taken seriously because they were younger than their colleagues. This was regardless of whether a woman was in academia or worked for a government agency. For example, Participant 7 said in her first position she, “… kept getting mistaken for a student”. Regarding an agency position, one participant mentioned behavior she saw when younger women were hired and became “…the new pet of the agency. They’re young, they’re pretty, they don’t have wrinkles, they’re new…” (P5).

However, there are also disadvantages to growing older:

“I would say that you are at a disadvantage the older you get. I guess just that stereotype of older women…You see a changing viewpoint of a woman as she gets older; a diminished role. What does she know? Men get some grey hairs, [they’re] viewed as wiser.” (P5).

Participants were not exclusively discriminated against due to their age; in a few instances, participants discussed how they change their behavior depending on the age of those involved in their interactions. Participant 23 talked about this specifically, saying, “…if it’s an older guy, I tend to just listen. And I think that goes back to just what’s been driven into me for so many years, to just sit back and listen. But if it’s a younger person I’ll tend to just get out and do whatever anyways. Especially if it’s somebody that I know
that I have some kind of a work relationship with…”. This quote demonstrates how some women will change their behavior to uphold gender expectations.

**Gender Roles**

We used the common definition of gender roles for this sub-theme as the expectations of how a person acts, presents, and engages with others based on their gender. An example of how gender roles can be reinforced in Natural Resources fields is provided by Participant 34, who’s family did not perceive her as having a job suited to her gender:

“…[my family] still sometimes will look at it as, ‘oh, some day she’ll outgrow playing outside, and she’ll come in and do something a little different.’ And it just makes me laugh that to this day it’s still seen that way. It’s that silly little girl who likes to play outside with animals…” (P34).

**Biological Differences**

Biological differences between women and their male counterparts created both benefits and challenges for participants. Some of the benefits for women included receiving help with more physical tasks like loading a deer into a work truck. Also, some respondents benefited from reduced workloads being assigned [“‘she’s a little girl…let’s not give her too stressful information or duties’…” (P20)] or better access [“…the bathroom lines are shorter…” (P32)].

On the other hand, participants could feel belittled by offers for assistance with physical tasks: “…they'd [male colleagues] kind of step in and try to do it and again it was the ‘if I need help, I’ll ask you’…” (P30). Having reduced workloads could also contribute to the perceptions that “… ‘she’s a little girl’… ‘let’s not give her too stressful
information or duties’…” (P20). Availability of bathrooms could be a challenge in the field, where many women discussed the desire for privacy and other female related issues:

“…I had to use birth control so that I wouldn’t have my period because I didn’t have a place to put in a pad or tampon or change it every few hours. What are you going to do? Squat down and take your clothes off in front of the men on the deck [of the boat]? You can’t do that. Or even, going pee or if you have to go to the bathroom, the men go over the side. They’ll whip it out and just pee over the side of the boat, but as women, if I did that, I would be baring it all.” (P36).

When discussing how to overcome these biological differences, one participant stated, “I got to start up higher than that. I’m too small. I’m not strong enough. I can’t carry all the equipment that you’re carrying. So, I need a better degree. I got to get a higher education than you, in order to compete at your level.” (P19). This suggests that some women use higher education to overcome the physical shortcomings of her size and stature.

Gender Gaps

The gender gap, for the purposes of this study, is defined as the differences between men and women in professional spaces. Few participants expressed not experiencing the gender gap or that they were aware of the gender gap, but the gaps did not impact their behavior: “I’ve never had any challenges professionally due to my gender. It’s amazing to me, ‘cause I know that’s really widespread.” (P39).

On the other hand, some participants were able to configure gender gaps as a benefit:

“…I do think that I got this job because they needed to hire a woman. It was kind of crazy that it was [year] and there were no females in this
department, right? And the reason I think it helped is I know that my phone interview was bad…” (P24).

Once hired, women often found that it was more acceptable for them to stay home with their children as opposed to their male counterparts when it came to travel:

“I do think that women…if they have a work conflict, say if they need to travel but they’ve got to stay home with the kids because they can’t find a babysitter or have to pick them up from school, they’re probably going to be more understanding to their need to be with the kids versus a man.” (P5).

**Caretaking Behavior**

One traditional gender role embodied by women is being the caretaker, which was often indirectly discussed by participants. This sub-theme can be aptly described by: “…I think, in general, and this goes in like any kind of like marriage or any other kind of relationship is women carry more of the emotional burden of making sure everything is happening and that everybody is okay.” (P15). This exemplifies how the traditional caretaker role that women are expected to uphold extends beyond their personal life and into their professional life as well. Some women discussed the expectations that they would care for their students more as opposed to their male colleagues:

“…[at conferences] I tried to start doing that even as time went on, as I became more well known in the field, seeing if a student seemed to feel uncomfortable or was getting like too much attention from someone who it seemed like the vibe was weird. And trying to pay attention to that or maybe divert attention if someone was feeling uncomfortable.” (P27).

On the other hand, a few participants discussed how having this caregiving personality trait negatively impacted their students’ or peers’ perceptions of them, such as “I would say as a faculty member, where I’m most aware of it [challenges arising from my gender]
is that I’m not ‘nurturing enough’ with my graduate students or that is how they report me.” (P25).

Sensitivity

Participants were negatively impacted by the common gender stereotype that women are more sensitive than men. This perception led some participants to question, “…where’s the line between being paranoid and being aware?” (P32). Since they are viewed as more sensitive, women often second guess themselves about their perception of the gravity of a situation. Some participants expressed being told that they were being too sensitive when they addressed something that was important to them:

“Once or twice, I felt directly insulted as a female and I did bring that up to him to which he got somewhat threatening in his body posture, he is this very tall man, and he stood in my face and started poking me and telling me he didn’t know I was so sensitive while in my face.” (P4).

To the contrary, some women survive workplace inequality by countering the sensitivity stereotype, like “I also am not sensitive to stuff, basically nothing anyone can say will offend me. That’s my personal policy, I don’t take things personally, because people are going to behave how they behave.” (P36). This “thick skin” allows them to persist despite negative experiences.

Juggling Multiple Work and Home Roles

Expectations of women inside and outside the workplace can cause some women to be overwhelmed with all that they have to accomplish. Participant 11 demonstrates this in the following quote:

“There was a lot of huge issues with whether I could do this or not. [It’s] still a tremendous source of stress for me because it’s hard to manage all
these different roles on top of what I need to do for my job. That has been my biggest barrier or struggle as a woman.”

In a similar facet, other respondents discussed not being able to enjoy time at home due to worrying about their work responsibilities:

“I have a few [master’s] students, they’re like halfway done…I have a student in the field, and there’s a lot of anxiety I feel like. And it’s hard to be away from email and it’s hard to turn work off. And I’m trying to take advantage of this time with my newborn…but I can also feel that if I’m not on top of things that there will be more anxiety when I go back.” (P26).

Though there are still expectations for men outside their home roles, the expectations are disproportionate. This often leaves women feeling that one must be sacrificed for the other. This is outlined here:

“So, that’s a big disadvantage whether someone is at the younger end of their career and having children or at the older end and taking care of aging parents-whatever it is, we don’t seem to be too good taking into account that those burdens usually fall on women more than men. Even thinking about it as a burden, we should be enjoying that! Those contributions they are making towards their family and society are just as important as other parameters of your career like publications. And we aren’t good at that…” (P7).

**Gender Roles in Work Assignments**

A large number of participants discussed being assigned certain tasks that aligned more with traditional feminine gender roles. This could include physical tasks such as,

“…when I was younger being assigned the note taker versus someone doing more hands-on field work.” (P20). In these situations, women being assigned as the note taker were prevented from doing more hands-on field work tasks that were assigned to their male counterparts. Some different work assignments extended to having fewer leadership-oriented tasks or instructor positions as discussed here:
“…he [my advisor] was inviting students to help with workshops and it was only his male students…workshops also help people view you as an expert in the field, so you’re taking all of these male students and not taking any of your female students who also work in the same field. So, you’re kind of hamstringing some of us by restricting our opportunities.” (P27).

*Marriage and Work*

Despite their education and positions, many participants discussed the difficulty of having certain expectations imposed on them due to their marital status. This could start in their graduate career, explained by one participant’s description of her advisor as “…still of the viewpoint that, for example, if a woman got married, that would mean the end of her academic career.” (P37). This expectation continues into the workplace, where “…trying to figure out how to find a job for myself and my partner at the same time was always really challenging.” (P21). If spouses are unable to find positions that are at the same institution or in the same location, it can force long distance relationships. This issue is amplified when both spouses are in the same field, which introduces the need to distinguish themselves:

“Yes, [my husband and I] purposely did not collaborate. We purposely were not coauthors on each other’s papers because I thought it was important [that] we were seen as independent people that could be hired for two independent skill sets. We purposely picked PhDs to try to separate ourselves.” (P24).

In this instance, the participant went on to discuss the system of spousal hire accommodations and how often when the woman is hired as an accommodation she is not able to pursue her desired research topics. To avoid this, she and her husband looked for institutions where they could be hired in separate roles instead.
The expectation that a woman prioritize her marriage over work was also enforced by personal influences. An example of this is given by Participant 37, saying “…[my husband’s] family in particular directs a lot of question[s] to him about his career. My career is definitely secondary…” showing that some family influences still play a heavy role in the continued expectation of a male breadwinner and female caretaker.

Gender Roles and Parenthood

Related to marriage and work, there are different expectations of men and women in parenting roles. Responsibility of caring for children can be shared. Participant 30 indicated “…my husband would get up at 4 in the morning and work until they [our kids] woke up and then after they went to bed, I would work from like 8 to midnight or something like that…”, allowing both parents to be available to care for the children throughout the day but still have time to complete their work duties. However, in some situations, the roles are divided with one parent staying at home and the other working, “Yeah, and I have had really great male mentors who have had children. A lot of them have stay at home wives or partners that can sort of facilitate them with the pressures of academia…” (P3) or the complete opposite, “…what made much of my work possible when my kids were at home was that my husband was a stay-at-home dad.” (P32). There were also instances where both the participant and her husband worked, such as Participant 43 who was able to turn her volunteer position into a paid position to continue to afford childcare:

“The curator of [field] asked me if I could work more. He said, ‘I really need more help,’ and I said, ‘well, I’m already paying [amount] a week to
have my son in a nursery school for three mornings a week. And so, I really can’t afford to do it without some pay.”

The expectation that women are more necessary as caregivers was occasionally a benefit, such as:

“I’ve certainly noticed maybe it’s a little bit better at my agency, but I do think that women…if they have a work conflict, say if they need to travel but they’ve got to stay home with the kids because they can’t find a babysitter or have to pick them up from school, they’re probably going to be more understanding to their need to be with the kids versus a man…” (P5).

Motherhood

We categorized motherhood separately from parenthood as it includes the experiences related to pregnancy as well as childbirth. Due to the large amount of physical and emotional investment that pregnancy and child rearing requires, women perceive an expectation that they will stop working sooner, whether this is giving up an academic or other jobs with an agency or organization. One participant discussed a comical use of this understanding:

“…we were playing April Fools on my [grad school] advisor, and you know what my joke was? I emailed him and told him I was pregnant. Like, that was the joke….It was very well known, you do not have children in academia until you’re tenured…” (P42).

This can be understood as women not being able to prioritize childbirth and childcare until they have a secure job. For some, the need to have a secure job arose from the need to have maternity insurance to make a successful pregnancy affordable. Beyond insurance needs, socially it may negatively impact a woman in her professional environment if she is unable to perform certain tasks. Many women noticed, “…as I got further along in the pregnancy, people treat you a little bit differently or they treat you
more delicately, especially when you’re in the field.” (P30). Even if a male colleague has
good intentions, his actions can create more feelings of alienation based in the sentiment
that “…I’m pregnant, I’m not broke[n]. I can still do the work.” (P30).

For women that waited until they had a secure job to try and get pregnant, there
could still be further complications, for example:

“…my husband and I tried to start a family after I left academia and we
can’t…now that we’ve moved into the infertility world, there’s so many
women like professional women, lot of academics… who are all in the
same boat. They’re doing assisted fertility, they’re all looking for egg
donors, and we’re all within quote-unquote ‘childbearing age’ but not
really, like we’re on the cusp.” (P42).

Having a child often changed a woman’s perceptions of goals and achievements
as well as her priorities, for example:

“…before I had the children, I’d go to conferences no problem, I’m gone
and I come back. But after I had the kids, I find myself for example,
during a break at a meeting in the bathroom stall, pumping breast milk. I
had my little kit and everything and making sure everything’s clean and
I’ve got my breast milk and it’s in the little thermal pack and I was like,
‘oh yeah, that’s my achievement for the day,’ the talk is fine…” (P31).

Childcare also created a challenge for women if it conflicted with their work
expectations: “…if [senior or other staff] have someone that couldn’t do something
because they have to stay home with kids. It’s viewed negatively” (P5). This suggests
that women are likely to be perceived negatively when they do not prioritize their work.
However, other participants discussed being perceived negatively for not prioritizing
their children as outlined by the female caregiving stereotype: “…I would be judged on
‘oh, it’s not cool that you’re away from your kids so much like…what about your
husband?’…” (P15).
Although many women discussed challenges associated with pregnancy and motherhood, a few participants discussed how not having children impacted their careers. One participant stated, “I have a unique situation in that I chose not to have children. So, I am really not pampered in the way that a woman with children in this field would be.” (P6). Difficulties associated with being a working mother can contribute to the decision to not have children: “I have about five hundred reasons as to why I chose not to have children, but one is because career wise it would have been difficult.” (P6).

*Female Masculine Behavior*

Some women indicated that they intentionally or unintentionally adopt behaviors traditionally expected of their male counterparts in the workplace. For some participants, being, “…raised by men in this field…” (P38), in other words, working exclusively with men, changed the way that they interacted with their female colleagues. For example: “I had been interacting with men my whole career and I think I came off very to the point and women interpreted that as being rude.” (P38). This exemplifies that as a woman, “…you have to walk [the] knife’s edge of like being respected and knowing what you’re doing and not taking any flak from anybody, but also, you have to be nice about it.” (P15). Not being able to tread this line can negatively impact a woman’s career opportunities, as with a participant’s former student who “…got some feedback from a previous job interview that she didn’t have enough soft skills, which meant that she came across a little bit too harshly.” (P15).
Gender Issues

Gender issues can be understood as the difference between how people of different genders are impacted by or respond to policies or interventions imposed on them. In addition to this, these issues encompass differing access and use of resources by those of different genders.

Glass Ceiling

A trend for challenges experienced by participants was the glass ceiling, which is defined as an unofficially acknowledged barrier to career advancement (Oxford). Women either discussed the glass ceiling directly [“…crashing through makes it sound like the glass ceiling is gone, and it’s not gone.” (P15)] or indirectly referencing barriers [“…literally one generation above us were the first females in these professions.” (P4)]. In the latter case, it is assumed that the existing workplace culture acted as the barrier preventing women from achieving their desired positions.

Favoritism or Bias Towards Males

It was very common for women to discuss their experiences with men receiving more opportunities than women. Even prior to joining the workforce, favoritism between advisors and their grad students was discussed: “…I sometimes babysat [my major advisor’s] kids and that was fine, but sometimes I realized when I was babysitting it was because he was out hunting with the male PhD students. And I have a hunting license, I hunt.” (P4).

Beyond their graduate school careers, women discussed a preference for hiring males regardless of their qualifications. An example being:
“We have all these super smart, ambitious, super capable women, but then I looked at the workforce and I’m like, ‘well, where do they go?’ I’m seeing them at the university level, and then I’m looking in my interview panels, and I’m [thinking to myself], ‘where did everyone go?’ and it’s like, ‘oh yeah, they [men] all got the jobs…without the masters. Without the postdocs…” (P38).

Participants also discussed perceived bias towards males in organizations’ upper levels of management and entry level positions. In fact, according to some participants, it may be more prevalent in higher level management positions where people expect a man:

“So, one of the things that I did for [organization] as a board member, I was on the selection committee for the new CEO, and well, the most outstanding candidate that was a slam dunk in my opinion was a woman. And, when that information was shared with the board, there were some individuals that were just totally confused because they had been talking about him. When were we going to hire the new CEO – who was he going to be? It just was outside their realm of possibility…” (P7).

**Female vs. Female**

Rather than supporting one another, many participants discussed how conflict with other females contributed to their negative experiences. A common situation discussed by participants was having missed opportunities or connections due to their coworkers’ protective wives: “…the older you get, the more you get into a situation where your male colleagues are in long term relationships, or they’re married and so then there’s issues with their spouses being jealous…” (P32). Another example being, “…one of my roommates, she had a professional colleague in [agency] and he had a super jealous wife who didn’t even want him to do fieldwork with her or anything…” (P32).

Sometimes women within the public enforced gender stereotypes on participants:

“I had a woman come up to me one time at a gas station and tell me I couldn’t tie knots because I was a woman and women don’t tie knots…she went into the gas station, got a random stranger – man – and brough him
out and told him to tie my knots for me…He tied it up awful, horribly. He had no idea what he was doing. I just stood there, kept my mouth shut, let him do his thing, let both of them leave, then I untied it all, [and] tied it all back up.” (P22).

Within the workplace, female colleagues also acted as obstacles for participants. Many participants attributed this to adopted masculine behavior, like “‘yeah, you’re a little bit competitive in this way,’ but it’s like, you also see how it happens where they’re just surrounded by men that are like that all the time.” (P44).

**Female Diversity**

A majority of participants discussed the diversity of females or lack thereof in their careers. Being the only woman in the room was a benefit to some participants, but a detriment to others. One participant mentioned how female diversity was manipulated to ensure that working teams were neither fully male nor female, but that the often male majority could contribute to a feeling of isolation (P18). In specific agencies, the attention towards increasing female diversity was discussed by many participants as well; Participant 20, said “…[the agency] has been under legal actions to have representative demographic diversity and there’s a lot of turnover in women in [the agency] because of negative experiences of women in general.” This demonstrates how lack of female diversity may lead to women leaving or disengaging from their field.

Due to there being fewer women in the workplace, successful women are more recognizable: “When we [my male colleagues and I] walked in, I didn’t have to be introduced.” (P9). Participant 27 discussed an instance where it was perceived to be a detriment, when she was told by a friend at a conference that another speaker at the conference only remembered her because she was “…a 25-year-old woman, who likes to
go out drinking…”. This expressed to her that “…‘he [presenter] probably wants to sleep with you and so that’s why he remembers you’….” (P27).

However, some participants, such as Participant 3, talked very highly of female diversity in their workplaces: “I am currently on an all-female team which has been really fun. My boss is a woman, who I really admire and really respect – we work really well together, and I appreciate her.” Other participants also discussed how female diversity contributed to better connections between colleagues and greater feelings of belonging.

**Perceived Gender Subordination**

Very few participants discussed situations in which they subordinated themselves to other men regardless of position, Participant 44 said, “…I got myself out of the [creepy] situation and was able to leave the conversation politely. You know, and in hindsight it’s like, ‘why the hell did I have to be polite about it?’” In this situation there was no power differential, but the participant still felt the need to respectfully exit the conversation despite her own discomfort. On the other hand, participants discussed situations where they were expected to be subordinate. One participant was told that her supervisor “…‘puts women in supervisory positions because they’re more submissive.’” (P38), and indicated she was dumfounded by this. This suggests that women are expected to behave as if they are subordinate to men even when they are in a leadership role.

**Male Privilege or Lack of Understanding**

Due to the different experiences of males and females, some participants discussed difficulties with trying to explain their experience to their male counterparts. This sub-theme is also defined by male privilege, which is an advantage for males
afforded by the history of the male-dominated Natural Resource workforce. When Participant 44 had a discussion with her male supervisor about her photo being used for one of their organization’s campaigns, her supervisor indicated “… ‘this is great publicity for you!’” (P44). However, the participant’s feelings towards the images did not align with that of her supervisor: “No, it’s not. It doesn’t have my name on there. It doesn’t say ‘Dr. [Respondent] doing research at this lab.’ It gives me zero credit.” (P44). This misunderstanding arose from lack of understanding about representation for women in Natural Resources and how this can be used by some agencies and institutions to portray a misleading image of diversity.

Males may be more privileged than females in that their personal relationships do not often negatively impact their coworkers’ perceptions of them. Participant 24 discussed navigating the need to keep her relationships private to maintain work-life balance and not suffer the loss of professionalism that is sometimes associated with workplace relationships:

“…I’m a professional, this is my work life, this is what I’m doing to become a working professional and my personal life needs to not be involved with my work life and my career trajectory. And so, [my husband], that was not what he would have done. I don’t think he cared. He’s like, ‘why does it matter?’ but he essentially complied with my wishes…” (P24).

Communication
Another issue arising from differences between genders is how to best communicate with one another given differences in delivery of communication. The key differences between how males communicate and how females communicate is illustrated well by Participant 17:
“There’s ‘mansplaining’ and just kind of – the men tend to have kind of a swagger and they’re looked up to a bit more. So, they have this authoritative kind of swagger to them, whereas women, most women, I don’t know. We use different language and body language. Women use a lot more ‘hedge’ words. Words like ‘maybe this’ and ‘have you thought about that’. We temper things more. We’re not like blasting forth with giant egos as often.” (P17).

A few participants discussed changing how they communicated to better align with their male coworkers, but that this could also be received negatively:

“….if I speak up, then I wonder was I being too snarky or too aggressive? Was my tone wrong? Sometimes I feel that in order to make myself heard I have to come out a little bit stronger, but then you wonder, ‘am I snarky and aggressive?’…” (P2).

Situational Awareness and Unsafe Situations

Women may be more vulnerable to harassment in social situations or bodily harm while conducting fieldwork, often leading them to be more aware of situational threats. This is both in situations that are unsafe due to the behaviors of others and potentially physically hazardous environments in field work.

Different Perspective

Women’s increased situational awareness can give them a different perspective than their male counterparts. A few participants discussed that a benefit of being a woman was that they had a different perspective from their male colleagues: “…I feel like I see the world differently [than men], which I think is a benefit to some extent…my life experiences are different such that I interpret things differently, maybe, than other male colleagues might…” (P21). A different perspective can affect how women lead. For example Participant 32 indicated: “I started realizing that people really like my leadership style. And it was, I mean, I think a lot of it was just from being…a mom and just maybe
having some insights that men don’t have…” This participant goes on to discuss her belief that being a mother has “…made me a better leader.” (P32).

*Females are More Intuitive*

Another benefit discussed by a few participants was female intuition, defined as the understanding of people or situations based on feelings. Participants discussed using their intuition to better understand coworkers:

“…the way my mind works versus some of my other coworkers allows me to have better attention to detail and to understand [the] big picture and to understand [the] impact of decisions and have a greater depth of personality behind interactions. So, I think I have a higher social intelligence. And that is a really useful tool in navigating the workplace.” (P18).

Based on increased awareness and intuition, participants believed they were able to connect with their students more than their male counterparts. One participant states, “I think I can read students better…” (P1) as compared to her husband, in particular, who is also an educator.

*More Adaptable*

Participants exclusively discussed the perception that women are more adaptable as a benefit of being a woman. Participant 19 stated, “I tend to think that females are much more adaptable to change than men are.” This flexibility can not only aid in a woman’s journey to success, but also aids in the success of the teams they work on. One participant highlighted, “…thank goodness women have come into this field because women are so much better at teamwork and women bring to teams a level of performance that is not there without them.” (P7).
Sexism

Sexism was heavily discussed in interviews during this study. We defined this sub-theme using the traditional definition of sexism, as discrimination based on a person’s sex. It should be noted that sexism could be included as a node of our Gender Issues sub-theme, but due to the broadness of the topic, we set it apart and further divided it into different categories to best capture the various experiences of participants.

Pay Sexism

Women continue earn less money than their male counterparts in many fields. The pay gap can be more evident in some organizations than others: “…it’s a non-profit challenge, but I think it comes with being a woman as well. I feel like I’m expected to do things for free…I feel like if I was a man, that wouldn’t be the situation…you can see online how much they’re [men] getting paid. And it’s a lot.” (P35). Along with pay, a frequent topic was how women negotiated salaries. A task that was considered especially difficult because “…women aren’t really good at negotiating for salary positions as much as men…I think that that’s totally a challenge since it’s not something that comes naturally to us or any women, I should say.” (P8). Some participants discussed how their mentors helped them overcome the pay gap, an example being when a participant’s mentor “…set [a postdoc] up with the salary and everything before my name was even on it…he said, ‘just to make sure that you are paid what [your work] is worth.’” (P42). One participant mentioned actions taken by her organization to address pay sexism:

“…So, [organization] started to rebalance [the pay gap by] giving women raises on their salary that deserve it in order to catch up to men. And they also decided to just quit having a range of salaries available so that when
people are hired, there’s only one salary on offer. So, there’s no longer that option for that differential between men and women.” (P37).

**Romantic Sexism**

Participants discussed being discriminated against based not only based on their gender, but also how attractive they are: “I think he was looking for a girlfriend more so than a field technician…” (P17). In some situations, this could create additional opportunities for women, but more often acted as another barrier. Both situations are exemplified in one anecdote where “…my boss, on my first job out in [western state], was with a young, male PhD student, he was married. But he felt comfortable saying, he didn’t hire one of the [female] students at his university who was interested in [and qualified for] the job because he was attracted to her….” (P38). In this situation, the participant got the job because the hiring PhD student that she worked for was not attracted to her.

**Denial Sexism Exists**

Some participants reported that men outright denied that sexism was still prevalent in the workplace or that women were the primary people experiencing sexism. Participant 12’s male supervisor discussed his experience with sexism mentioning that his wife received more job offers with her undergraduate degree than he did with his PhD in the same field. Her supervisor expressed: “… ‘They wouldn’t offer me any jobs because I was a man and they only wanted to hire women’…” (P12). Despite his intention to share “…his example of how sexism has been used against him…” (P12), he actually indicated that he did not believe his wife was being offered employment opportunities based on her own merit.
Downstream Effects of Sexism

Outside of being directly discriminated against, participants also discussed being disadvantaged due to institutionally sexist systems. Participant 36, after a recent promotion to a leadership position, had an employee bring a case of sexual harassment to her attention. She discussed, “…I went through all the proper chains of command, talked to HR. I filed the appropriate forms. I created documentation in spreadsheets on incidents…I had my employee talk to HR. We had testimony from people who had observed this man doing these sorts of things…he’s still there.” (P36). The difficulty in formally lodging a sexual harassment complaint is a result of a system that does not prioritize addressing these complaints. To Participant 36, “…it really illustrated to me how little power I have….” despite her being in a leadership position.

Another downstream effect of sexism is its impact on a woman’s mental state. One participant, despite not lodging a formal complaint or taking legal action, felt “…a need to seek counseling and figure out how do I deal with this anger and frustration that I have that comes with these circumstances? How do I rise above them? How do I move through them? Knowing that as a woman, I’m going to continue to experience this…” (P44). Other participants mentioned similar situations affecting their confidence in attending interviews or applying for new positions.

Being Seen as a Professional and Proving Themselves

A common challenge that women discussed was not being seen as a professional in their field, recognized for their contribution, or respected for their expertise. In some situations, regardless of a woman’s history, she still was not perceived as being a
professional in her field, such as “…[the former leader] looked at me and he said, ‘you know, I’m sorry, but I could just never see you as anything but [former supervisor]’s secretary.’…” (P43). This was despite this participant having “gone to [university], even though [former leader] knew I had studied under [male professional], he still could only see me as the secretary…” (P43).

Some women used higher exposure to be seen as a professional: “I’d gone to so many events as a graduate student that I think they started seeing me as more of a professional since they saw me often.” (P8). Other women overcame this by proving themselves with different actions or accomplishments, but “…once they prove themselves, they’re probably OK, but a male wouldn’t have to prove themselves.” (P17).

Participants often felt the need to prove themselves: “…I’ve got that much more on the line to prove that I, women, can do this job…” (P7). The urge to prove themselves often came from the feeling of being “…under a little bit more pressure to prove that they [male colleagues] had their doubt when I came into this job…” (P7). Often in these instances, proving themselves was about more than the individual, and more so about the overall capability of being a woman who deserves to be in a specific role. For example: “… [my supervisor] handed me a shotgun. Although, I’m not really happy to collect birds, I picked it up and shot a [bird]. [I] felt rather badly about it, but I proved to him that I could do it.” (P43). Much like this example, sometimes women participated in actions they were not accustomed to in order to prove themselves.
Taken Advantage

Though being taken advantage of can be in a sexual or non-sexual context, our data set did not include any mention of being taken advantage of in a sexual context. In some instances, participants discussed being taken advantage of for their skills: “People kind of tend to think that I’m predominantly administrative, you know, and that I’m going to be better on the computer and I’m going to have all these, you know, skills that are kind of generic to an administrative position.” (P18). Participant 18 continued by indicating “…that a lot of people kind of take advantage of that.” (P18). In these situations, women felt that their skill sets were being exploited to keep them from continuing to develop as a professional.

Students took advantage of female professors’ flexibility, especially during the distance learning requirements created during the COVID-19 pandemic. Participants commented that “…students are going to female faculty more frequently to ask for extensions, exceptions, and leniency…” (P27). This participant goes on to indicate that she perceived that students presume female professors would be, “…more likely to be lenient than these other professors…” (P27).

Information about a woman’s personal life or decisions can be used to discredit her in the workplace. One participant discussed that being “…open and genuine in my conversations…” (P1) as potentially disadvantaging her because “…if someone is looking to take advantage of me, it puts me in kind of that more naïve position…” (P1). Demonstrating that sharing personal information with coworkers to make connections can be disadvantageous.
Job Performance and Extra Jobs

Various participants expressed that being a woman impacted the amount of work they were expected to accomplish as well as how their job performance was perceived. A woman’s job performance appears to be under higher scrutiny due to perceptions of affirmative action: “being female may get someone an interview and even a position, but [you] still must be able to prove that you are qualified.” (P13). Women discussed trying to overperform to overcome negative perceptions of their capabilities: “I just tried harder. Just tried extremely hard, didn’t complain…” (P7) Even women’s intellectual contributions can be under higher scrutiny: “…sometimes the suggestions or comments you make, maybe they view with a more critical eye than they would if it came from a man.” (P5).

Participants discussed being assigned additional responsibilities outside of their job descriptions. These assignments could be resultant of the expectations of women: “…there are expectations that you’re going to do more…. ” (P6). Ultimately, this can lead to women receiving many additional responsibilities: “…if you look at all the obligations that are piled on females, like the service obligation, then it just adds up.” (P6). These expectations are not typically outlined in a job description and “…[women] kind of give more of their time to things that are not technically on the books or that other people have dropped because they don’t want to do it anymore and so, you’re kind of picking up the slack” (P27). Difficulty declining offers or asserting oneself, as a woman, may cause responsibility overload such that when it comes to being asked to take on new tasks, they
may not be able to decline: “I don’t know if women have a harder time saying no, but I certainly struggle with it.” (P6).

Capabilities and Expectations

Participants often discussed their capabilities being underestimated. This included in their graduate career where, “…some [male peers] assumed that I was succeeding by cheating because from their perspective there was no way I could possibly get 100% on a test without copying off someone….” (P40). In their professional careers, women’s capabilities can be underestimated as it relates to more physical tasks: “…where people assume you can’t do things because you’re a woman…” (P14). Due to being a woman, the expectation may be that, “…you’re not as strong and can’t do rugged fieldwork, and…if you’re working with other people, sometimes they’ll assume they need to carry things for you, or assume that you need help doing something, when in fact you’re perfectly capable.” (P14).

A few participants discussed the expectation that women produce higher work to prove that they belong, for example, regarding publications, “it’s still very hard for me to imagine that the majority of reviewers would, you know, expect a female to go above and beyond. But I think for some reviewers that bias does exist.” (P1).

Career Advancement and Qualifications

Participants often mentioned how being a woman impeded their career advancement. Frequently, this was related to participants applying for tenure. Participant 41 expressed that despite meeting the qualifications for tenure, “…the chair of the [field] department had fudged the numbers in support of my tenure. So, I was told that I didn’t
get support from my department…” This participant was able to have this corrected and once sorted out and she did get tenure.

In some instances, rather than impeded, some women’s career advancement was not in pace with their male counter parts. For example: “…when I started, he [male colleague] was still an assistant professor. Then right before I left, he got full professor… in 4 years. If that tells you how fast that he moved to full professor.” (P12). Despite their qualifications, some women experienced “Every single time, I have lost a job to a male – 95% of the time, it’s a white male. And these are the [positions] that I interviewed for….I would just go and look to see who the person was [that was awarded the position] and it’s a white male.” (P12).

Men’s influence on women’s career advancement can prevent women from addressing issues of harassment, inappropriate comments, or discrimination. Participant 21 indicated that she “…didn’t wanna risk future opportunities…” after being excluded from a document listing the experts in her field. The participant goes on to say: “…the person who produced the [document indicating experts in my field] would have a really negative impact on my career at that point [because I was excluded] …” (P21).

Clothing and Appearance

Participants commonly discussed receiving comments regarding their clothing or physical appearance in the workplace. Women’s physical appearance could impact perceptions of their knowledge: “…[my supervisor] told me, ‘you should legitimately think about dying your hair…they won’t take you as serious with being a blond’…” (P38). Even though this participant decided not to change her hair color, she went on to
say, “…[my advisor wasn’t wrong, I sensed that for a long time, ‘wow, legitimately not only is my sex an issue, but so is my appearance.” (P38). A woman’s physical appearance could invite unwanted comments: “…I had comments on my cleavage.” (P10). Unwanted comments on a woman’s physical appearance could also be conveyed as a benefit by male colleagues: “… ‘if you wore tighter pants, you’d probably be able to get more conservation done’…” (P29).

Clothing was a challenge for some women because they were unable to obtain clothing within their organization’s color and style specifications: “…it’s like you guys make these [clothing] policies and then you don’t even look at what’s available under those policies for men versus women…” (P38). Other women were singled out regarding women’s clothing in general. For example:

“…there were ten of us [in the class] and I was the only woman…we’re getting ready to go on a field trip on Thursday…[my professor] said, ‘[Respondent], make sure you are appropriate clothing.’ And I said, ‘And that would be like what? High heels and a tube top?’” and everybody laughed and I laughed, but it’s like why not just say, ‘wear your appropriate dress for the field,’ right?” (P33).

In this situation, the participant was singled out for what she was wearing, but due to her being the only woman present, her professor perceived that there was potential for her to dress inappropriately.

Confidence

Comments regarding confidence, or lack thereof, were prevalent among participants. This included discussion of Imposter Syndrome: “…I may have more of the imposter syndrome than the typical man would, but of course I don’t know what they feel.” (P6). What may have contributed to women’s lack of confidence was not wanting
“…to come off pushy, you know?” (P8). This participant goes on to say: “I try to be confident and the women I know try to be confident with things, but maybe we just don’t push enough?” (P8). Some women became more confident as their career progressed:

“…I perceived in some instances, there would be somebody asking to talk to the next person thinking the next person was going to be a man [or] that they were going to get a different answer. And I had to get comfortable with being like, ‘for this there is nobody else. This is it….’ But that is not something you feel empowered to do early on in your career.” (P30).

Motivations

Participants were motivated by several factors, both internally and externally. Internal motivations could be passion for their field or excitement to work with their team:

“…just seeing the excitement from people and the sense of belonging when they come to event after event…they can meet other people and we can achieve these things together. And I think that’s what motivates me to keep going because I see that this is working, and I see that it’s helping people in so many different ways.” (P35).

External motivation could be positive reinforcement from mentors or supervisors:

“…we’re so supportive, ‘I’m so happy. How do I help you stay in the room with me?’” (P38). Other women were externally motivated by the determination to prove others wrong:

“…[I] heard from another woman who became a leader in her field about her experience when she had a baby during graduate school, and she left her husband who was abusive and had raised this baby on her own, and he [our advisor] told her, ‘You can’t do it. That’s impossible. You won’t be able to finish your PhD.’ And for her, that became the fire that lit her to go on and achieve lots of great things.” (P37).
**Intimidation, Physical Threats, and Power Dynamics**

We defined intimidation as non-physical threatening. Participant 20 experienced a non-physical threat in “…a bullying situation…” with a male colleague that was “nothing horrible…it was more just verbal stuff.” In this situation, the participant was intimidated because “…it was a time when I would be up for a promotion, and I just felt I had to do everything he said…” (P20). Some women indicated that the process of submitting a formal sexual harassment complaint was intimidating due to its ability to affect their future opportunities: “I didn’t really wanna file a formal complaint…I just wanted it addressed…and I wanted to protect my ability to come back to this agency.” (P38). On the other hand, physical threats were clear threats of personal harm to the participant: “…we were looking at [order of species] and he [male stakeholder] said, ‘if you catch a [specific species] and release it and I find out, I’m going to shoot you.’…” (P33).

Power dynamics could introduce further challenges for women wanting to address an issue with their supervisor or advisor. For example, Participant 38 discussed having a difficult conversation with her female PhD advisor about how, “…we all could adjust our interactions to improve communication…” However, this participant then indicated that her advisor’s response leaned heavily on her position of power: “…then that’s where the power dynamic [had an effect], her response was… “I could ruin your life if I want to.” …” (P38). A few participants discussed how some male mentors used avoidant behavior, like male professors never going to lunch with a woman to avoid misconceptions: “…the perception of inappropriate behavior [that] could be conceived.” (P40).

*Harassment and Inappropriate Behaviors*
We grouped verbal and physical harassment with inappropriate behaviors due to their similarities. Harassment is defined by often more aggressive or overt, persistent actions than inappropriate behaviors, though in both cases behaviors are unlawful or unwanted. Physical harassment, for example:

“When she [my colleague] started, she had a supervisor that gave her so many opportunities…but every morning when she came in, he’d pat her on the ass and be like, ‘Hey, [name], how’s it going?’” (P44).

Verbal harassment, for example: “…there aren’t many women. It’s really common to be hit on and be objectified…” (P44). One participant discussed after presenting at a conference:

“…people coming up to me and realizing pretty quickly that talking about my research was sort of like the “in” to talking to me…and then it’s like, ‘well, what do you do in your spare time?’ and like ‘are you single?’…it’s totally undermining what I’m here for and basically devaluing my research…” (P44).

These situations also occurred in academia, where behaviors were socially accepted:

“…the way he [professor] talks about young female students with me around was absolutely disgusting. He did this in front of other professors, and no one ever called him out…” (P4). Participants also experienced harassment when interacting with stakeholders. One participant discusses being approached by an audience member after giving a presentation who expressed: “…‘oh, if I had a professor like you, I probably would have come to class more often’…” (P15).

Behaviors were deemed inappropriate by participants’ perceptions and included comments and actions from peers, supervisors, or the public. Experiences discussed in this category could align with the definition of harassment, but the participant did not
identify it as such. One participant discussed an inappropriate comment by a keynote speaker at a conference she attended: “…[he said] ‘I know your advisor,’ tells me his room number, invites me to his room.” (P42). Inappropriate comments were not always directed towards participants: “I can think of a million times there were jokes and comments made…and they weren’t necessarily directed at a person, but I think [the jokes were] sexually motivated comments just about the female sex” (P1). This participant goes on to say “…I’ve always been able to laugh things off…” (P1), meaning that she did not show that the jokes may have bothered her.

Directional inappropriate comments could be specific to a woman’s appearance. Participant 36 discussed a male commenting on her appearance: “… ‘I can see that they’re hiring people that I like to look at,’…” In addition, inappropriate comments could be specific to a woman’s personal relationships: “…a coworker made kind of what I would consider to be an inappropriate comment to me. Kind of referencing dating and my taste in men and it made me really uncomfortable…” (P30). With social media advancement, inappropriate comments can also occur online rather than in-person.

Participant 30 discussed comments regarding her appearance, position, and experience that she found in an online message board prior to one of her scheduled presentations: “…there’s this kind of anonymous courage that people feel like they have and how they would interact with an individual and the things that they would say online compared to if you were in person with them.” Ultimately, this participant decided not to present to this community.
**Expected a Man**

Due to the male-dominated history of Natural Resources fields, many women felt that they were not meeting the gender expectations of those they worked with or public stakeholder groups. Some women discussed visibly seeing shock at their gender:

“…in some cases, I would get the surprised look when I would show up somewhere. Like, you wouldn’t necessarily expect this 5-foot something woman to walk in and be talking about the topics that I would be talking about. And so, there was that and I could feel it, it was palpable.” (P30).

Other women expressed that they were not recognized for their leadership roles because their peers expected a man: “…multiple times [after stating my name and title], often a man, says ‘does anybody know who replaced the last person in this position?’ and I said, ‘Yes, that is me. That is what I just said.’” (P29). The participant attributed this to her not meeting the gender expectations of a leader. Participant 29 anticipated this by, “…now when I introduce myself, I say, ‘this is my name, I replaced so-and-so, who retired a year ago.’” (P29). Other people at these meetings often did not acknowledge her title or expertise prior to her making the connection to the man that previously held her position.

**Racial Minority Diversity Issues**

We understand that it was impossible for a participant to determine if she was discriminated against due to her gender or her racial or ethnic identity individually. However, we used this theme when women discussed racial and minority diversity issues directly. We will discuss further the intersections of identities causing compounded disadvantages later in our Intersectionality theme.
Some women discussed being recognized more for their additional minority status than for their qualifications, leading them to question if they were awarded their position due to their merit. For example: “…I get the impression that some people believe because I’m a minority, my successes are only related to that…” (P11). This participant added that this was despite her achievements: “…my other qualities, my publication record, or the number of grants that I’ve obtained at this point…” (P11) she still received “…a few comments that had given me the impression that people believe that they think it’s more related to the fact that I’m [racial/ethnic minority] …” (P11).

The idea that additional minority status took precedence over qualifications could be heightened when there were fewer minorities present in the workplace. One participant discussed: “…I get worried that I’m being chosen for this because there’s one of the two people in my office who is a female and not a Caucasian…” (P18). This led to feelings of inadequacy: “…am I making it this far because of my diversity component? Like am I being put in this position because I am the person that makes it more balanced and meets qualifications?” (P18).

Token Minority or Only Minority Here

In the context of this study, tokenism is a symbolic effort to recruit minorities to give the appearance of diversity. Women exclusively discussed tokenism in the scope of racial or ethnic minority status. For example: “I felt that there was kind of this tokenism and that ‘okay, we got a [racial minority] woman here and I’m not really sure what she’s doing…but she’s here.’” (P31). This participant went on to discuss feeling that her peers and supervisors did not take interest in her research topics but appreciated the appearance
of diversity that she gave the department. Being a token minority led some women to mistrust colleagues when entering new collaboration relationships. For example: “… [my colleague believed] the only reason this guy was collaborating with her was because of her [additional] minority status…” (P24). Rather than viewing this token situation negatively, the participant suggested:

“The only way we’re gonna have people of color and people of all these different ethnicities and we have diversity is if people have to collaborate with them. ‘So, if he’s collaborating with you because he has to do it, run with it, love it. That means he’s collaborating with you because of who you are.’” (P24).

Feelings of tokenism often arose from being the only or one of few women in a workplace that were racial or ethnic minorities. Since she was the only racial minority in a staff of 40, Participant 23 stated: “…when it comes to representation for our division, I’m it. And with that, it’s one of those things that I take pride in myself…” However, this participant felt that her department’s leadership wanted to use her work or images of her working to portray a false sense of diversity. She discussed further trying to balance being representation for the next generation but not allowing her department to exploit her or her work.

**Hiding Racial Identity**

The desire to fit in with others in their workplace led a few participants to hide their racial identity. Passively hiding racial identity occurred when a woman was able to “pass as white” or did not visually appear to be of a different race or ethnicity. However, some women actively hid their racial identity: “…it’s not like I would offer that information freely to folks…sometimes people will make comments about my name and
depending [on] if I’m comfortable or not, I’ll offer that information [about my racial identity] …” (P26). Participant 26 went on to discuss that she felt comfortable promoting her racial identity in her graduate career as opposed to her professional career: “…I do feel like I have to hide that part of myself…” (P26). The desire to fit in with her peers, despite potentially losing connections with her students, made this participant question “can I have a [country] flag on my door on my office so that folks can ask me about it or feel more welcomed?” (P26).

Another participant did not hide her racial identity to fit in, but rather due to “…a personal conflict about being [identified as a racial minority] or not because I present as super white.” (P29). This participant indicated that she was able to pass as white because, “…nobody’s like ‘Mm, that person might be [ethnicity]’ until they see my last name and then sometimes, they think I’m married to somebody.” (P29).

**Sexual Orientation and Gender Equity**

We defined sexual orientation equity as the fair treatment in consideration of a woman’s sexual orientation. This was received positively by participants: “…I was very open when I went up there to [state] that I was gay, and I did not have any issues with that. I did not feel at all that I was treated at all differently…” (P5). Similarly, a few participants discussed experiencing gender equity in their workplace: “I feel like I’ve had a pretty unique experience in that it hasn’t seemed that hard being a woman.” (P6).

Going one step further, some women discussed taking action to support gender equity themselves. For example: “…women tend to have more equal distribution of genders in co-authorship and men tend to have primarily male co-authors” (P27),
showing that women likely create collaboration relationships based more fairly on an individual’s qualifications. Another participant mentioned using her mentorship to model gender equity for future generations: “I tell everybody, ‘I can come talk to your girl scout group, but I want to talk to the boy scouts too. I want them to see, I am a woman [position]. I study [field]. I catch [wildlife],’ right? Like I want them to see that, the boys and the girls.” (P33).

**Gender and Race Affirmative Action**

Gender affirmative action was mentioned by many participants both as a benefit and a challenge. Some participants expressed that although women can be granted a position because of their gender, one cannot maintain a position solely for this reason. Many participants discussed that they knew or expected that they received their position because of gender affirmative action. However, one participant discussed purposefully taking advantage of actions to diversify the workforce to achieve employment for herself and her husband at the same institution:

“...we made the decision that I should apply and not [my husband] because it was a department full of men and so we bet on the idea that there would be pressure for them to hire a female, right? For them to increase their diversity in some way. And so, that they would be pressured to take someone like me and everyone loves [my husband], so I would be the harder one to get the job. I would get the job, everyone would love [my husband], and then they would hire him. Which, they did.” (P24).

Conversely, people perceive that “…finding a job is going to be the easiest thing on the planet…” for women because “…they perceive that affirmative action is something different than what it is….” (P12). However, despite this perception, Participant 12 indicated: “I can tell you from personal experience, having applied for jobs
several times, that that is not the case.” This demonstrates that perceptions of gender affirmative action are inaccurate: “People just think, ‘Oh, you’re a woman. You’ll get a job. Don’t worry about it.’” (P12).

Other participants mentioned potentially receiving preferential treatment based on their race as well. This treatment could result in negative perceptions from their peers: “In grad school…I was chosen to go to a conference and a coworker asked, ‘Oh, is it a minority conference?’ and different things like that.” (P23). However, race affirmative action could also negatively affect both the woman and the institution when the woman hired did not have the proper skills:

“…there was a young woman who came into our research group some years ago….maybe even from the very beginning there was just sort of a disconnect, where when this young [same racial minority as respondent] woman came on, it took a while for her to kind of figure out what it is that she wanted to do….So, to me there’s a danger in just bringing somebody through a system, and not really checking to make sure that first of all, they have the skill level to do what it is that they were asked to do, because that’s a huge issue…” (P31).

**Respect Topics**

Women in their academic and professional careers discussed at length what levels of respect they received from their students, peers, and supervisors. We included in this theme discussion of respect, disrespect, boundaries, and trust (Figure 2.3).

**Respect**

Being respected was very important to participants, yet only a few discussed receiving positive respect. This often related to respect of personal space: “I had to get something from my hotel room to give him [male peer] and he wouldn’t close the door of
the hotel room.” (P23). In this instance, not only was this participant’s male colleague respecting her personal space, but also avoiding potential misconceptions. A similar example is given by another participant regarding an interaction with her advisor:

“…I one time closed the door to our office meeting ‘cause I wanted to have a conversation that I didn’t want everyone in the hallway to hear…. he talked to me and politely like never even broke conversation, went and cracked the door. And I was like, ‘Oh! I was really insensitive to him as a young male professor that he has a female [student alone with a shut door].’” (P38)

Women also discussed earning respect from students, like one participant that mentioned gaining the respect of students in the first course that she taught: “…by the end of the class, some of those guys that were probably the most disrespectful came by and shook my hand after the class…” (P15). Other participants managed to earn respect from their coworkers in various ways: “I have sort of made my own way within certain groups and I think those people respect me for what I do…” (P2). Others earned respect by standing up for themselves or others. Participant 22 discussed reacting quickly if her students express sexist or racist sentiments saying, “…nope, that’s not okay to say that…” This participant went on to say “…I’ll make it where they’re uncomfortable…and people stop. It’s amazing how well it worked actually.” (P22).

When respect was earned, it was not always confined to that specific workplace. For example, when entering a new position, one participant indicated that: “…the people who…had worked with me when I was at the [former position] had a lot of respect for me…” (P41).
Trust

Trust and respect are closely linked concepts, in that respect is defined as the admiration of someone’s abilities, qualities, or achievements and trust is the belief in someone’s reliability, ability, or strength (Oxford). Participants discussed gaining trust from students as a woman: “…a lot of students would innately sort of trust me because I was a woman, particularly the female students, because we had so few female professors…” (P12). Unlike with respect, women were more likely to be trusted without additional effort on their part: “…that sort of trust…you don’t have to earn someone’s trust. They just sort of give it to you because you’re a woman, and they’re another woman, and they kind of assume you’re going to be trustworthy. Which is nice.” (P12). Thus, it appears that rather than having a negative impact, lower numbers of women in Natural Resources can actually foster deeper connections between women.

In addition to gaining trust, participants discussed determining who they could trust in their workplace. Participant 20 indicated: “…I’ve developed my own networks, people I really trust, and they trust me…” (P20). However, mistrust can further alienate a woman in her work environment by preventing connections and collaborations: “I still have trust issues with that group and knowing who I could trust. I would trust my advisors and mentors. Beyond that, I don’t really know who, like what team are they really on?” (P21).

Disrespect

Participants discussed perceived disrespect from their students, peers, and supervisors. Participant 1 discussed: “…undergrads who will always refer to a male
professor as Dr. or Professor so-and-so and they’ll call you [a woman] Miss…” (P1). Disrespect from peers included physical avoidance: “I had a male, who’s technically on a publication with me, that never acknowledged me.” (P22). This situation demonstrates that even being co-authors on the same publication did not earn this participant respect from her peers. Belittlement was another way that participants could experience disrespect from their peers: “…the guys [students] all told me what the other faculty had said to them. That they [male faculty] were all discouraging them [students] from working with a woman and what did I know? ‘She’s only a woman,’…” (P41).

Participants discussed being disrespected by their supervisors and mentors: “…there had been a few times where female students were not incorporated into papers that they should have been, either as co-authors, or their work was not cited appropriately [by our advisor].” (P27). Participant 32 discussed being improperly introduced by her supervisor when receiving an award: “…[our director] obviously knew absolutely nothing about my work, didn’t bother to find out, and said something…kind of demeaning about studying [specific species]…” It was often discussed that women may have to earn respect rather than being considered inherently equal with their male peers: “…I feel like if people don’t know me that they’re less respectful towards me as a woman than they would be to a man.” (P6). However, in some cases, women can overcome this perception: “Once people know me and what I’m capable of, people are more respectful, but the initial pass and just being a woman…it’s a ding against me in building relationships.” (P6).
Boundaries with Male Colleagues

Participants discussed situations where male colleagues respected or disrespected their personal or professional boundaries. Women discussed various methods for establishing boundaries with colleagues and how they responded when boundaries were broken. Participants expressed discomfort when interacting with male colleagues that did not respect their physical boundaries: “…there’s this mindset that if you are helping me in some way that you can touch me…” (P23) which “…makes me very uncomfortable….” (P23). Similarly, male colleagues disrespecting participants’ professional boundaries could be uncomfortable. For one participant, this came from uncomfortable conversations involving her dating life or inappropriate jokes:

“Not really understanding boundaries of like work-friend, friend-friend, strictly-work-friend, strictly a colleague. So, those lines get blurred really easily. And if you’re not careful, you can very easily find yourself in situations are where conversations are going places that are not comfortable.” (P18).

Setting boundaries across power dynamics can be even more difficult than setting boundaries with peers. For example, Participant 40 discussed how her male peers sought romantic relationships with their mentees: “…men looking for relationships with graduate students or women that were within their sphere, so a power imbalance…” However, Participant 44 discussed that power dynamics were not always a factor: “…often times in those situations, if somebody was harassing me, hitting on me, whatever, it was not somebody that had any authority or status over me...”.

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Support

Participants discussed people or institutions that contributed to or detracted from their support systems during their careers. These support systems could either contribute to a woman’s desire to stay in her field or further push her to disengage or leave the field. This included relationships and interactions with peers, mentors, and the public (Figure 2.4).

Positive Support

We defined positive support as constructive relationships and connections in a woman’s career. This support could come from a system or institution: “I was really fortunate in grad school to have a community, and program with faculty that were really supportive and did not highlight gender difference or expectations as much.” (P44). This is meaningful in that many participants did not have this experience from their institution or faculty overall, but more often received positive support from specific individuals with whom they interacted.

Positive Female Support

Many women expressed that their positive support systems, both professionally and personally, included female colleagues and mentors. It is possible that positive support systems are easier to foster between women due to shared experiences: “…it’s easy to get that mentorship female to female, because we have that female bond, whereas with men it might not be quite as easy.” (P4). Participant 10 expressed a similar sentiment: “We [women] build each other up, which is helpful.” This is demonstrated by the many participants that sought to fill gaps in support left by their leaders and other
peers by creating bonds with female colleagues. One participant discussed: “I have a lot of strong, female scientist friends that are very supportive, and it’s something to coalesce around.” (P10).

**Positive Male Support**

Positive male support systems included male allies. Participant 20 indicates her and her team’s awareness of the impact of male allies: “…we already knew back then, without even understanding all these social constructs, that we had no representation unless we had an in with one of the guys who could represent us and bring our ideas forward…” (P20). Often the standard for positive male supports were low, such that it did not require drastic action on the male’s part to be perceived as a positive support. One participant discusses one of her previous leaders as a provider of positive support: “…[male leader] was reflective and thought about his biases and would ask people questions instead of making assumptions…” (P32). This participant went on to describe her leader as, “…just great and he more than others, I think, [was] aware of unconscious bias issues…he was really awesome…” (P32).

Positive male support was also expressed as actions that enabled women to have new opportunities or empathy with some of the struggles that women experienced within their careers. For example:

“Part of the reason I got to where I am today is because I had strong men who helped me along the way. I had the guy in undergrad who was a professor, who did everything he could so I could get into graduate school. I had the project leader in [southern city, state], who didn’t know what to do about it but at least he was angry. At least he knew it wasn’t right. There was not something right about it. I had the person who put me in this position who was confident that I could come here on my own and start this up and do what needed to be done here.” (P33)
Better Treatment Than Males

Some women perceived that they received better treatment compared to their male counterparts. Many participants mentioned receiving assistance with physical tasks during field work: “…my [male] boss would say, ‘no one ever stops me to help me load a deer in the back of the truck,’ when I mentioned that men would do that [for me].” (P38). Other situations included special accommodations during travel [“I get my own hotel when I go travelling…” (P19)] and advice from the public while in the field [“I think the thing that probably I get more often than not from stakeholders is just a lot of, ‘oh, you should be careful’ and a lot of unsolicited advice…” (P38)]. Additionally, flexibility in scheduling and work expectations around pregnancy and childbirth was perceived as a benefit: “…during my pregnancies, my supervisors were very flexible [with] doctor’s appointments, so I would take an hour off to go to a doctor’s appointment during the day and would that same generosity be expressed to a man in a different situation? Maybe not.” (P30).

Be an Advocate

Rather than receiving positive support, some women discussed how they provided positive support to their current and future female colleagues by being an advocate. Women that discussed the opportunity to be an advocate mentioned it exclusively as a benefit of being a woman in their position. In these instances, participants discussed that their position gave them an advantage to advocate for other women in the workforce: “I’d say one benefit of me being in this position is I hope that I’m opening more doors for women who come after me, so it’s not as hard for them.” (P15). These discussions were
often closely related to participants acting as mentors or role models for others, which we will discuss separately in a later sub-theme (Role Models, Supervisors, and Mentors).

**Female Networking and Connections**

Networking and connection opportunities between female professionals was frequently discussed as a benefit by participants. This included discussion, working, research, and social groups. In the absence of these groups, some participants formed them to create a support system that they could share with their female colleagues to support one another. Even participants that did not feel as excluded by male colleagues acknowledged the impact that female networks could have on their experience in the workplace: “…it did not resonate with me that being with other women would be so powerful. And it was. It was super powerful.” (P33). Connecting with female colleagues and “having other women representation matters and having those relationships matter for navigating some of the challenging situations.” (P44). These connections were not always made intentionally, instead they were sometimes formed by being one of the few women in the field: “…you do form some friendships that are almost entirely because like ‘Welp! We’re the only women here and so, we might as well be friends” and they turn out good…” (P27). Regardless of how these relationships form, they “…tend to be some of the longer lasting friendships, that you kind of share a perspective on how things are.” (P27).

**Negative Support**

Negative support is defined by relationships or interactions with people that detracted from a participant’s career progress. In most instances, negative support was
discussed as a lack of positive support in a woman’s career. Women discussed lacking support in general: “…some of the early challenges were just kind of a lack of support from my [leader] as far as his helping me to build or articulate a research program.” (P31). Other participants spoke more specifically about negative support they received from mentors, leaders, and peers.

*Negative Female Support*

Women discussed receiving negative support from their female mentors and colleagues. Participant 26 discussed her relationship with her female PhD advisor saying that it, “… was difficult because I think she had a lot of imposter syndrome…and there wasn’t a lot of, I feel like, scientific discussions or like, I’d be scared to ask questions…”. In this instance, the negative support manifested as “…a lot of like passive aggressiveness…” (P26) that caused the participant to feel uncertain about how to progress with her degree. Participant 29 discussed negative support from female colleagues: “…surprisingly competitive women that do not want to see you succeed and will try to tear you down…” This participant went on speculate about the cause of these situations: “…there’s so few spaces for women, that there’s not enough room for women in multiples.” (P29). This perception supports the idea that negative female support is more likely to be an act of professional self-preservation than malice.

*Negative Male Support*

Negative male support from peers was often perceived as general feelings of resentment, in addition to feelings of being excluded. Participant 41 stated: “… [my male colleagues] did not accept the fact that the board of trustees was trying to encourage more
diversity on campus, and that included hiring women faculty…”. This participant also indicated: “they [male colleagues] just resented me. I wasn’t there because they wanted me there. I was just sort of there because the powers that be wanted me there.” (P41).

Lack of support from mentors was expressed more as a feeling of abandonment, often based on the perception that male and female students were receiving different amounts of support. One participant discussed how her mentor informed her that: “…you have to make it on your own, if you keep publishing with your PhD advisor, no one will view you as an independent scientist. You have to separate yourself….“ even though the same advisor continued to publish with his male students (P27). Receiving different amounts of support compared to their male counterparts often made participants unsure of who to seek for guidance. Some women overcame this by seeking their own mentors outside of those that may have been assigned by universities or organizations.

**Personal/Professional Balance**

Support, or lack thereof, in a woman’s professional or personal life can impact her ability to balance the different roles’ responsibilities. Lacking support in her personal life can make a woman feel the need to prioritize personal matters over professional matters. On the other hand, lacking support in her professional life can lead a woman to spend more time at work or thinking about work topics to compensate for missing support. It is important to note that this was perceived as a challenge regardless of whether a participant had children or not. In some instances, expectations at home and at work made participants feel stretched thin: “I’m on the road a lot with an understanding spouse, but [we] don’t have kids and I can’t imagine how I would do my job [if I had
kids]. And I have seen that it’s a challenge for me…the demands of the job, the expectations, as well as the expectations for families…” (P5).

Family planning can also act as a disrupter to work-life balance, as discussed by Participant 3:

“I’m engaged and will be married by the end of the year, and quite frankly I’m 32 so if we are going to have kids, we kind of want to [do] it soon. So, it’s hard to balance you know, things I want for my personal life and my professional life that…you know, early 30s there’s a lot of pressure both hoping to be fertile and trying to make it in academia. That’s a lot to prioritize at once. Unfortunately, in our field, I think we see a lot of that. It is just something that we have to deal with.” (P3)

Women are often the caretakers of the family, including childcare, elder care, or other responsibilities, which can cause strain on their career progression or continuance. For example: “Not the children needing care but the elders needing care, I’m seeing that I’m pulled more into that and it’s reflective of having young kids because my time is needed and I don’t have as much time for that “publish/perish” aspect.” (P40). This can lead a woman to prematurely end her career: “…I think there’s a bookend coming up for my career as my time gets taken by elder care.” (P40).

**Role Models, Supervisors, and Mentors**

Leaders can positively or negatively influence women’s perceptions of support throughout their career. The support that these women received also influenced how they provided support to others. Role models and mentors in this sub-theme were not always formally assigned. Some relationships arose organically or outside of the woman’s organization or institution: “I have never felt comfortable with a formal one, but I think that informal mentors are really important as role models.” (P2).
Participant’s Mentors

Positive relationships with mentors or supervisors were often connected with more positive feelings of support. For example: “I’ve had really great female mentors. They’ve really been very aware and supportive, so I think I’ve had few challenges from that perspective.” (P11). However, partnering female professionals with female mentors did not always provide the best support, as was the case for Participant 25: “My female mentor, whom I wanna just make this clear, I really value [female mentor name], but she very openly said, ‘the only reason [supervisor] is matching us is because I’m female and I don’t really have time to mentor you.’” In this instance, the participants’ assigned mentor provided little positive support despite the reasoning behind their assigned collaboration. Participant 40 discussed negative support from assigned mentors as well: “…when I got into my [agency] work, I felt like I was in a position of sink or swim. Everyone was very busy, and I didn’t have any mentoring.” (P40).

Our participants’ positive mentors acted as allies, advocates, and supporters during their careers. For example: “…I really lucked out with having good male mentors throughout my undergraduate and graduate and postdoc career…” (P21). For many participants, there were only male mentors available in their field. But with positive male mentors that, “…see the challenges…” (P42), that women face, it can be difficult to enact change because, “…they [male mentors] also work in a system run by men.” (P42).

When a participant had female mentors, it was often intentional, either with them being assigned by their superiors or with the participant seeking a female professional as a mentor. Participant 35 discussed the process of creating a relationship with a female
mentor: “…she [mentor] ended up having a call with me. And it went so well that she invited me to her house…so that we could have a longer conversation. And she’s been one of my mentors ever since…”. Another benefit of female mentors and supervisors discussed was the difference in what knowledge women can pass along to other women: “…there were things I learned from [my advisor], just sort of as a woman, as far as like having confidence as a woman in our profession.” (P44).

*Lack of Similar Identity*

Participants discussed the challenges of entering their fields without female mentors or supervisors to connect with or rely on. While many were still able to attain their desired degrees or positions without this support, the ease or comfort with which they were attained was compromised. For example: “I think, again, had there been more women it would have been a lot easier for me to assimilate into [agency], which I don’t think I ever really had…. not even necessarily someone to talk to, but someone to identify with.” (P2). Participant 8 shared a similar sentiment: “I never had that [a female mentor]. I had all male teachers, male professors, male supervisors – it was just fine, and I learned an immense amount from them, but it is always nice to have someone to talk to about these kinds of things.” As such, the lack of similar identity mentors or supervisors may not be devastating, but it is still an obstacle for participants.

Participants did not discuss similar identity role models as exclusive to their gender identity; for some, similar racial and ethnic identity role models were important as well. Participant 11 expressed: “…[I] had great female role models. That’s been no problem.” She goes on to say, “My [female] mentor was amazing for both my master’s
and PhD, and then also at the undergrad level, there were a couple female faculty that really encouraged and supported me in pursuing this career to begin with.” (P11).

However, “…I haven’t had really any [same ethnicity] role models throughout my career…. it’s just there’s cultural differences that I had to navigate on my own.” (P11).

**Relationships with Mentees**

A few women mentioned how they cultivated their mentee relationships based on what they desired from their mentors, such as specific communication styles and how they supported their students. However, outside of self-imposed expectations, there are external expectations of how women mentor others. Compared to their male counterparts, women are, “…expected to be way more of an emotional support animal for our grad students than any kind of male faculty member ever is….“ (P15). This participant saw this even with her own male advisor that “…never did that for me. If I could get him to show up to a meeting was a miracle, much less like ‘Oh, I’m really stressed out right now.’” (P15).

This emotional support extended even to unassigned mentors roles held by women. For example, one participant discussed students seeking her as a mentor:

“‘So, my lab became the place for anybody who was not a white male to come hang out. They knew me from taking classes with me and word spread, I mean, it was pretty obvious that I was a woman and everybody else was male. And so, the women all came to find me because they were having a real hard time. But then, the Spanish males, the African-American males, as I said, anybody who was not a white male came to find me ‘cause they heard that I would listen to them, I would sit down and try to help them with whatever problems they were having and people knew that I would serve as a sounding board for them.” (P41)
While many participants complied with student and colleagues’ expectations of their mentee investment, others chose to challenge their students more and be less of a caretaker. Participant 33 described her approach to mentorship: “…[I] set the bar high and expect you to meet it, but then I’m going to do anything I can [to support].” These participants were still concerned about their mentees well-being but did not extend their involvement into their students’ personal lives.

Unofficial or Unassigned

Even informal or unassigned mentors had an impact on how supported a participant felt in her career. For example: “I had some great…kind of like female mentors even though they weren’t a part of my committee…” (P27). Unofficial role models were often other women that participants admired for their accomplishments or skills. Participant 20 discussed a female colleague that she looked to as a role model because “…she keeps ticking off all these different accomplishments…” and was able to get married and start her family while continuing to progress in her career.

Yourself as a Role Model

Many participants discussed the importance of acting as role models and supporting the next generation of field professionals. This topic was discussed often indirectly without respondents formally acknowledging themselves as role models: “…I’ll say one thing that being a successful woman, or relatively successful woman, in this field is that I have an obligation to younger women in this field to try and open more doors for them.” (P6). This can be interpreted as not only the participant being a role model, but also an advocate for the next generation. Another example is one participant
that changed how she spent time at conferences after a conversation with one of her female mentees: “I was the first professional PhD woman [position title] she [the mentee] had ever spoken with….She said, ‘it’s so important that someone like you goes to these meetings and interacts with the students.’” (P33). This motivated the participant to visit student poster sessions and other student presentations more often to engage with students and potentially act as a role model.

Social Gender Changes

Changes in participants’ perceptions of their support network could also be changed by external factors, such as social level changes in gender perceptions. For example:

“I guess there’s things that people are trying to change. So, given that there are a lot of problems for women in science and academia, there are some opportunities, such as fellowships and that sort of things that are directed specifically at women, and female support groups.” (P10).

The changing diversity in these networks also contributes to the feelings of support in the workplace: “…the social networks have gone from white-male dominated to much more diverse and now, I think people are stretching to be as inclusive and equitable as possible.” (P40).

Culture and Inclusion

Culture, defined as a system of customs and accepted behaviors created by a particular people or social group (Oxford), greatly impacts how women can be accepted in their workplace. This theme was composed of related sub-themes that related to workplace culture and regional culture (Figure 2.5). Environments that were designed
with a male-focus may not be very welcoming or inclusive of women in the workforce. Some women discussed taking on actions or behaviors to fit in with their colleagues while others resigned to not fitting in with their coworkers. Women were often not recognized or acknowledged in their workplace because of their deviation from the “ideal candidate” in these spaces fostered by the long history of the Good Ol’ Boys Club in Natural Resources. Women that travelled within the United States or internationally experienced how women were perceived or treated by their peers in different cultures.

**Belonging and Fitting In**

Many participants discussed feelings of belonging or fitting in, whether they felt that they did or did not belong in their workplace. Participant 20 said: “…all I wanted to do was feel like I was part of [the] group and just a professional with everybody else…” Women discussed feeling, “like, ‘what am I doing here…I don’t belong here…” regardless of whether it was, “…the first couple of years…” that they had been in their field or if they had been in the field longer (P2). Participant 2 also discussed: “…I sort of just kept at it.” (P2) and did not let the feeling that she did not belong prevent her from pursuing her goals in the field. Feelings of belonging can be reinforced by the demographics of coworkers, exemplified by a participant’s previous position where a “…majority of all of our employees at that time, were all women, and I didn’t feel that same feeling [of not being heard] there.” (P23).

Rather than continue to feel that they did not belong, some women took steps to facilitate their sense of belonging and tried to fit in with their male coworkers. This could be done by adopting some of the male behaviors or their sense of humor: “There were
two women there [at conference], and the other woman started [her] talk with a sex joke.” (P32). Though this shocked the participant at first, she conceded: “…sometimes you just do what you gotta do to fit in, right? [It] just becomes a habit, you don’t even think about it after a while.” (P32). However, some participants chose to give up on fitting in or belonging and disengage with situations that made them uncomfortable: “…[my male colleagues’] idea of having a department meeting was to sit around the table and yell at each other, which was probably the most uncomfortable experience that I had ever felt at that point in my life and basically, I just didn’t say anything.” (P41).

**Being Heard**

Participants commonly discussed not being heard and being ignored. Many participants discussed situations where they offered a suggestion in a meeting that was not considered until another person, often a male, repeated it. Other participants mentioned feeling dismissed by their supervisors or colleagues, who belittled or did not consider their suggestions. Some felt that not being heard may be a result of women’s delivery of information compared to men: “…men can be heard a lot easier and be more forceful and sort of have an authority.” (P2). On the other hand, for a woman to, “…make herself heard, you have to be a little bit more aggressive with the way you speak. Otherwise, it goes under the table and the guy next to you says the same things and get the credit.” (P2).

A few participants discussed being one of the few women in the room and not being heard because more attention was drawn to their appearance. In these instances, participants were heard physically, but their content was not understood or retained: “I’ve
definitely had comments after meetings where it was like, ‘oh, thank you for sharing this. It’s nice to listen to a pretty woman talk about [field].’ And it’s like… ‘did you listen to any of the content of what I said?’” (P44). This participant expressed that the topics she discussed were heard but not retained because those that attended her talk were more occupied with her appearance.

**Recognition**

Being recognized for work and accomplishments can also impact a woman’s perception of belonging in her workplace or field. Participant 34 discussed the difficulty of having her accomplishments recognized as a young professional:

“You don’t have a reputation beyond your master’s project, which is known by you and your advisor and your committee and your university and that’s it. But then you’re trying to get yourself known and to make a name for yourself but do it in a way that people want to work with you and respect you for what you can bring to the table.”

However, even participants that were established in their fields discussed not being recognized for their contribution to research:

“I had a role where I played [a] significant component of doing the analysis and all of that and didn’t get authorship on it and I think if I were somebody else maybe that would have been different.” (P29).

Participant 41 discussed being formally recognized for her work in her field when she was nominated as, “…a remarkable woman.” It is important to note that in this situation, women were being recognized for their accomplishments separately from their male counterparts.
Good Ol’ Boys Club

The culture created by male-dominated workplaces can be an obstacle for some women to feel included. The Good Ol’ Boys Club is an informal network that connects men both inside and outside the workplace, these connections provide men better access to information and opportunities than their female counterparts (Nelson 2017). Participants expressed that this male-oriented workplace culture prevented them from making connections with their colleagues: “…I think that’s the good ol’ boy thing. If you’re with the type of people who think it’s a man’s field, then you’re [women are] gonna be excluded. They’re gonna talk to each other. They also have more in common with each other…” (P17). It may be that the Good Ol’ Boy Club persists as a continued tradition that has not been disrupted by women joining the workforce. Good Ol’ Boy culture is also reinforced by sentiments like: “…there are people who still have that attitude. That’s probably, you know, if you’re not a hunter, and you’re female, you’re less likely to be one of them.” (P17). Optimistically, some participants expressed that they see this mentality shifting with more women joining the workforce:

“I think as there are more and more women, I think it will grow, but sometimes getting over that hump can be hard, and those first women have a hard, hard time. I think a lot of it is breaking into the old boys’ club. They go out for beers every week for years together, so maybe they’ll invite you, maybe they won’t…those kinds of things, and are they going to tell you what you need to do to get tenure or not? So, I just think a lot of women get to a faculty position and just feel incredibly isolated. Not to say that men are not under a lot of pressure when they start as an assistant professor-everybody is, but I think it is harder for women because a lot of them are alone and they don’t have somebody to sort of say that it’s okay and this is what you need to do and this is what you need to not do…those kinds of things.” (P2)
International and Regional Culture

Participants perceived different benefits and challenges of being women depending on where they were geographically. When travelling internationally, one participant noted: “…often times you are one of the only women in a place. For example, when I went to that [international conference] meeting…women from [Asian country] were not presenting their own work. Male scientists were presenting for them.” (P40). This difference in culture led the participant to stand out even more because “…having women scientists present their own work like I would be doing was noticed.” (P40). The previously provided example of Participant 23’s male colleague not entering her hotel room to retrieve the item with her also occurred while abroad and was potentially the result of cultural differences.

While still in the United States, some participants expressed that they were treated differently while in “the south” versus other regions of the US. One participant mentioned rationalizing the difference in how she was treated in the south as opposed to other regions of the United States: “…it takes experience to figure out ‘are they doing that because they don’t think you’re worthy or are they doing that because that’s just their culture and how they were raised and it’s really a compliment?’” (P33). Participant 33 expressed: “…there’s a little bit of protectionism [of women in the south] that I never felt when I was in the north.” However, the participant reached this conclusion by choosing which battles were worth fighting:

“…where do you want to spend your time? Do you want to spend your time fighting the fact that they’re going to open the door for you, or do you want to spend your time fighting that they didn’t use your correct
professional title? …I’m going to go with the latter. ‘Cause that stuff, I can find charming for the most part. I feel included.” (P33).

**Intersectionality**

Intersectionality is the additive discriminatory effect of multiple minority identities for one individual (Crenshaw 1989). This topic was both indirectly and directly discussed in our interviews. Intersectionality can relate to a number of identities, but our participants primarily discussed gender intersecting with race, age, and education.

The intersection of gender and age often led to the belittling of women in the workplace: “…working with a younger woman as a colleague was very challenging for them [male colleagues].” (P37). This challenge also arose when interacting with stakeholders: “Most [landowners] were older men who had been managing their land for decades, [and] felt…I wasn’t qualified as much due to my [young] age and inexperience as to being female.” (P13). Despite their positions, being a young female contributed to participants’ difficulties with being respected.

The intersection of gender and race was discussed often by some of our participants due to the inability to separate their experiences as a woman from their experiences as a person of color. Participant 29 discussed a comment made by a male mentor about her ethnicity and gender: “…because ‘you’re a woman and [ethnicity], you will probably be given opportunities that you’re not ready for…or not qualified for and so, you should be careful…” In this situation, the participant was warned that she may be awarded positions to increase diversity of an organization or university rather than due to her qualifications. Other participant’s awareness of intersectionality allowed for the
understanding that their race offered them benefits that minority women did not get:

“…as a white woman, I’m in a much better position, and I’m [thinking], ‘this shit is hard. I can’t even imagine dealing with another layer of it.’” (P38). In this situation, the participant is referencing another layer as an added reason for further discrimination based on other facets of her identity.

The less discussed intersection of gender and education was brought up because a participant was told “… ‘Quit trying so hard’” (P34) by a more experienced male peer. Participant 34 indicated that the same male peer said: “… ‘[you are] a woman without a PhD, you’ll never go beyond where you are.’” (P34). Participant 34 went on to express that this reinforced that not only did she not meet the gender expectation of her position, but she might not meet educational expectations either. This comment struck a point of insecurity for the participant, which ultimately motivated her to pursue other career options. However, this participant did not make evident whether this was just one peer’s opinion or if this opinion was shared by her other peers and superiors as well.

Discussion

Women in Natural Resources’ experiences during their educational and professional careers, and even in some cases, the post-retirement period, are varied yet all appear to impact self-image. One’s self-image is their idea of their own appearance, ability, and personality and is closely related to their self-identity and self-esteem (Ackerman 2018). Because of this, our participants’ experiences as women, impacted not only their work as professionals in Natural Resources, but also their personal lives. The
themes that emerged from our interviews often included both benefits and challenges for women, however the challenges were more prevalent.

Diversity and Equity topics were discussed by all our participants more often as a challenge than a benefit. This pattern was driven by the discussion of challenges posed by sexism and gender roles. Experiencing sexism influenced not only our participants’ confidence and sense of belonging, but also their perceptions of their own appearance and capabilities inside and outside of the workplace.

Many women working in Natural Resources continue to experience processes and colleagues that appear to be sexist, either intentionally or unintentionally, despite interventions to decrease these forms of discrimination. Stamarski & Son Hing (2015) found that sexism and gender bias in institutions’ Human Resources practices can impact social acceptance of discriminatory behavior, perpetuate exclusionary workplace cultures, and give rise to gender inequalities. As seen in our results, women may not file formal complaints of sexual harassment or discrimination to avoid conflict or complications with their colleagues or due to fear that it will negatively impact other’s perceptions of them (Jeffrey et al. 2015). If the goal is to create more diverse and inclusive work environments in the future, it is important to provide opportunities for women to express their concerns in a safe environment, to promote better understanding of different perspectives and potential for perceived biases (Jeffrey et al. 2015; Crandall et al. 2021).

Traditional gender roles have been shown to impose varying professional and personal expectations on women (Blackstone 2003). In professional spaces, these expectations can affect what women believe they are capable of and how they present
themselves (Bligh & Kohles 2008). We see this clearly reflected in our sample in nodes like “Imposter Syndrome”, “Proving Themselves”, and “Capabilities and Expectations”, where participants discussed how they endured or overcame these challenges. Women may be assigned different tasks or responsibilities at work based on traditional gender roles. King et al. (2019) mentions the stereotypical desire to protect women can prevent women from being professionally challenged and ultimately lead to fewer women in leadership. Despite the findings of King et al. (2019), our results, including experiences of some women in leadership, show more prominently that women resented being treated as though they were not capable, motivating them to work harder and pursue different opportunities.

Based on traditional gender roles, expectations of women in their personal lives can also impact their professional lives. Women take more time away during their early careers for family formation (Connelly et al. 2006) and are more likely to change their working hours after having children than their male counterparts (Connelly et al. 2006). In addition, Emslie & Hunt (2009) found that even after their children have matured and left home, women continued to express having difficulty balancing their personal and professional lives. This can be found in our results where participants expressed the feeling that they had to choose between being successful in their profession or supporting their families. However, as many of our participants demonstrated, it is not impossible to find a balance between work and motherhood (Poduval & Poduval 2009).

Lack of diversity in Natural Resources can foster the feeling that racial minorities do not belong in these fields (Blackwell et al. 2009; Moss-Racusin et al. 2012). This
feeling can arise from both there being few minorities in these fields as well as lack of visual representation of minorities present. Crandall et al. (2021) suggests focusing on retention of women and other minorities already working in Natural Resources fields may be a better approach to increasing and maintaining diversity. Programs to recruit and retain minority employees should pay special attention to doing so without lessening one’s sense of achievement by singling them out and considering their accomplishments separate from their peers (Burdett et al. 2022). As seen in our results, being one of the few racial minorities may make someone feel that perhaps their achievements are not based solely on their merit (Bagilhole & Goode 2001). Similar to the retention of women in these fields, retention of other minorities as well can provide representation for future generations (Batavia et al. 2020). Exposure to Natural Resources opportunities can encourage continued diversity in these fields (Bowman & Shephard 1985; Davis et al. 2002; Samson et al. 2017; Halsey et al. 2020). Retaining diversity in these fields by supporting women and minorities can demonstrate to future generations that these careers are viable options regardless of their identities.

When women do not have similar identity role models or mentors, it can change what positions they believe are accessible to them (Gonzalez-Perez et al. 2020). Women and other minority groups are often more successful when they have similar identity role models (Carrell et al. 2009). Role models are more effective when they are relevant to one’s self-image and personal goals (Lockwood & Kunda 1997) or differ greatly from stereotypes for certain positions (Cheryan et al. 2011). However, role models alone are
insufficient (Byrne 1993) and should be implemented in addition to other support and mentoring systems, like peer mentoring (Gibson 2004).

Positive support from peers and mentors can encourage women to stay in their field by improving their ability to balance work and motherhood and their perceptions of their own capabilities (Beede et al. 2011). In our results, women that continued in their profession after having children were able to do so with support from their supervisors and colleagues. New mothers often require additional support and schedule flexibility following childbirth; having this positive support can help decrease symptoms of depression when returning to work after childbirth (Staines & Pleck 1984; Dagher et al. 2009, 2011; Shepherd-Banigan et al. 2016). Beyond family formation, positive support in women’s early careers is vital to learning workplace customs and informal expected behaviors (Ostroff & Kozlowski 1993; Pell 1996; Goulden et al. 2011; Zipp 2022). Our participants often expressed that they found better support from peers than mentors; this may be due to the lack of power differential and mutual desire for success (Chandler 1996).

Women may receive negative support from their colleagues and supervisors unknowingly as a result of male privilege and lack of understanding. Covert and overt discriminatory behaviors, such as harassment and microaggressions, can negatively impact women’s sense of belonging in their workplace (Leaper 2014; Sekaquaptewa 2019; Marshall et al. 2021). Further, women and other minorities may have difficulty making connections with colleagues due to differences in perspectives and perpetuation of male privilege (Brown et al. 2022). As part of a larger study focused on students
enrolled in four-year universities in North Carolina, Dancy et al. (2020) found that students perceived women and minorities in STEM had to work harder to overcome discriminatory obstacles that are absent for their male counterparts. This may explain why some of our participants expressed that they had difficulty receiving respect or positive male support in their careers.

Women may change how they choose to present themselves depending on how they are shown respect. When colleagues or supervisors “bully” or disrespect a woman in the workplace, it can lead to reduced productivity and retention (Daniel 2006; Saline 2015). Our results demonstrated that even in positions of leadership, women may still struggle to be respected by peers or feel that they are under higher scrutiny than their male counterparts. The glass cliff, a variation of the glass ceiling, is the idea that women are under higher scrutiny in leadership positions to find reasoning to discredit them (Brescoll et al. 2010; Bruckmuller et al. 2014; Ryan et al. 2016), often exposing women to greater potential for bullying in leadership positions (Salin 2015).

Workplace culture can influence women’s health and the likelihood that working mothers will return after giving birth (Salihu et al. 2012). Further, connections with coworkers can improve mental and physical health, which can ultimately encourage people to remain in their profession (Mitchell & Lee 2001; Holt-Lunstad 2018). Women’s perspectives and contributions to their field can be perceived as being minimized or ignored by their male colleagues (Davidson & Black 2001); whether or not the woman is a mother. In our results this was caused by the Good Ol’ Boys Club’s influence on the perception that women do not belong in certain positions. Lack of
recognition in the workplace can encourage feelings of imposter syndrome and self-doubt, which can manifest as women being less likely to self-cite than their male counterparts (King et al. 2017). Acknowledging and respecting achievements, regardless of the identity of those making the accomplishment, can encourage support among colleagues and foster more inclusive work environments.

There are different expectations of women based on the intersection of their gender and other identities. Women of color can have varying experiences with different types and amounts of harassment based on their race or ethnicity (Phoenix & Pattynama 2006; Rosette et al. 2018). This harassment can be overt, such as our participants that received negative comments from their colleagues about being a “diversity hire” or questioning their qualifications for a position. More subtle harassment can be in the form of a social norm, such as Japanese women that are expected to terminate their career after starting a family (Belarmino & Roberts 2019). Ageism is another facet that can complicate the female experience. Women can experience discrimination based on their age whether they are younger or older than their counterparts (Walker & Zelin 2021). Our results include discussion of women being belittled or condescended due to being younger than their colleagues and being ignored or dismissed as they aged. This could be a result of how society views successful men versus women. Barnett (2005) expressed that while successful men continue to be respected as they age, women’s wisdom and relevance is perceived to decline with age. The various experiences that women may have based on their identities introduces additional complexities to addressing these challenges.
and calls for more than a “one size fits all” approach to supporting and retaining women in Natural Resources.

**Conclusions**

We used qualitative inquiry to evaluate what challenges and benefits women in Natural Resources experienced in their careers, including graduate school and, in some cases, post-retirement. Our responses were dominated by five major themes: Diversity and Equity, Respect Topics, Support, Culture and Inclusion, and Intersectionality. We found that not only did women’s experiences impact their professional life, but also their personal lives. We believe this widespread impact to be caused by change in women’s self-image as a result of their experiences. Our case study highlights an interesting line of inquiry that can potentially be explored quantitatively in the future. Although we are unsure whether we reached saturation in our sampling for this study, the purposefully broad scope of our topic and questions allowed us a wide array of responses that can be further explored. It is important to note that whether or not saturation was reached does not lessen the validity of our participants’ experiences or their likelihood to be common among female Natural Resource professionals in the United States.

Using a quantitative approach to further investigate the topic in the future, either short-term or longitudinal, will allow for a much larger and statistically representative sample size, that will allow for the quantification of the challenges and benefits of being a woman that have been identified in this qualitative study. Both this study and any future quantitative studies may be used to bring increased awareness associated with JEDI issues specifically geared toward women. Ultimately, our hope for this study’s results is
that they will assist in implementation of interventions to decrease JEDI challenges and increase retention of women and minorities in Natural Resources.
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Figure 2.1 Percent of transcripts from interviews of 43 women working or retired from Natural Resources professions conducted between 2018 and 2022 in which at least one quote was coded with the following major themes, Diversity and Equity, Support, Culture and Inclusion, Respect Topics, and Intersectionality.
Figure 2.2 Percent of transcripts from interviews conducted between 2018 and 2022 of 43 women working or retired from Natural Resources professions in the United States that contained at least one quote coded within the theme Diversity and Equity as the following sub-themes, Sexism, Gender Issues, Gender Roles, Sexual Orientation and Gender Equity, Situational Awareness, Racial Minority Diversity Issues, Ageism, and Expected a Man.
Figure 2.3 Percent of transcripts from interviews conducted between 2018 and 2022 of 43 women working or retired from Natural Resources professions in the United States that contained at least one quote coded within the theme Respect Topics as the following sub-themes, Disrespect, Boundaries with Male Colleagues, Positive Respect, Trust, and Respect Topics.
Figure 2.4 Percent of transcripts from interviews conducted between 2018 and 2022 of 43 women working or retired from Natural Resources professions in the United States that contained at least one quote coded within the theme Support as the following sub-themes, Role Models, Supervisors, and Mentors, Positive Support, Social Gender Changes, Negative Support, Female Networking, and Personal/Professional Balance.
Figure 2.5 Percent of transcripts from interviews conducted between 2018 and 2022 of 43 women working or retired from Natural Resources professions in the United States that contained at least one quote coded within the theme Culture and Inclusion as the following sub-themes, Belonging, Good Ol’ Boys Club, Being Heard, Regional Culture, Fitting In, International Culture, and Recognition.