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Mark Rouleau

*Michigan Technological University*, [mdroulea@mtu.edu](mailto:mdroulea@mtu.edu)

Terry Sharik

*Michigan Technological University*, [tlsharik@mtu.edu](mailto:tlsharik@mtu.edu)

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# Enrollment Decision-Making in U.S. Forestry and Related Natural Resource Degree Programs

Mark Rouleau,\* Terry L. Sharik, Samantha Whitens, and Adam Wellstead

## Abstract

This article investigates enrollment decision-making trends among students currently enrolled in forestry and related natural resource (FRNR) degree programs in the United States. We conducted an online survey administered to all student participants attending the Society of American Foresters (SAF) National Convention in Salt Lake City, UT, in 2014 to obtain our enrollment decision-making data. Students were asked to rank the enrollment factors they considered most important to their decision to enroll, and factors that caused them to hesitate when enrolling in their degree program. We found that the “typical” FRNR enrollee was a person who enjoyed being outdoors and had an affinity toward nature, while being attracted to the idea of working outdoors on subject material that pertained to nature in general. We also found that there were many important differences between the “typical” FRNR enrollee and their minority counterparts. For example, women were found to be significantly more hesitant about enrolling in a FRNR program than males (the dominant demographic of FRNR students). In addition to these differences, we found critical differences between degree program and specialty that also crossed gender lines. We report the results of these findings and discuss the implications for future recruitment efforts geared toward both boosting FRNR enrollment overall as well as increasing FRNR student diversity.

## Core Ideas

- Typical forestry and related natural resources students are attracted to their program because it satisfies a need to be outdoors and with nature.
- Forestry and related natural resources students are hesitant to enroll in the program due to concerns about earning potential and the desire to avoid contentious political issues.
- Women are hesitant to enroll in a forestry and related natural resources program due to concerns about their gender, work locations, and work conditions.
- The environmental stewardship aspect of forestry and related natural resources programs may boost enrollment rates and address issues related to underrepresented minority enrollment.

**E**nrollments in forestry and related natural resource (FRNR) degree programs have been a persistent topic of concern for a number of decades. Underlying this concern is a fear that current enrollment rates are insufficient to offset the anticipated losses of retirees in FRNR career fields in the near future (Sample et al., 2015; Coalition of Natural Resource Societies 2012; Adewusi, 2008). This issue sparked national attention when FRNR enrollments peaked in 1996 and then declined for more than 10 straight years, with a loss of 4% of the FRNR student population per year until 2007 (Sharik et al., 2015; Barnes, 2010; Nyland, 2008; Xu and Bengston, 1997). Forestry and related natural resource enrollments have since rebounded and remain at about their historic high two decades later (Sharik et al., 2015). An interrelated problem is the lack of underrepresented minorities in FRNR fields (Sharik, 2015; Adamo, 2013; Millenbah and Wolter, 2009; Adams and Moreno, 1998). For example, women are somewhat underrepresented at 41% of the FRNR population (as opposed to 57% for all U.S. undergraduate majors) but remain severely underrepresented in certain areas, such as forestry, where women represent only 18% of the field (Sharik et al., 2015). An ideal enrollment solution would address both the number and diversity of FRNR enrollees and their impact on the future workforce (Lopez and Brown, 2011; Sharik et al., 2015). This requires a better understanding of FRNR enrollment decision-making—one that can differentiate the motivations of “typical” FRNR students from key underrepresented minorities.

In 2004 and 2007, Sharik and Frisk (2011) conducted a preliminary FRNR enrollment survey to determine the most common reasons for and reservations to enrolling in an FRNR program. Their work used open-ended questions to elicit responses about FRNR enrollment attractors and detractors. Two factors cited most frequently regarding the reasons for enrolling in an FRNR program, in addition to the subject matter per se, included: (1) meaningful work related to the environment and concern for it and (2) the opportunity to work outdoors coupled with a love of and interest in nature. The factors causing students to hesitate to enroll in an FRNR program fell into three broad categories: (1) economic concerns (e.g., job security and relative salaries), (2) personal concerns (e.g., the perceived disconnect between society and nature, a declining desire to work outdoors, and a growing negative perception of forestry and other “extractive” FRNR programs), and (3) academic concerns (e.g., the narrowness and rigidity of

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Michigan Technological Univ., 1400 Townsend Dr., Houghton, MI 49931. \*Corresponding author (mdroulea@mtu.edu).

**Abbreviations:** ANOVA, analysis of variance; FRNR, forestry and related natural resources; SAF, Society of American Foresters.

the FRNR curriculum, "science phobia," and the length of time necessary to achieve a terminal professional degree). For the purpose of our study, we turned the open-ended responses of Sharik and Frisk (2011) into a comparable set of closed-ended questions in an effort to re-test their findings. Additionally, we also compared the findings of our "typical" FRNR student to those of a key underrepresented minority to gain a sense of how women differ from men with respect to enrollment decision-making.

Numerous studies in addition to Sharik and Frisk (2011) have argued that underrepresented minorities face a series of unique enrollment attractors and barriers when compared to the "typical" FRNR enrollee (Balcarczyk et al., 2015; Anderson et al., 2013; Arevalo Pardo de Donlebun, 2011; Armstrong et al., 2007). Specifically, it has been argued that women are more likely to perceive the "consumptive" aspect of traditional FRNR programs, like forestry and wood products/science, negatively while being more positively attracted to FRNR programs with a "conservation" or "sustainability" focus (Sharik et al., 2015; Goodell, 2013; Yanciw, 2004). Other more specific enrollment barriers and attractors have been put forward to explain the underrepresentation of ethnic/racial minorities in FRNR programs, which further highlight the possible ways in which enrollment decision-making may deviate from the perspective of the "typical" FRNR student (Sharik et al., 2015; Schelhas, 2002; Wellman, 1987, Leatherberry and Wellman, 1988; Bengston, 2004). It is these sorts of differences in enrollment decision-making that our study seeks to uncover and confirm in an effort to bolster recruitment efforts intended to not just promote FRNR enrollment but also to boost enrollment diversity.

Recent national FRNR enrollment trends appear to confirm the above hypothesized minority attractors and barriers, as reported in Sharik et al. (2015) and Sharik (2015). For example, the number of women in FRNR programs has increased 71% (an annualized gain of 8% per year) from 2005 to 2012. As hypothesized, the areas experiencing the greatest increase were natural resource conservation and management (up 47.2% from 2005 to 2012) and environmental science and studies (up 53.8% from 2005 to 2012). These broad national trends seem to confirm the expectations of existing scholarship on minority enrollment attractors and barriers in FRNR. However, rather than simply inferring individual-level motivations from aggregate enrollment statistics, it is always wise to confirm population-level trends at the level of the individual decision-maker. We show below which individual-level characteristics matter when deciding to enroll in an FRNR program while identifying key motivational differences across gender and social background.

The goal of the current paper is to identify barriers to (and opportunities for) increasing FRNR enrollments while promoting student diversity. We conducted exploratory statistical analysis on data obtained from a survey of nationally enrolled FRNR students to uncover critical differences in enrollment decision-making between "typical" FRNR enrollees (primarily white males) and a key minority counterpart (women). Our work builds on the prior efforts of Sharik and Frisk (2011), who first studied enrollment decision-making at the height of FRNR enrollment decline in 2007. Our study replicates the approach of Sharik and Frisk (2011) to first determine how FRNR enrollment decision-making has changed in the time since enrollment rates have rebounded nationally. We then extend this approach to show

how differences in gender and social background cause enrollment decisions to deviate from the perspective of the "typical" FRNR student. We highlight these differences with the goal of informing future recruitment efforts tailored to the needs and desires of underrepresented minorities who represent the greatest potential for FRNR enrollment growth.

## METHODS

In October and November 2014, we administered an online survey via Survey Monkey to student participants attending the annual Society of American Foresters (SAF) National Convention held in Salt Lake City, UT (5–11 October). The target population for this survey was committed students enrolled in a U.S. Forestry or related FRNR programs who are often leaders of their field. This was the same target population studied by Sharik and Frisk (2011), who assumed that students attending a major professional conference would be more likely to be deeply involved in their declared major. Society of American Foresters conference organizers provided a list of registered email addresses, making it possible to distribute our survey online to all student attendees. A total of 326 surveys were distributed resulting in 9 undeliverable questionnaires, 8 opt-outs, and 130 completed questionnaires for a total response rate of 40%.

Our survey was designed to retest the findings of Sharik and Frisk but also to compare FRNR enrollment decision-making across gender and social background. The original Sharik and Frisk survey used open-ended questions to prompt students to identify factors they believed were important to their enrollment decision. Responses were then partitioned into "positive" and "negative" factors using content analysis and then further partitioned into the subcategories of Career, Academic, Personal, and Affective for the "positive" factors and Career, Academic, and Personal for the "negative" factors (the Affective category lacked a "negative" dimension). Our survey adopted these same factor categories but opted to use closed-ended rather than open-ended questioning to facilitate cross-survey comparisons and to permit statistical hypothesis testing. In our survey, students were given a list of potential influencing factors and were asked to choose how significant each factor was to their decision to enroll in an FRNR program using a 5-point Likert scale. Positive factors were phrased as being "important" to the enrollment decision (response categories were: very important, somewhat important, neutral, somewhat unimportant, not important) and negative factors were phrased as causing students to "hesitate" to enroll (response categories were: very hesitant, somewhat hesitant, neutral, somewhat unhesitant, not hesitant). Finally, students were asked to provide demographic information, information about their current FRNR program, and information about the other majors they considered before deciding to enroll in an FRNR degree program.

Responses were analyzed using IBM SPSS statistical software. Frequency reports were used to determine the relative weight respondents as a whole assigned to each factor as a way to describe enrollment decision-making from the perspective of the "typical" FRNR student. A series of *t* tests were then used to determine if the respondent means for each factor were statistically significantly different than the neutral category of our Likert scale as a way to verify the directionality of respondent attitudes (the level of importance or hesitance). In other words, we assumed that factor

**Table 1. Respondent demographics.**

Gender	<i>n</i>	White	African American	Asian	Multiracial
Male	49	39	1	1	4
Female	70	65	1	0	1
Totals	119	104	2	1	5

means that failed our *t* tests were statistically equivalent to neutral, providing no indication of directionality, whereas those that passed the *t* tests could be relied on to infer the directionality of respondent attitudes observed in our study. Finally, *t* tests or ANOVAs were used to analyze differences in the importance or hesitancy assigned to each factor across the demographic dimensions of gender and social background. This final round of testing made it possible to distinguish critical differences in enrollment decision-making between the “typical” FRNR student and their minority counterparts. Reported findings were considered statistically significant at the 95% confidence level when they achieved an *α* of less than 0.05.

## RESULTS

### Who Are the Respondents?

Of the 130 respondents to our questionnaire, women slightly outnumbered men 58 to 42% (Table 1). Although this figure is roughly comparable to national enrollment rates across all majors, the proportional difference between males and females is reversed in our sample when compared to national statistics where women make up only 41% of FRNR programs (Sharik et al., 2015). Women appear even more overrepresented in our sample when we consider that women represent only 18% of the field of forestry (Sharik et al., 2015), which was the most common degree program for SAF attendees. The “overrepresentation” of females in our sample signals that the aggregate statistics of our data should be interpreted with caution, which we do below. However, oversampling women is also beneficial to hypothesis testing in our study because it makes it easier to detect statistically significant differences between this critical minority group and the most common national enrollee (white males).

Overrepresentation was not a problem for the other minority groups in our sample (see Table 1). For example, the percentage of white respondents (87%) was significantly greater than the percentage of non-white respondents (10%) in proportion similar to national FRNR enrollment statistics (racial/ethnic minorities comprise 14% of the national FRNR enrollment population). Given the low number of respondents falling into each individual race/ethnic minority category, we decided it would be best not to infer racial/ethnic minority perspectives from such a small sample size.

**Table 2. Respondent by degree program.**

Degree program	<i>n</i>	%
Forestry	105	88.2
Natural resources conservation and management	16	13.5
Environmental science and studies	6	5.0
Watershed science and management	5	4.2
Fisheries and wildlife	1	0.8
Natural resources recreation	1	0.8
Range science and management	1	0.8

In addition to racial/ethnic and gender differences, our respondents also came from a diverse array of social backgrounds. As a whole, respondents reported having lived more of their life on average in a suburban environment (41.1% of their life) followed by rural (31.3%) and then urban (26.8%). Nevertheless, all three social backgrounds were well represented in the sample with many respondents (over 73%) having lived in more than one setting throughout their life (87% of whom lived in two settings and 9.2% lived in all three). The urban setting was least common with only 19% of respondents having lived the majority of their lives in this setting while that same figure rose to 31% for rural and 43% for suburban. It is important to note that these figures differ slightly from the original Sharik and Frisk (2011) study, which found greater representation from rural rather than suburban settings.

In terms of academic programs, forestry was the most commonly declared major among our survey respondents (88%) with the remaining respondents (12%) enrolled in an FRNR program other than traditional forestry (Table 2). This result was similar to Sharik and Frisk with the exception of a slightly broader representation of FRNR majors other than forestry. Silviculture was the most common specialty (23.4%) followed by GIS/remote sensing (16.8%), fire science and management (14.0%), human dimensions (10.3%), restoration ecology (9.4%), public policy (8.4%), and so on (see Table 3 for a complete breakdown). A large majority of respondents were attending a land-grant university (79%) as opposed to a non-land-grant university (21%). Almost half of the respondents were attending a university in the West (46%), where the SAF convention was held, with the number of respondents declining as geographic distance increased from the conference location: 28% were

**Table 3. Respondent by degree specialty.**

Degree specialty	<i>n</i>	%
Silviculture†	25	23.4
Fire science and management†	15	14.0
GIS/remote sensing†	18	16.8
Human dimensions‡	11	10.3
Restoration ecology†	10	9.4
Public policy‡	9	8.4
Landscape management‡	11	10.3
Hydrology†	8	7.5
Economics‡	8	7.5
Climate change‡	7	6.5
Urban forestry‡	6	5.6
Soil science†	5	4.7
Conservation biology†	4	3.7
Communications‡	3	2.8
Forest pathology†	3	2.8
Recreation‡	3	2.8
Wildlife habitat analysis†	3	2.8
Entomology†	1	0.9

† Predominantly natural science oriented.

‡ Significant social sciences component.

from the South, 22% from the North Central, and only 3% from the Northeast (regions denoted as per www.naufrp.org). It should be noted that, although respondents from the West and land-grant universities outnumbered respondents from other regions and non-land-grant universities, there were no statistically significant differences across these respondent groups with respect to the enrollment decision-making factors reported below, which should alleviate some concern about the potential for Western bias in our survey data. We should also note that the prior surveys of Sharik and Frisk were both conducted in the West (Alberta, Canada, and Oregon, USA) so there should be minimal concern about comparing dissimilar populations across these studies.

Finally, most respondents (62%) were undergraduates, but the sample also included some Masters (29.2%) and Doctoral (9.2%) students. We should also note that the original Sharik and Frisk study included undergraduates only but, as we explain below, there were very few statistically significant differences between undergraduate and graduate responses in our data, which is why graduates were included to boost our sample size.

## Factors Influencing Matriculation

### Factor Means for All Respondents: The "Typical" FRNR Student

To establish a general profile for the "typical" FRNR student from our study data, we first analyzed the frequencies and means of our enrollment decision-making factors across all respondents (Tables 4 and 5 provide an overview of respondent answers to our Important and Hesitant enrollment factor questions in a response frequency distribution). The first thing to note is that respondents as a whole considered almost all the provided attractive factors "important" to their decision to enroll in an FRNR program (see Table 6). "Earning potential" (41% ranked this neutral with a factor mean of 1.91), "exposure to FRNR in high school" (frequencies were quite evenly divided on this factor with a factor mean of 1.90), and "tuition/fees" (44% ranked this neutral with a factor mean of 2.12) were the only attractive factors respondents rated neutral rather than important on average (all three means were also statistically significantly equivalent to the neutral score of 2). This result is interesting because it highlights the fact that FRNR

Table 4. Frequency counts for important factors.

Category	Not important	Somewhat unimportant	Neutral	Somewhat important	Very important
<b>Career</b>					
Employment opportunities	3.4% (4)	7.6% (9)	10.2% (12)	39.8%† (47)	39.0% (46)
Earning potential	14.4% (17)	14.4% (17)	41.5%† (49)	25.4% (30)	4.2% (5)
Working outdoors	1.7% (2)	0.9% (1)	0.9% (1)	15.5% (18)	81.0%† (94)
Job satisfaction	0.8% (1)	5.0% (6)	3.8% (5)	23.3% (28)	66.7%† (80)
<b>Academic</b>					
Subject matter	0.8% (1)	2.5% (3)	10.0% (12)	44.2%† (53)	42.5% (51)
Scholarships/funding	5.9% (7)	11.8% (14)	29.4% (35)	34.5%† (41)	18.5% (22)
Reputation of school	1.7% (2)	4.3% (5)	18.1% (21)	45.7%† (53)	30.2% (35)
Tuition/fees	10.3% (12)	12.0% (14)	44.4%† (52)	21.4% (25)	12.0% (14)
<b>Personal</b>					
Being outdoors	0.0% (0)	1.7% (2)	0.0% (0)	14.3% (17)	84.0%† (100)
Family/friends	21.8% (26)	19.3% (23)	37.0%† (44)	15.1% (18)	6.7% (8)
Exposure as child	8.5% (10)	6.8% (8)	17.1% (20)	28.2% (33)	39.3%† (46)
Exposure in high school	24.4% (29)	12.6% (15)	26.9%† (32)	21.0% (25)	15.1% (18)
Concern for environment	3.3% (4)	5.8% (7)	16.7% (20)	28.3% (34)	45.8%† (55)
<b>Affective</b>					
Enjoy wildlife	2.5% (3)	6.7% (8)	15.1% (18)	40.3%† (48)	35.3% (42)
Enjoy forestry	0.0% (0)	1.7% (2)	1.7% (2)	21.7% (26)	75.0%† (90)
Enjoy nature	0.8% (1)	3.4% (4)	8.4% (10)	23.5% (28)	63.9%† (76)
Enjoy outdoor recreation	0.9% (1)	1.7% (2)	4.3% (5)	25.6% (30)	67.5%† (79)

† Highest frequency count in category.

students are attracted to FRNR programs for reasons other than strictly economic considerations (e.g., job availability, salary expectations, etc.). For example, "being outdoors" was considered the most important enrollment factor for respondents as a whole (84% ranked this very important with a factor mean of 3.81). This was followed by "working outdoors," which was the most important factor for the Career category (81% ranked this very important with a factor mean of 3.73), and "enjoying nature," which was the most important factor for the Affective category (64% ranked this very important with a factor mean of 3.70). The "subject matter of one's program" was the most important factor for the Academic category (43% ranked this very important with a factor mean of 3.25). Finally, "job satisfaction" (67% ranked this very important with a factor mean of 3.50) and "enjoying outdoor recreation" (68% ranked this very important with a factor mean of 3.57) also ranked highly within their respective categories.

Respondents as a whole were also not very "hesitant" about any of the provided detracting factors (see Table 7). In other words, all of the "hesitant" factors averaged on the "not hesitant" side of neutral and all factor means were also statistically significantly different from neutral. Relatively speaking, the factor that caused respondents to be the least "hesitant" on average was the "respondent's own race" (74% reported not hesitant with a factor mean of 0.48) followed by the "respondent's own gender" (71% reported not hesitant with a factor mean of 0.55), the "reputation of

the school/faculty" (63% reported not hesitant with a factor mean of 0.59), and "job satisfaction" (61% reported not hesitant with a factor mean of 0.62). Although no factors caused respondents to be truly "hesitant" on average, the factors causing the most hesitancy were "earning potential" (28% reported neutral, 29% reported hesitant or very hesitant, with a factor mean of 1.63), "contentious political issues" (23% reported neutral, 23% reported hesitant or very hesitant, with a factor mean of 1.37), "work locations" (18% reported neutral, 21% reported hesitant or very hesitant, with a factor mean of 1.21)—all three being "Career" factors—and "scholarships/funding" (23% reported neutral, 14% reported hesitant or very hesitant, with a factor mean of 1.13)—the sole non-Career factor falling into the "Academic" category. "Earning potential" was also ranked highly in terms of hesitancy in the original Sharik and Frisk study but the increased hesitancy with respect to "contentious political issues," "work locations," and "scholarships/funding" is a new finding in our study. The Personal category was least likely to cause hesitancy but "the lack of exposure to FRNR in high school" (21% reported neutral, 17% reported hesitant or very hesitant, with a factor mean of 1.08), "the lack of exposure to FRNR as a child" (19% reported neutral, 13% reported hesitant or very hesitant, with a factor mean of 0.96), and the "influence of family/friends" (23% reported neutral, 14% reported hesitant or very hesitant, with a factor mean of 1.02), caused the most (albeit slight) hesitancy in this category.

Table 5. Frequency counts for hesitant factors.

Category	Not hesitant	Somewhat unhesitant	Neutral	Hesitant	Very hesitant
<b>Career</b>					
Earning potential	25.0% (30)	18.3% (22)	28.3% <sup>†</sup> (34)	25.8% (31)	2.5% (3)
Working conditions	45.8% <sup>†</sup> (54)	16.9% (20)	22.9% (27)	13.6% (16)	0.8% (1)
Work locations	41.9% <sup>†</sup> (49)	19.7% (23)	17.9% (21)	16.2% (19)	4.3% (5)
Job satisfaction	61.0% <sup>†</sup> (72)	22.0% (26)	11.9% (14)	4.2% (5)	0.8% (1)
Political issues	33.6% <sup>†</sup> (40)	20.2% (24)	23.5% (28)	21.0% (25)	1.7% (2)
<b>Academic</b>					
Subject matter	57.6% <sup>†</sup> (68)	19.5% (23)	15.3% (18)	7.6% (9)	0.0% (0)
School reputation	62.9% <sup>†</sup> (73)	19.8% (23)	12.9% (15)	4.3% (5)	0.0% (0)
Scholarships/funding	37.0% <sup>†</sup> (44)	26.9% (32)	22.7% (27)	12.6% (15)	0.8% (1)
<b>Personal</b>					
Family/friends	50.8% <sup>†</sup> (60)	11.9% (14)	22.9% (27)	13.6% (16)	0.8% (1)
Exposure as child	52.9% <sup>†</sup> (63)	14.3% (17)	19.3% (23)	10.9% (13)	2.5% (3)
Exposure in high school	48.7% <sup>†</sup> (58)	13.4% (16)	21.0% (25)	15.1% (18)	1.7% (2)
Forestry image	62.2% <sup>†</sup> (74)	14.3% (17)	17.6% (21)	5.0% (6)	0.8% (1)
Own gender	70.6% <sup>†</sup> (84)	11.8% (14)	10.1% (12)	7.6% (9)	0.0% (0)
Own race	73.9% <sup>†</sup> (88)	10.1% (12)	11.8% (14)	2.5% (3)	1.7% (2)

† Highest frequency count in category.

## Differences in Means across Respondent Demographics: Investigating “Atypical” FRNR Students

The frequencies and factor means reported above highlight the degree of importance and hesitancy respondents assigned to various enrollment factors as a whole. This gives us a sense of the relative weight the “typical” FRNR enrollee places on different reasons for being attracted to or detracted from their chosen FRNR program. However, it is also important to compare factor means across respondent groups to determine how well the “typical” FRNR enrollee represents members of key minority enrollment populations. To do this, we performed a series of difference of means tests, using either an independent samples *t* test or ANOVA when appropriate, among key subgroups within our sample.

The first group comparison performed was between undergraduate and graduate students. We performed this test to determine if it was reasonable to compare the results of our full data set with that of Sharik and Frisk, whose sample included undergraduates only. We used a *t* test to compare differences in factor means between undergraduates and graduates and found that “the availability of scholarships/funding” was the only statistically significant factor in the “important” category, which graduates ranked as being slightly more important than undergraduates (see Table 8). We believe the prevailing norm to fund graduates students (but not undergraduates) during their studies is the reason why students differed

Table 6. Important factor means.

How important were the following factors when you made your decision to enroll in forestry or a related natural resources program? Scale ranges from 0 (not important) to 4 (very important)			
Category	Mean	Standard deviation	<i>n</i>
<b>Career</b>			
Employment opportunities	3.03*	1.054	118
Earning potential	1.91	1.070	118
Working outdoors†	3.73*	0.690	116
Job satisfaction	3.50*	0.860	120
<b>Academic</b>			
Subject matter†	3.25*	0.802	120
Scholarships/funding	2.48*	1.104	119
Reputation of school	2.98*	0.904	116
Tuition/fees	2.13	1.103	117
<b>Personal</b>			
Being outdoors†	3.81*	0.509	119
Family/friends	1.66*	1.175	119
Exposure as child	2.83*	1.261	117
Exposure in high school	1.90	1.386	119
Concern for environment	3.07*	1.078	120
<b>Affective</b>			
Wildlife	2.99*	1.004	119
Nature†	3.70*	0.588	120
Forestry	3.46*	0.852	119
Outdoor recreation	3.57*	0.735	117

\* Statistically significantly different than neutral (2) at the 95% confidence level.  
† Item with highest mean in category.

on this factor. In addition to this difference, the following five “hesitant” factors were also found to be statistically significantly different between undergraduates and graduates: “working conditions,” “work locations,” “availability of scholarships/funding,” “exposure to FRNR as a child,” and “respondent’s own race” (all of which graduates were more “hesitant” about than undergraduates; see Table 8). This tells us that the inclusion of graduate students in our sample slightly overinflates the importance and hesitancy of these six factors when compared to Sharik and Frisk, which is why we caution the reader not to place too much emphasis on shifts in the importance of these factors across the time period of our two studies. However, we are confident that the profile of the “typical” FRNR enrollee we drew above is representative of the undergraduate FRNR enrollee population, despite the inclusion of graduate student data. This is because there were no statistically significant mean differences between graduates and undergraduates with respect to the factors considered to be the most “important” or to cause the most

Table 7. Hesitant factor means.

How hesitant did the following factors make you feel when you made your decision to enroll in forestry or a related natural resources program? Scale ranges from 0 (not hesitant) to 4 (very hesitant)			
Category	Mean	Standard deviation	<i>n</i>
<b>Career</b>			
Earning potential†	1.63*	1.189	120
Working conditions	1.07*	1.145	118
Work locations	1.21*	1.265	117
Job satisfaction	0.62*	0.914	118
Political issues	1.37*	1.199	119
<b>Academic</b>			
Subject matter	0.73*	0.984	118
Reputation of school	0.59*	0.875	116
Scholarships/funding†	1.13*	1.081	119
<b>Personal</b>			
Family/friends	1.02*	1.169	118
Exposure as child	0.96*	1.182	119
Exposure in high school†	1.08*	1.208	119
Negative forestry image	0.68*	0.991	119
Own gender	0.55*	0.954	119
Own race	0.48*	0.919	119

\* Statistically significantly different than neutral (2) at the 95% confidence level.  
† Item with highest mean in category.

Table 8. Statistically significant mean differences for academic standing.

Category	Undergraduate mean	Graduate mean	Significance
<b>Important</b>			
Scholarships/funding	2.26	2.81	0.008
<b>Hesitant</b>			
Working conditions	0.88	1.38	0.020
Work locations	0.96	1.62	0.005
Scholarships/funding	0.88	1.54	0.001
Exposure as child	0.75	1.28	0.017
Own race	0.27	0.80	0.002

**Table 9. Statistically significant mean differences for gender.**

Category	Male mean	Female mean	Significance
Important			
Concern for environment	2.84	3.38	0.007
Hesitant			
Own gender	0.24	0.98	0.000

“hesitancy” for the “typical” FRNR enrollee as outlined above. In other words, given that our conclusions remain the same with or without the graduate data, we opt to include the graduate data for the sake of increasing our sample size for the analysis conducted below.

The second group comparison we performed was between males and females. Two factors stood out as being statistically significantly different across gender (see Table 9): “concern for the environment” and “respondent’s own gender.” Females on average ranked “concern for the environment” more than a half point higher in terms of being “important” to their decision to enroll in an FRNR program than males (3.38 and 2.84, respectively). Females also ranked “respondent’s own gender” nearly a full point higher in terms of causing one to be “hesitant” when enrolling in an FRNR program when compared to males (0.98 and 0.24, respectively). It is important to note that these half-point and full-point differences occur on a scale with only a 5-point range. This tells us that, even among committed FRNR students, gender greatly impacts the decision to enroll in an FRNR program. Our results also indicate that emphasizing the environmental protection aspect of an FRNR program is a possible avenue to boost FRNR enrollment among females. It appears that this is something different FRNR programs are likely already doing by default. For example, gender not only affects the decision to enroll in an FRNR program, it also affects which FRNR program respondents prefer. For example, males were more likely to be enrolled in a strictly forestry program whereas females were more likely to be enrolled in one of the other non-forestry FRNR programs declared by the students in our survey (these proportional differences were statistically significant using Pearson’s Chi-squared). Males also favored silviculture, fire science and management, and GIS/remote sensing as degree specialties whereas females preferred human dimensions, public policy, climate change, and conservation biology (again, statistically significant Pearson’s Chi-squared). There was also a

statistically significant difference (at the 90% confidence level) between genders regarding the majors respondents considered other than FRNR before ultimately committing to an FRNR program. Males were more likely to have not considered another major or to have considered a degree in engineering or business/economics; however, females were more likely to have considered degrees in the social sciences, humanities, or biology (all closely aligned with concern for the environment and sustainability). Finally, it is also interesting to note that undergraduate males and females were equally likely to be a member of a university student FRNR organization, whereas graduate males were more likely to be a member of a similar organization than female graduate students (with respect to statistically significant mean differences). This final result points to an interesting gender bias among student organizations that appears to persist only at the graduate level.

The next group comparison we performed was across students enrolled in different FRNR programs. The purpose of this comparison was to determine how students with different enrollment concerns self-select into an FRNR program they believe best alleviates these concerns. The goal here is to see how the salience of certain enrollment factors drives students to enroll in one FRNR degree program or specialty over another. The broadest way to approach this question is to first look at differences in factor means between students enrolled in a traditional forestry program versus non-forestry FRNR programs (Table 10). Here we find that there is only a single statistically significant mean difference for the importance of “enjoys being outdoors,” which forestry students find more important than non-forestry students (3.87 for forestry students and 3.68 for non-forestry FRNR students). “Work conditions” (1.40 for non-forestry students and 0.90 for forestry students) and “work locations” (1.59 for non-forestry students and 1.03 for forestry students) were the only two hesitancy factors to be statistically significantly different between forestry and non-forestry FRNR students with non-forestry FRNR students being more hesitant about both these factors. Similar differences in enrollment decision-making also apply to degree specialty. For example, students specializing in a predominantly natural sciences area of FRNR (specialties such as silviculture, fire science and management, GIS remote sensing, restoration ecology, hydrology, soil science, conservation biology, forest pathology, wildlife habitat analysis, and entomology) were more likely to consider “working outdoors” important to their decision to enroll than those specializing in an areas with a

**Table 10. Statistically significant mean differences for degree program.**

Category	Forestry major mean	Other FRNR major mean†	Natural science specialty mean	Social science specialty mean	Other natural science mean	Other social science mean
Important						
Being outdoors	3.87	3.68	–	–	–	–
Working outdoors	–	–	3.75	3.33	3.81	3.37
Hesitant						
Work conditions	0.90	1.40	–	–	–	–
Work locations	1.03	1.59	–	–	–	–
Salary levels	–	–	–	–	1.11	1.93
Forestry image	–	–	0.56	1.18	–	–
Exposure as child	–	–	–	–	1.33	0.68
Own gender	–	–	0.41	1.00	–	–
Own race	–	–	0.32	1.24	0.41	1.05

† FRNR, forestry and related natural resources.



significant social sciences component (specialties such as human dimensions, public policy, economics, climate change, urban forestry, landscape management, communications, and recreation). On the other hand, students enrolled in a specialty with a significant social sciences component were more hesitant about the “negative image of forestry,” “respondent’s own gender,” and “respondent’s own race” than students enrolled in a predominantly natural sciences specialty. Finally, we see similar results when comparing students across the other majors they considered before eventually enrolling in an FRNR program. For example, students who considered enrolling in another natural sciences major were more likely to find “working outdoors” to be important and were more hesitant about “salary levels” than those who considered majors with a significant social sciences component (including humanities degrees). On the other hand, those who considered enrolling in a social sciences or humanities major rather than an FRNR program were more hesitant about “exposure to FRNR as a child” impacting their decision to enroll.

## DISCUSSION

The purpose of our study was to first analyze changes in FRNR enrollment decision-making since the original Sharik and Frisk (2011) study conducted in 2004 and 2007. At the time of the original Sharik and Frisk (2011) study, FRNR programs were facing significant declines nationally from their enrollment peak in 1996. Our study replicated the work of Sharik and Frisk to see if it was possible to identify a shift in attitudes now that enrollment rates have rebounded. Our study found that, on average, students enrolled in FRNR programs today continue to be people who enjoy both being outdoors and nature in general. These program features lead students to believe that a career in an FRNR field will result in higher job satisfaction despite continuing concerns about earning potential and the impact of contentious political issues on job performance. On the other hand, respondents as a whole had few strong reservations about enrolling in an FRNR program. This is to be expected, given that our respondents were committed FRNR students who we assume would have a positive overall outlook on their decision to join an FRNR program. Yet, even within this committed group, it was possible to detect important reservations regarding critical financial considerations, such as “earning potential” and the “availability of scholarships/funding.” These concerns were elevated within our study as compared to the original Sharik and Frisk study, and this is likely due to increased exposure to a national economic crisis since 2008. Finally, it is also interesting to note how students associate FRNR programs with “contentious political issues.” The rise in hesitancy regarding this factor is also likely due to increased exposure to a growing political environment that has become much more confrontational in general but also with respect to FRNR issues since 2008. Thus, on the whole, we can say that the average FRNR enrollee today closely resembles the profile outlined in the original Sharik and Frisk study with the exception of some newly emerging reservations about FRNR that are likely due to changes in the national economic and political environment since 2008.

The second purpose of our study was to determine how key demographic characteristics impact FRNR enrollees differently. The assumption here is that not all FRNR enrollees match the profile of the “typical” student. Therefore, learning something about the diversity of enrollment decision-making

within the FRNR enrollee population can help us to better understand why certain groups tend to dominate FRNR programs more than others. Our study explored how gender impacts FRNR enrollment decision-making as well as uncovered interesting differences between newly admitted FRNR students and those who have been enrolled in FRNR programs for more than 1 year. With respect to gender, we found that women are much more likely to be attracted to FRNR programs due to concern for the environment and are much more likely to be hesitant about enrolling in an FRNR program due to concerns about their own gender. This result was not apparent in our aggregate statistics nor the original Sharik and Frisk study because it deviates from the profile of the average FRNR enrollee (who is also more likely to be male than female). However, this result is very important to the design of targeted efforts to boost female enrollment in FRNR programs. We cannot say exactly why women continue to perceive their own gender as a barrier to enrollment, but we can verify that this concern still exists and is likely to be a factor in lower female than male enrollment rates nationally (Sharik et al., 2015). Furthermore, we can also say that emphasizing the environmental care aspect of FRNR programs is one way to potentially overcome this enrollment barrier. We see evidence that FRNR programs other than forestry and degree specialties with a more social science orientation (as opposed to natural science orientation) are currently in a better position to stress this environmental care aspect. This is not necessarily the case for existing FRNR student organizations whose reform could be another potential avenue to encourage female enrollment and possibly further matriculation.

In addition to enrollment factor differences between the average FRNR enrollee (a white male) and a key underrepresented minority, our study also found statistically significant differences across FRNR degree programs and specialty preferences. Not only were women more likely than white males to be enrolled in an FRNR program other than forestry but students as a whole from these programs were also less likely to consider the outdoor aspect of the field important to their decision to enroll. Women and students from FRNR programs other than forestry in general were also more hesitant about work locations and work conditions than students from traditional forestry programs. However, our study also found statistically significant enrollment factor differences across FRNR programs that are not explainable by gender preferences alone. For example, students who specialize in social-science-related FRNR areas are more likely to be hesitant about the negative image of forestry than students who specialize in predominantly natural sciences FRNR areas. This result indicates that expanding the awareness of alternative social-science-oriented FRNR specialties may help to overcome preexisting enrollment reservations centered on the image of traditional forestry fields. We also found that students who considered enrolling in a social science major rather than the FRNR program they ultimately enrolled in were more hesitant about salary levels than students who considered enrolling in a natural science major as an alternative to their FRNR program. This result suggests that social-science-oriented FRNR students may be opting to enroll in an FRNR program rather than a social science program due to the perceived salary advantages of the former, which appears not to be the case for students who considered enrolling in another natural science program as an alternative to their FRNR program. Finally, we see that

students who considered enrolling in a natural science major as an alternative to an FRNR program are more hesitant about their lack of exposure to forestry as a child than students who considered a social sciences major. This result indicates that the existence of social-science-oriented FRNR programs may be helping the field to overcome enrollment barriers among students with little to no exposure to FRNR as a child. Overall, it is clear that the social-science-oriented FRNR programs are providing important enrollment benefits for students who do not fit the traditional FRNR profile.

Finally, we believe it is important to note that our study really only touches the surface on issues of enrollment decision-making among “atypical” FRNR students. We highlight the ways that women differ from men in terms of enrollment decision-making but we do not discuss deviations with respect to race/ethnicity, which many would see as just as important (if not more) for boosting FRNR program diversity. Although we did collect data on race/ethnicity in our study and found statistically significant differences, the resulting racial/ethnic composition of our sample was overwhelmingly skewed toward whites. Only 7% of our sample self-identified as being non-white, which is in line with national statistics that report only 12% of the FRNR student population is non-white (Sharik et al., 2015), but leads one to question the validity of drawing statistical inferences from such a small number of respondents. Given this low sample-size, we erred on the side of caution and chose not to report race/ethnicity analysis in the results section above despite interesting findings that suggest the greatest difference between whites and non-whites is that non-whites were just as hesitant about their own-race being a barrier to enrollment as in FRNR program as women were about their own gender. We believe such a finding both reinforces the fact that more attention must be paid to enrollment decision-making differences among underrepresented minorities and highlights the reason why such voices often go unheard due to a lack of adequate representation in the field.

## IMPLICATIONS AND RECOMMENDATIONS

Our study illustrates that the profile of the average FRNR student has changed very little since the original assessments done in 2004 and 2007 in the study by Sharik and Frisk (2011). In terms of the profile of the “typical” FRNR student outlined in this study, we see no indication that a new type of FRNR student (relative to that found in the Sharik and Frisk study) is responsible for the recent rebound in FRNR related programs nationally. However, we did uncover a rise in concern for earning potential and the impact of contentious political issues on job performance that may explain why FRNR enrollment rates have yet to reach beyond their historic 1996 peak. We also uncovered critical differences between the average FRNR student and a key underrepresented minority. We found that gender continues to be perceived as a barrier to enrollment from the perspective of women. We also found evidence that particular FRNR degree programs and specialties are better able to overcome this barrier than others. We acknowledge that these results are not necessarily representative of all FRNR students, but we do believe our findings provide an important first step toward addressing FRNR enrollment and retention barriers in the future. More work must be done to confirm the results of our findings within a broader and more representative sample of FRNR students, and we hope our work will inform and motivate this future endeavor.

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