A Comprehensive Analysis of U.S. Biological Field Station Goals, Operations, Land Management, and Recreational Opportunities

by

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A thesis submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Master of Natural Resources

Auburn, Alabama
May 10, 2025

Keywords: biological field stations, land management, conservation, wildlife, education, recreation

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Abstract

There is a project aimed to protect thirty percent of the planet's lands and oceans by 2030. This project, known as The Thirty by Thirty Project (30x30), stemmed from the Paris Climate Agreement and was developed by the United Nations Convention on Biodiversity. Several projects have used the 30x30 framework as a start to their efforts to prevent the extinction crisis and address climate change, conservation, and sustainability (Galloway, 2021). Within the US there are various types of land stewards that contribute to the 30x30 goal. For the purpose of this research we are solely focusing on U.S. biological field stations. Field stations are outdoor environmental research, teaching, and engagement centers (OBFS, 2024). Historically, they have been established and run by individual universities, government agencies, NGOs, or private research institutions. In the U.S., field stations are located in a variety of ecosystems and habitats. The range of field stations across the continent have supported research that has contributed to decades of data, specimens, and knowledge (Mitchener, 2009). The Organization of Biological Field Stations is a community of 313 field stations across the U.S. and U.S. territories designed to connect, network, and help field stations to focus on research and their common goals. Unfortunately, the combined contribution of research stations have been overlooked due to their independence and sometimes isolated community of researchers. With little summary documentation about field stations as a system, they can be a bit of a mystery (National Research Council, 2014) resulting in unknown information about their missions, conservation goals and issues, contribution to 30x30 goals, land management, and collaborations. Recognizing gaps in the literature, we developed a study to document and investigate the; 1) background and missions, 2) conservation issues and land management strategies, 3) collaborative partnerships, and 4) outdoor recreation opportunities of field stations.

Findings from this survey reveal field stations share common goals in research, education, community, outreach, conservation and management. Most respondents report active land management and goals,with invasive species management and active forest and hydrological restoration and manipulation being common. Current literature highlights the research, education, outreach mission and goals, but seldom mentions how active land management on field stations is or can be used as a tool to achieve these ends.

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List of Abbreviations

BFS	Biological Field Stations
FS	Field Stations
NGO	Non-Government Organization
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
T Species	Threatened Species
E Species	Endangered Species

Research Questions

The goal of this research was to further the understanding of biological field stations in the United States. We formulated four research questions to address what we identified as gaps in the literature :

1. What are the backgrounds and central mission/goals of the field station?
2. What are the conservation goals of field stations?
3. What are the land management issues and strategies of field stations?
4. Do field stations offer outdoor recreational opportunities?

Chapter 1: Biological Field Station Report

Private landowners that are not large corporations control 39% of forested land in the United States, making their conservation efforts indispensable in safeguarding biodiversity (National Association of State Foresters, 2024). By protecting natural habitats on their properties, private landowners contribute to the preservation and conservation of crucial ecosystems and the species they support. Biological field stations (BFS) are an important societal resource for environmental research and educational experiences (Klug et al., 2002). BFS and private landowners' relationship is typically one of collaboration and mutual benefit, particularly in the realms of conservation, research, and land management. BFS can be operated by universities, private research institutes or centers, non-governmental organizations, or government agencies and may be found in terrestrial, freshwater, and marine systems (Tydecks et al., 2016). BFS serves as spaces to study the natural environment, acting as living libraries that contain a wealth of information and data while still writing the next chapter.

Biological field stations are unique research facilities that provide hands-on learning environments for studying ecology and environmental science. Unlike traditional laboratories, where researchers often work with controlled environments, field stations allow scientists to observe and analyze complex ecosystems in their natural state. They facilitate research in a wide range of biological disciplines, from molecular biology to ecology, and are indispensable for understanding the intricate relationships between organisms and their environments (Michener et al., 2009).

The ability to study ecosystems over extended periods is one of the key strengths of BFS (McNulty et al., 2017). Long-term data collected at field stations have contributed significantly to our understanding of climate change, biodiversity loss, and ecosystem services. These stations

serve as ecological observatories, offering unique datasets that would be difficult to obtain elsewhere. For instance, the Cedar Point Biological Station, as described by Janovy and Major (2009), offers students first-hand research experiences in a natural setting, where they can engage with live organisms and ecosystems, building a deeper appreciation of the interconnectedness of life. Such experiences are also critical for cultivating future generations of biologists, ecologists, and conservationists.

Biological field stations offer opportunities for field-based research, education, and outreach, which helps further conservation efforts (Stepien et al., 2017). These stations are focused on scientific research and often host long-term ecological studies (McNulty et al. 2017). Research at BFS often provides the only information on ecological data for regional areas, and collecting data at BFS can demonstrate larger-scale global changes in environmental systems, processes, and biodiversity (Michener et al., 2009). Additionally, BFS are gathering places for students, scientists, and citizens, creating a place and community where scientific research and discoveries take place.

Field stations range in size and complexity. Some include dormitories, laboratories, and information centers, with state-of-the-art equipment. Others have less infrstructure and are limited in modern technology and facilities. BFS can employ hundreds of people and have complex leadership (e.g., boards of directors, vice presidents, presidents), or may only employ a few dozen people and be led by a single manager or lead scientist. The acreage of BFS also varies widely from under ten to over thousands of acres in size.

In key areas such as funding, public outreach, leadership, cyber infrastructure, and networking, many BFS are vulnerable to being irrelevant, outdated, or financially unsustainable (Baker et al., 2015). Some BFS may be at a continuous risk of closure because of financial

insecurity, lack of public support, or weak governance (Whitesell et al., 2002). Economic, geographic, social, or institutional barriers may also prevent collaboration between stations (Beck et al., 2019). These stations could benefit from modernizing and engaging more with policymakers, stakeholders, funders, and the general public (Baker et al., 2015) to increase appropriate access to stations and improve overall operational effectiveness.

For some BFS, a traditional reliance on government and academic funding sources is no longer sufficient to ensure financial stability. As the scientific community has become more interdisciplinary and global, there may be increasing pressure for field stations to collaborate with international partners and diversify their funding streams (Billick et al., 2013). The rise of digital technologies and cyberinfrastructure in scientific research has created new opportunities for data collection, sharing, and analysis. Field stations that fail to incorporate these technologies may struggle to remain competitive (Baker et al., 2015)

Field stations in the United States have the potential to provide many opportunities to the public. Approximately 78% of the US population lives within 60 miles (and 98% live within 120 miles) of a field station (Struminger et al., 2018). Many BFS engage the broader public through educational programs, public outreach, and citizen science initiatives. BFS can enhance its impact by prioritizing public communication and visibility, and there is significant room to increase its visibility through targeted outreach and advocacy campaigns (Struminger et al., 2018). Public support is essential for securing funding and maintaining the relevance of biological field stations in the scientific community. Fostering a deeper connection between the public and BFS can be achieved through educational and outreach activities of field stations (Elisner et al., 1982). This may include engaging the public in citizen science programs and offering guided field trips.

Biological field stations are integral to advancing our understanding of the natural world and addressing global environmental challenges. However, as highlighted in recent studies, biological field stations must evolve to meet contemporary challenges and expand their role in global research networks. By leveraging their unique strengths in education, research, and public engagement, field stations can continue to play a vital role in advancing biological and environmental sciences for years to come.

Literature Review

In "Why We Have Field Stations: Reflections on the Cultivation of Biologists" (2009), authors John Janovy and Krista Major explore the historical and educational significance of biological field stations in the development and early years of new scientists. Janovy and Major (2009) note that these stations provide essential environments for hands-on learning, allowing students and researchers to engage directly with natural ecosystems that they may not have encountered until the start of their professional career. The authors emphasize that field stations provide a unique context for experiential education, where learners can apply theoretical knowledge to real-world situations, thereby enhancing their understanding of biological concepts.

Janvoy and Major (2009) also discuss how field stations are a platform for scientific research and student collaboration. These field stations facilitate original research experiences, infield research, opportunities for long-term studies and environmental data collection, strengthening our nation's student scientists (Janovy & Major et al. 2009). They note that the collaborative atmosphere of field stations encourages interdisciplinary research and partnerships. Students are given the opportunity to participate in conservation practices and research at active

field stations. Reinforcing collaboration between students, universities, and field station personnel not only enriches a sense of community but also prepares student scientists for real-world work beyond classroom walls alone (Janovy & Major et al. 2009). For the values of higher education to survive in a technology-driven university, original and physical research is needed. Students need to 'do' what their own educators have done (Janovy & Major et al. 2009). By reinforcing their educational role and enhancing their research opportunities, field stations can continue to play an important part in training the next generation of biologists and contributing to ecological research.

The Organization of Biological Field Stations (OBFS) organized a report titled "Field Stations and Marine Laboratories of the Future: A Strategic Vision" (2013). The report stresses the importance of field stations in addressing current and future global challenges such as climate change, loss of biodiversity, and sustainable resource management. The report highlighted that it is essential for some of these institutions to adapt to evolving scientific needs and changes, and to create plans for the future (Billick et al., 2013). Specifically, the report identifies key areas for development, including (1) fostering collaboration across field stations and institutions. Billick and colleagues (2013) note that integration of research and resources between all station types can push forward science and increase efficiency in a discipline that rarely interacts with one another. This results in enhanced research capabilities and broadens the impact of scientific findings. The authors propose a central office to coordinate collaborations and standardized data collection to ensure research across all stations and organizations.

Additionally, the authors address the need for (2) archiving and preserving legacy data. The longitudinal data collected at these stations provide reference points for our modern and changing world. To answer these scale of questions, we need to know what is being done where,

which requires surveys, database infrastructure, financial incentives, and data organization and management to improve the operational effectiveness of FSMLs (Billick et al., 2013). Billick and colleagues advocate for a proactive, strategic approach to ensure that field stations and marine laboratories continue to thrive and fulfill their essential roles in ecological research and education.

Beth Baker's article "The Way Forward for Biological Field Stations" (2015) addresses the current challenges that biological field stations face in maintaining their importance and preventing cuts and defunding. Baker's article highlights several main issues, which include funding, public communication, leadership, cyberinfrastructure, and networking. Some field stations are struggling to evolve and adapt, which threatens their ability to contribute to important ecological and conservation research (Baker et al. 2015). It is important for these institutions to modernize and reassess their strategies in order to survive in a limited financial resource landscape (Baker et al., 2015).

There are several proposed strategies for biological field stations to navigate these issues, including fostering collaboration among institutions and researchers, diversifying funding sources, advertising field station research success, and embracing modern technologies (Baker et al. 2015). The authors advocate for a more integrated approach to BFS management that involves engaging with local communities and stakeholders to enhance the awareness and relevance of research conducted at these stations. By embracing change and new tactics, Baker believes that biological field stations can strengthen their contributions to science and ensure their long-term sustainability, ultimately benefiting both researchers and the ecosystems they study.

Laura Tydecks and others (2016) also examine the critical role that biological field stations (BFS) play as essential hubs for scientific research and education globally. They emphasize the significance of these facilities in conducting long-term ecological studies, fostering biodiversity conservation, and providing hands-on training for students and researchers. Field stations are essential for understanding the changes caused by a warming climate. Field stations monitor and collect data in various biomes across the globe, giving well-rounded insights to the nature of global climate change (Tydecks et al., 2016). The authors also explore the diverse functions of biological field stations beyond research. Field stations are important for understanding and protecting ecosystems, yet they face ongoing threats of closure due to "financial insecurity, lack of public support, and weak governance" (Tydecks et al., 2016, p. 269). Historically, field stations provided easy access to nature for individual researchers focused on natural history, but many now feature advanced infrastructure, labs and technologies. To remain adaptive to meet future needs, field stations require a strengthened relationship between research, education, outreach, and societal issues (Tydecks et al., 2016).

Within "The Organization of Biological Field Stations at Fifty" (2017), McNulty and colleagues provide a comprehensive overview of the foundational roles these stations have played in ecological research, education, and conservation. They highlight the change in ecological research from organismal and natural history research to theoretical and modeling approaches (McNulty et al., 2017). From this shifting academic climate, field stations have adapted to changing scientific priorities and technological advancements. They continue to produce field-based education and research while integrating advanced scientific technology (McNulty et al., 2017). The authors also acknowledge the field stations' contribution to the world through education and information. They identify four key functions that influence the

effectiveness of these stations: (1) such as observation of environmental change, (2) training the next generation of scientists and continuing training of practicing educators and natural resource professionals, (3) engaging the public in science and discovery of the natural world, and (4)space to test new technologies and method (McNulty et al., 2017, p. 359-360). Successful field stations often leverage partnerships with universities, government agencies, and non-profit organizations, which can enhance resource availability and research opportunities.

Finally, the report (McNulty, 2017) addresses future challenges and opportunities for biological field stations, particularly in the context of global environmental change and the need for effective science communication. McNulty and colleagues advocate for strategic planning that incorporates financial sustainability and adaptability to ensure the relevance of BFS in contemporary science. They emphasize the need for inspiring bold decisions by administrators and fostering financial relationships with government, non-profit, university, and other partners (McNulty et al., 2017). Ongoing evaluation and innovation with these institutions will maintain their critical role in training future scientists and addressing pressing ecological issues. By outlining a vision for the future, the authors aim to inspire continued investment in and support for biological field stations as essential components of the scientific landscape.

In "Perspectives of US National Park Service Employees on University-National Park Field-Station Partnerships" (2018), Stevens investigates the importance of collaborative relationships between university-based biological field stations and National Park Service partners. The study highlights the mutual benefits of these partnerships, emphasizing how they can expand their capacities for education, research, and outreach (Sevens et al., 2018). Stevens also explores the perspectives of National Park Service (NPS) employees regarding the effectiveness and challenges of these partnerships. Through interviews and surveys, the study

reveals that while many NPS staff recognize the value of collaboration with university field stations, they also identify barriers such as differences in institutional priorities, gaps in communication, limited resources, differing timelines, and funding constraints (Sevens et al., 2018). These challenges can hinder the potential for successful partnerships, suggesting a need for improved strategies to align the goals of both entities. The interviews also revealed strategies to resolve these issues, such as communicating with interested parties, outside funding, agreement renewals, strengthening professional relationships, and joint projects (Sevens et al., 2018). Furthermore, the article illustrates the need for enhanced communication and ongoing dialogue between NPS and university partners to foster stronger relationships and address shared objectives.

Struminger (2018) argues that BFSs have a unique opportunity to engage communities by integrating place-based learning with STEM education. By creating meaningful connections between local ecosystems and science content, these stations serve as informal educational hubs that allow individuals to experience science firsthand. However, these efforts are not without obstacles, such as the need for dedicated personnel, risk management policies in place, financing to support these aims, and outreach activities to attract broad audiences (Struminger et al., 2018). The research suggests that developing a comprehensive framework for informal STEM education at BFSs can help field stations refine their outreach efforts.

Biological field stations (BFSs) play a significant role in informal STEM education, offering hands-on learning experiences that promote science learning and environmental conservation education. The studies by Struminger from 2018 and 2021 highlight how field stations engage diverse audiences through a range of outreach programs such as nature walks, citizen science projects, and science camps. Through these programs, field stations can increase

public interest and awareness, as well as curiosity to learn about natural science and processes (Struminger et al., 2021). Despite the successes in raising awareness and knowledge, challenges remain in reaching underrepresented groups and ensuring the inclusivity and sustainability of these programs.

The body of literature encompassing biological field stations (BFS) emphasizes their importance to ecological research, education, historical data, and public engagement, while also addressing the challenges they face in a modern, developing scientific landscape. Baker and others (2015), articulate a pressing need for BFS to adapt in order to ensure their longevity and societal importance. He underscores the importance of innovative funding strategies, modernizing stations, and nurturing collaboration among various institutions as important pathways to strengthen the impact of these facilities (Baker et al, 2015).

Billick and others (2013), echo this theme by providing a strategic vision for the future of field stations and marine laboratories. Baker and Billick highlight the importance of partnerships and interdisciplinary collaboration, and diverse funding, in preserving the longevity of field stations. Their emphasis on leveraging collective resources and collaborations highlights the possibilities for field stations to strengthen research capabilities and ecological impact. This notion aligns with Janovy and Major's (2009) reflections on the importance of field stations for developing and seasoned field biologists, who greatly benefit from the educational function of field stations. By preparing the next generation of scientists, field stations contribute to the continuity of BFS and the evolution of ecological research.

In a more organizational context, McNulty and others (2017) analyze the governance structures of biological field stations, revealing the diversity of operational models that exist.

They advocate for effective leadership and future-oriented planning to navigate the modern challenges these institutions face. The authors emphasize the importance of aligning university, governmental, and non-profit organizational priorities with modern scientific demands to enhance the effectiveness of field stations. Similarly, Tydecks and others (2016) highlight the role of BFS as vital infrastructure for research, education, and public engagement. Their discussion points to the importance of community involvement and outreach to create ecological literacy and awareness, reinforcing the idea that field stations are not merely research facilities but also pivotal educational resources. Stevens and others (2019) add another dimension to the discussion by reviewing the relationships between university-based field stations and the National Park Service. He emphasizes the need for improved communication to maximize benefits between the two.

Collectively, these articles advocate for a strategic approach to the evolution of biological field stations, stressing the importance of adaptability, proper funding, collaboration, and public engagement in sustaining their critical roles in science and education. The synthesis of these perspectives illustrates a comprehensive vision for the future of biological field stations as essential contributors to ecological research and societal engagement. However, there is a need for additional research on BFS specifically regarding their land management practices and policies, goals and missions, networking and recreation activities.

Methodology

A survey instrument was created to measure education, research, and land management within BFS. We collaborated with the Organization of Biological Field Stations (OBFS) to distribute an electronic (online) survey instrument. An invitation to complete the survey was

announced on the OBFS listserv on July 8th of 2024. A follow-up reminder was sent on July 22nd. OBFS extended another invitation to take the survey in their newsletter which is emailed monthly. The survey was closed on September 6th, 2024.

Individuals invited to participate in this study included managers, directors, or knowledgeable employees of a biological field station. Participants were not selected based on any demographic characteristic (i.e., age, gender, sex, education level, etc.). These respondents were selected based on their knowledge of station management, employment, programs, and policies. Potential participants were recruited via personnel at the Organization of Biological Field Stations (OBFS), who forwarded the study information through email to a list of their members. OBFS is an organization that creates a platform for "member stations to increase their effectiveness in supporting critical research, education, and outreach programs (https://www.obfs.org/). All member stations are either terrestrial or marine stations located in the United States. U.S. stations were the focus of this study, so U.S. territory field stations were excluded. There were seven sections of the survey participants were asked to complete: 1) introductory information, 2) legal structure and affiliation, 3) mission and land management, 4) conservation program enrollment, 5) facilities and employes, 6) partnership and collaborations, and 7) recreation opportunities.

This research utilized a case study approach and is exploratory in nature. We sought new variables, and we used open-ended questions to understand various aspects of field stations. The full survey instrument is available to review in Appendix 1. The survey was created and administered using the Qualtrics™ online platform. All survey data was collected through the online Qualtrics format to reduce the possibility of data entry errors.

Statistical analysis of quantitative survey items and content analysis of qualitative items was performored. Data analysis was conducted through Excel and the Statistical Package for Social Sciences (SPSS). A non-response bias check was completed to see if our respondents were different than the non-respondents by field station type (University, Agency, NGO/non-profit), and we found that the proportion of our sample was similar to that of the non-respondents due to the rate of university affiliation. We believe our sample is slightly skewed toward university-oriented field stations.

Summary of Key Results

Of the 312 members, 62 (n=62) participated in the study, yielding a 20% response rate. Respondent cases were retained in the dataset if they were 75-100% complete. Field stations that participated in the study were classified into three main types: University/College-affiliated stations (n=41), Non-Profit/NGO stations (n=15), and Agency-affiliated stations (n=6). University stations are affiliated with academic institutions, while Non-Governmental Organization (NGO)/Non-Profit stations operate independently and are not affiliated with a university or agency. Agency stations are managed by governmental agencies such as the USDA Forest Service (USFS), U.S. Fish and Wildlife, and NOAA, though some may also operate as nonprofits.

Of the respondents to the survey, the oldest participating field station dates to 1819, with the newest established in 2018. The greatest growth of field stations happened between 1951 and 1999, with the 1960s having the highest number of emerging field stations. Field stations saw a decrease in establishment after the 1990s.

Regarding station management, 42% of field stations manage multiple locations, with many University stations managing several locations. NGO/Non-Profit stations generally manage only a single station. The land size managed by these stations varies in size. Agency stations handle large acreages that can be over 300,000 acres and are primarily within the United States Forest Service (USFS) managed lands. NGO/Non-Profit stations manage between 500 and 30,000 acres, while University stations range from one to 20,000 acres.

Cooperative agreements amongst field stations are common, with all agency and NGO/Non-profit stations participating in at least one agreement. University stations also commonly participate in cooperative land agreements, though to a lesser extent (80% of all university respondents). The amount of acreage under cooperative agreements varies by type, with agency stations overseeing the largest areas.

Most field stations that responded to the survey (n=48) are structured as non-profits. Though fewer than half report holding 501(c)(3) status, which grants tax-exempt recognition. Ownership history is mixed for BFS that completed the survey. In some cases, BFS land was purchased from landowners who also had conservation-driven management goals. In other cases, the land for a BFS was acquired from landowners who did not have conservation-management goals or landowners who originally bought their land for non-conservation purposes, but donated it for conservation purposes later in life. Many respondents detailed the history of their lands and not the legal structure.

Field station respondents (n=26) reported a focus on education (46.8%), research (62.9%), and community engagement (25.8%) as key activities. Field stations also reported a commitment to conserving habitat for non-game species (54.8%), with emphasis on biodiversity, ecological conservation, and restoration (80.7%), and controlling invasive species (63%).

Stations also manage several ecosystems, with woodland and forest being the primary focus of university and NGO/Non-profit ecosystems.

Field stations practice different types of land management (n=52). Common practices include invasive flora species control, with mechanical(65.4%) and chemical(53.9%) methods. Other popular practices include prescribed fire (44.2%), planting vegetation (40.4%), and planting trees (44.2%). The least practiced strategies are irrigation (3.9%) and planting forage crops (1.9%).

Issues with pathogens (54.8%, n=34) and pests (58%, n=36) are common at many stations. Pathogens mentioned by respondents include Lyme disease (n=14), Beech Leaf Disease (n=6), and Beech Bark Disease (n=6). Mentioned pests are Emerald Ash Borer (n=12), Hemlock Woolly Adelgid (n=9,) and the Bark Beetle (n=7). Respondents also manage against invasive flora (77.4%, n=48) and fauna (43.5%, n=27) species. Respondents mentioned 55 invasive flora species they manage against, most mentioned species are Autumn Olive (n=7), Japanese Stilt Grass (n=6), Privet (n=4), and Asian Bush honeysuckle (n=4). Invasive fauna are Wild Hogs (n=6), Asian Carp (n=4), and European Starlings (n=3).

The findings from this study offer valuable insight into how field stations approach land management. Results show that most stations are actively engaged in managing some portion of their lands. These are not untouched natural areas; rather, many field stations are working to manage against pathogens, pests, and invasive species. While managing for conservation, restoration, native flora, and fauna species. Stations share education, research, community, conservation, management, and outreach as common missions and goals.

Itemized Results

While key findings have already been summarized, this section presents detailed results for each item from the survey questionnaire. Data are displayed in tables or graphs, accompanied by brief descriptions to highlight the main takeaways.

1. Field Station Introductory Information

Following data collection and cleaning procedures, we were able to utilize data from a total of 61 BFS who had completed the survey. This was composed of 41 university-affiliated BFS, 15 NGO BFS, and six agency-affiliated BFS.

Table 1.

Name of respondent organizations.

University n=41			
Station Name	State	Station Name	State
College of Natural Resources, Treehaven	Wisconsin	Field Station Name: Green Oaks Field Research Center Organization Name: Knox College	Illinois
Cornell University Arnot Teaching and Research Forest	New York	Florida Atlantic University Center for Environmental Studies, Riverwoods Field Lab	Florida
Haskin Shellfish Research Laboratory	New Jersey	Juniata College, Raystown Field Station	Pennsylvania
Missouri State University, Bull Shoals Field Station	Missouri	Louis Calder Center	New York
San Francisco State University, The Sierra Nevada Field Campus	California	Midwestern State University, Dalquest Desert Research Station	Texas
SSU Center for Environmental Inquiry: Fairfield Osborn Preserve, Los Guillicos Preserve, and Galbreath Wildlands Preserve	California	Murray State University, Hancock Biological Station	Kentucky
State University of New York College of	New York	Museum of Comparative Zoology, Concord Field	Massachusetts

Environmental Science and Forestry, Adirondack Ecological Center		Station (part of Harvard University, founded 1636)	
SUNY College of Environmental Science and Forestry, Thousand Islands Biological Station	New York	Old Dominion University, Blackwater Ecological Preserve	Virgina
SUNY ESF, Cranberry Lake Biological Station	New York	Rice Creek Field Station	New York
UC Davis NRS, Stebbins Cold Canyon Reserve	California	Selman Living Laboratory	Oklahoma
University of California Santa Barbara, Sierra Nevada Aquatic Research Lab	California	Smith College, Ada and Archibald MacLeish Field Station	Massachusetts
University of California, Merced, Yosemite and Sequoia Field Stations	California	Southern Nazarene University, Quetzal Education and Research Center	Oklahoma
University of Illinois Urbana Champaign, Prairie Research Institute, Illinois Natural History Survey, Forbes Biological Station	Illinois	The Duke Forest	North Carolina
University of Virginia, Blandy Experimental Farm	Virginia	The University of Mississippi Field Station	Mississippi
University of Washington, Friday Harbor Laboratories	Washington	Thomas More University Biology Field Station	Kentucky
University of Wisconsin - Milwaukee, Saukville Field Station	Wisconsin	University of Colorado, Mountain Research Station	Colorado
University of Wisconsin-Madison, Kemp natural Resources Station	Wisconsin	University of Idaho McCall Field Campus	Idaho
Bard Ecology Field Station	New York	University of Montana, Flathead Lake Biological Station	Montana
Chico State Big Chico Creek Ecological Reserve	California	UNM Sevilleta Field Station	New Mexico
Clemson University, Baruch Institute of Coastal Ecology and Forest Science (BICEFS)	South Carolina	Wheaton College Field Station	South Dakota
NGO/Non-Profit n=15			
Station Name	State	Station Name	State
Archbold Biological Station	Florida	Mohonk Preserve	Mohonk Preserve
Field Stations Program	California	National Great Rivers Research & Education Center	Illinois
Hawk Mountain Sanctuary Association	Pennsylvania	Pepperwood	California

National Audubon Society, Audubon Starr Ranch Sanctuary	California	Pierce Cedar Creek Institute	Michigan
Ouachita Mountains Biological Station	Arkansas	Polistes Foundation, Shoal Creek Sanctuary	Georgia
Carnegie Museum of Natural History Powdermill Nature Reserve	Pennsylvania	The Appleton-Whittell Research Ranch of the National Audubon Society (Audubon Southwest)	Arizona
Crane Hollow Preserve	Ohio	The Jones Center at Ichauway *not apart of OBFS	Georgia
Downeast Institute	Maine		
Agency n=6			
H.J. Andrews Experimental Forest	Oregon	The Canyonlands Research Center	Utah
NOAA Fisheries, James J. Howard Marine Sciences Laboratory	New Jersey	Illinois River Biological Station	Illinois
USDA Forest Service-Southern Research Coweeta Hydrologic Laboratory	North Carolina	NOAA Fisheries Northeast Fisheries Science Center, Milford Lab	Connecticut

The oldest functioning field station was established in 1819, with the newest field station created in 2018 (see Table 2 below). The fifty years from 1951 to 1999 experienced the most growth of field stations. Seven stations were established in the 1960s, making it the most productive decade to erect field stations, and the creation of university field stations began to slow down in the 60s.

Table 2.

Years each field station was established.

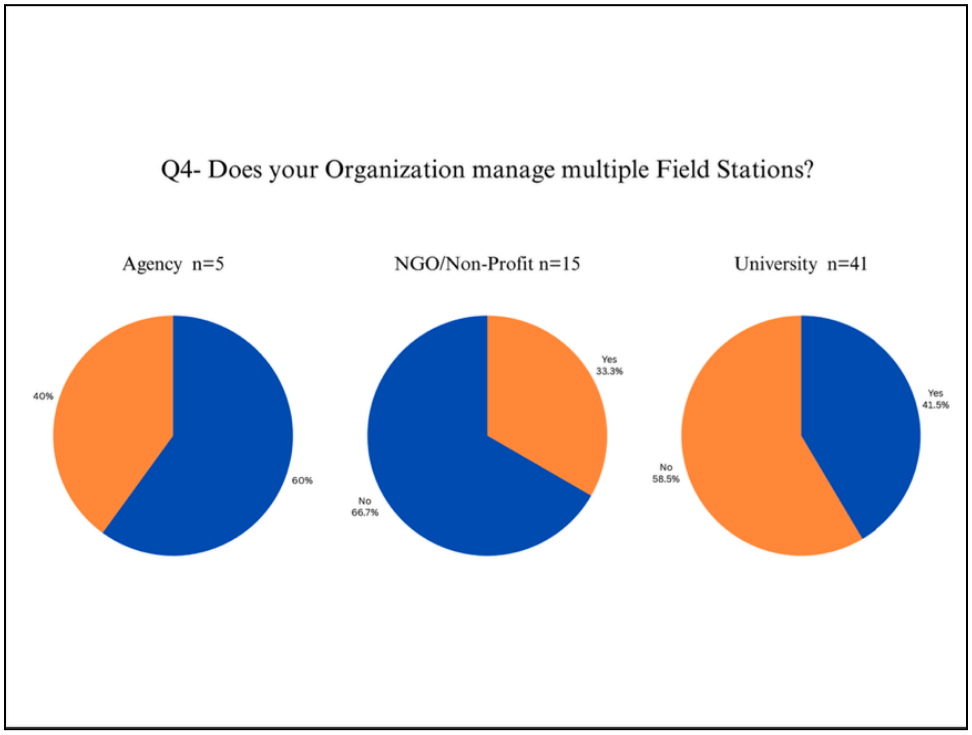
	University n=41	NGO/Non-Profit n=15	Agency=6
1800-1825	1		
1826-1850	2		
1851-1875	4		
1876-1900	6		
1901-1925	5	2	

1926-1950	5	3	2
1951-1975	5	2	2
1976-2000	9	4	1
2001-2025	2	4	

Most University field stations manage multiple stations. The majority of agency and NGO/non-profit field stations do not manage multiple field stations. These results are illustrated in Figure 1 below.

Figure 1.

Organizations that do/do not own multiple field stations.



Two of the six agency-affiliated stations that completed the survey reported that they manage more than one station. Some outliers exited within the dataset. For example, one

agency-affliated station respondent manages 95 stations, and the other 3. Both of these respondents are a part of the United States Forest Service.

Table 3.

Amount of field stations organizations manage.

	1-6 Field Stations	7-12 Field Stations	40-41 Field Stations	95 Field Stations
University n=41	17	3	1	
NGO/Non-Profit n=9	7		1	
Agency n=6	1			1

Table 4.

Breakdown of University field stations that manage 1 to 6 stations.

	1 Field Stations	2 Field Stations	3 Field Stations	4 Field Stations	5 Field Stations	6 Field Stations
University n=41	5	2	3	2	3	2

The average size of a BFS, based on respondents in this study, is 8,195.8 acres. For university-affiliated BFS, the average size is 58,258.7 acres, for NGO-affiliated BFS the average size is 5,690.2 acres, and for agency-affiliated BFS, the average size is 1,625.9 acres. Agency-affiliated BFS respondents have the two largest outliers in terms of BFS size, with 39,042 and 305,000 acres. Which coincides with those identified earlier as belonging to the USDA Forest Service, which manages a large volume of public land and protected areas in the U.S. NGO/Non-Profit-affiliated station respondents mainly reported BFS within a range of 500 and 10,000 acres, see Table 5. below.

Table 5.

Acreage of primary field stations.

	University n=41	NGO/Non-Profit n=15	Agency=6
1-25	9	1	3
26-50	1	1	
51-100	2		
101-300	8	1	
301-500	7		
501-1000	4	2	
1,001-3,000	4	3	
3,001-5,000	1	3	
5,001-10,000	2	2	1
13,001-15,000	1		
15,001-20,000	1		
20,001-30,000		2	
39,042			1
305,000			1

Over 50% of agency and NGO/non-profit-affiliated respondents manage lands under cooperative agreements. While only 37% of university-affiliated respondents manage land under cooperative agreements. These resulted are illustrated in Figure 2, and presented in Table 6, below.

Figure 2.

Lands under cooperative agreements for use, management, and non-formal options.

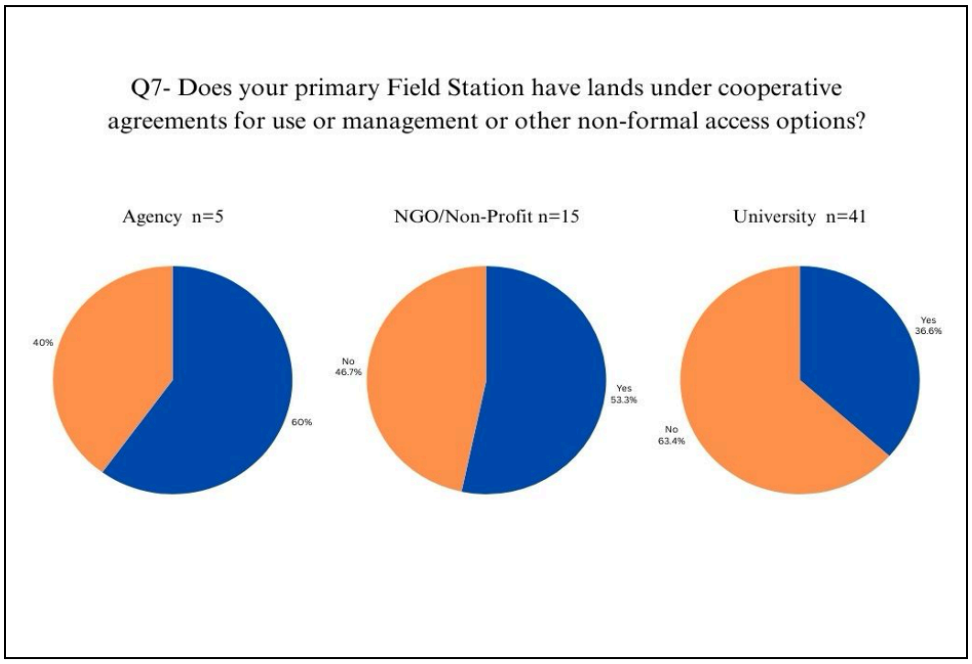


Table 6.

Acreage under cooperative agreements.

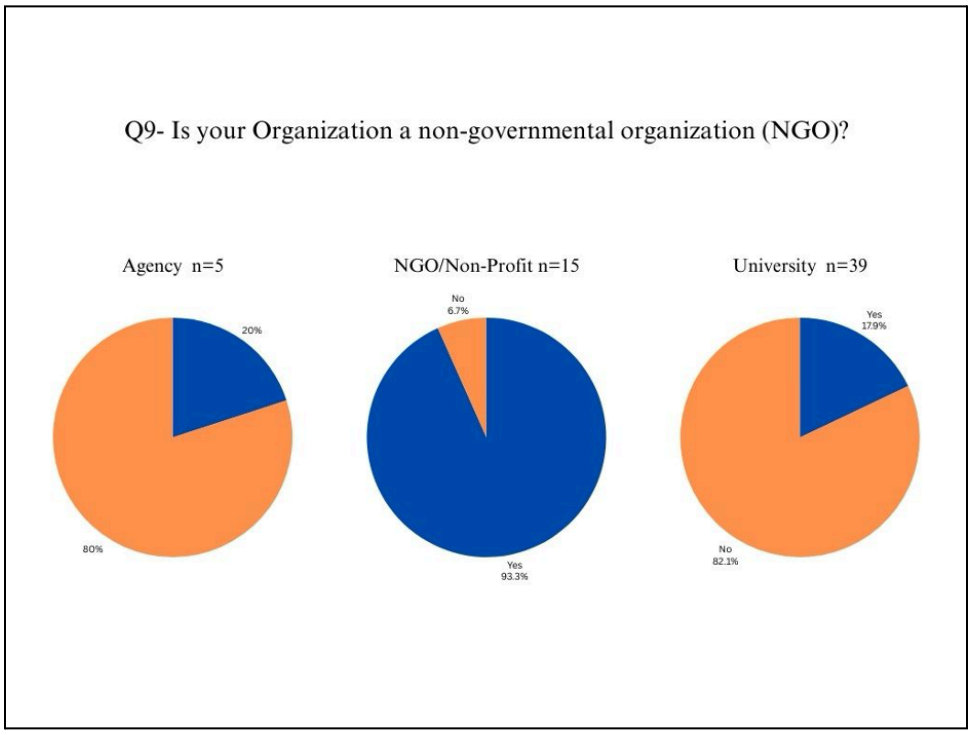
	University n=21	NGO/Non-Profit n=8	Agency=4
1-25	2		1
51-100	1		
101-300	2		
301-500	4		
501-1000	2	3	
1,001-3,000	4	2	
3,001-5,000	1	2	
5,001-10,000	1	1	1
10,001-13,000	1		
13,001-15,000	1		
15,001-20,000			1
301,000-500,000	1		1
1,600,000	1		

2. Field Station Legal Structure and Affiliations

The majority of collegiate organizations are not NGOs (see Figure 3 below). 84% reported that their field stations are affiliated in some manner with the government. Some field stations can be both a nonprofit and an NGO. Most NGOs tend to be non-profit, but not all non-profits are NGOs. Non-profits tend to be NGOs when operating outside of US borders (ex. Doctors Without Borders). Agency organizations reported that none of their sites are NGOs.

Figure 3.

Percentage of non-governmental organisations.

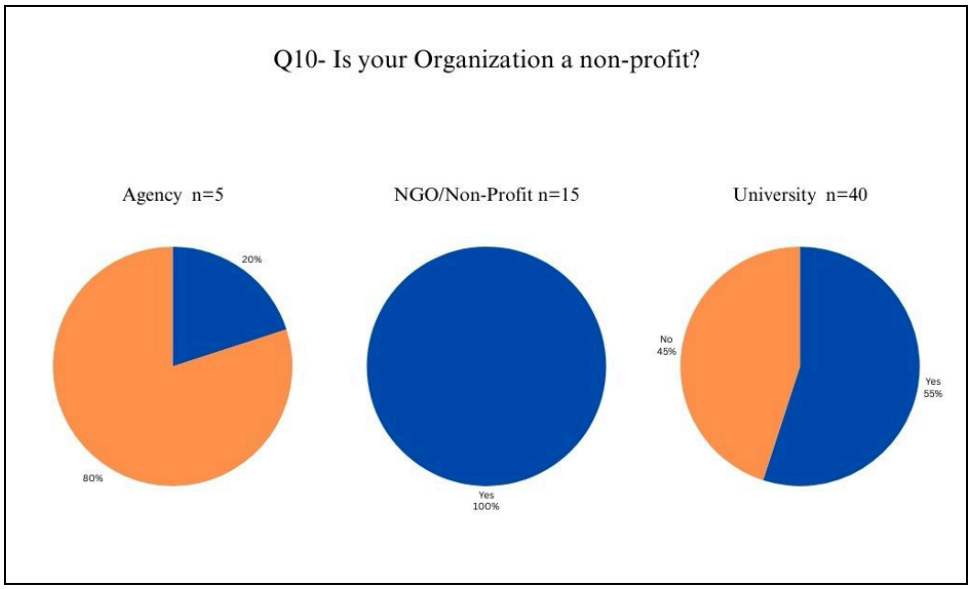


Similarly, slightly more than half of the University/College field stations report to be non-profit organizations (see Figure 4). All Non-profit/NGO organizations state that they are non-profits. Most NGOs are non-profit. Tax exemptions make it easier to operate as a combined

NGO and non-profit. Every agency respondent relayed that they are not non-profits. Government agencies are funded through the government and are not eligible to receive tax exemptions.

Figure 4.

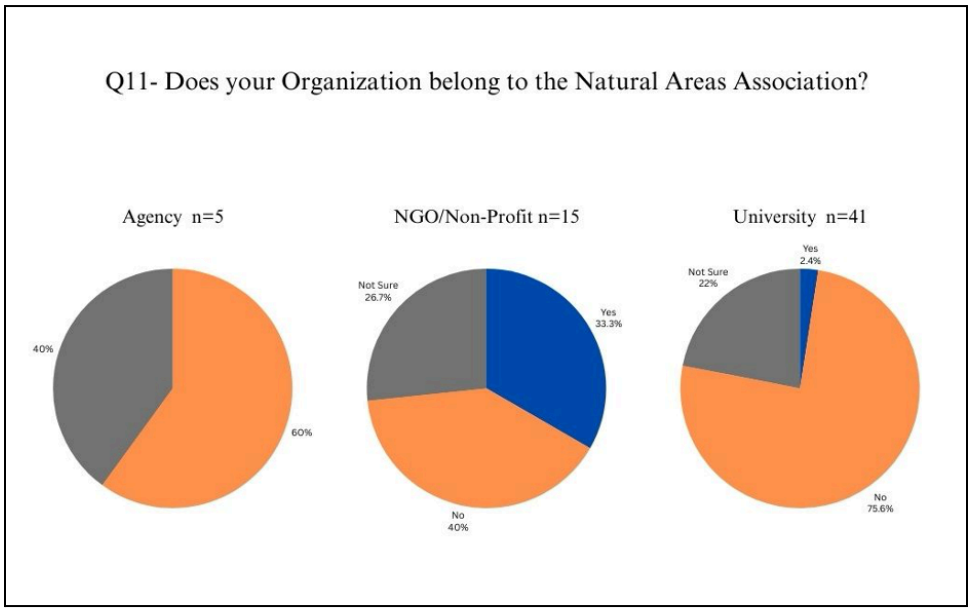
Percentage of non-profit organizations.



The Natural Areas Association (NAA) serves scientists and practitioners focused on managing ecologically significant natural landscapes to protect biodiversity for current and future generations (Natural Areas Association, 2024). Most respondents reported that they are not a part of the NAA (see Figure 5 below). Some respondents also reported that they are unsure if they are a part of the NAA.

Figure 5.

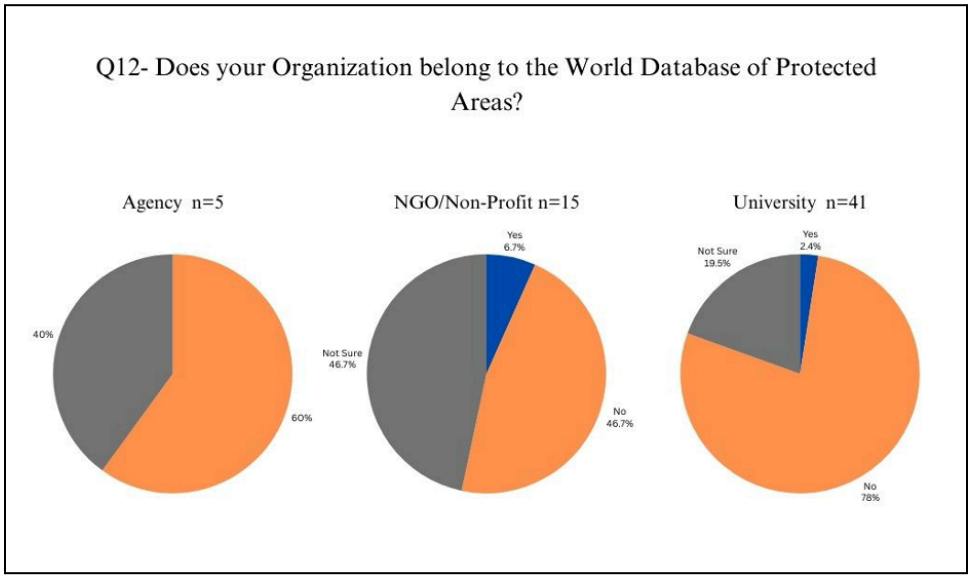
Percentage of organizations that are apart of Natural Areas Association.



The World Database on Protected Areas (WDPA) is the most comprehensive global database of marine and terrestrial protected areas (Protected Planet, 2024). It is a joint project of the U.N. Environment Program and the International Union for Conservation of Nature (IUCN). Most respondents in this study reported thay they are not a part of or they are unsure if they are a part of the WDPA (see Figure 6 below).

Figure 6.

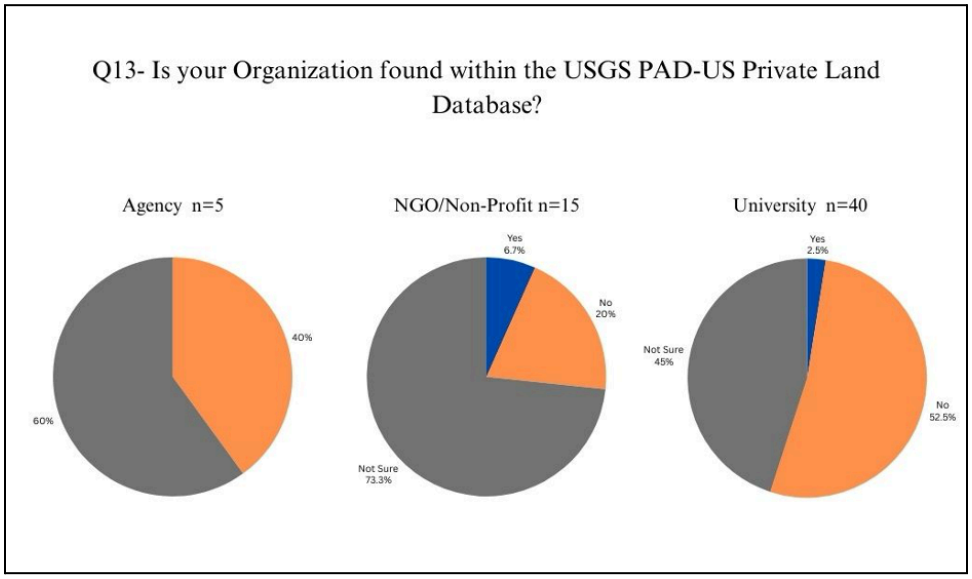
Percentage of organizations that are a part of the World Database of Protected Areas.



Administered by the U.S. Geological Survey Gap Analysis Project, the Protected Areas Database of the United States (PAD-US) is the nation's official inventory of public open space and private protected areas (USGS, 2024). Most respondents reported that they are not sure whether or not they are a part of the PAD-US database (see Figure 7). Many others resported thay they are not a part of the PAD-US.

Figure 7.

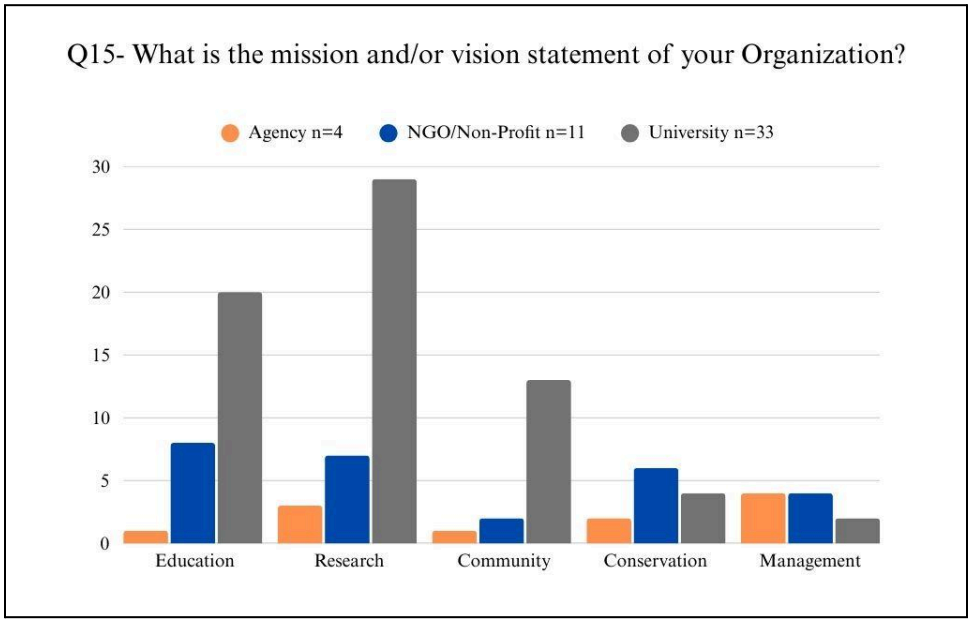
Percentage of organizations within the USGS PAD-US Private Land Database.



Most respondents report being a non-profit organization (see Figure 8). Of the 34 stations that reported non-profit status, fewer than half are 501(c)(3) verified. A nonprofit recognized as a 501(c)(3) organization is verified by the IRS as tax-exempt by virtue of charitable programs. Non-profit organizations are structured for non-profit uses and purposes. Many respondents state that their station was acquired through a previous owner. Previous owners purchased land for their own uses and later decided to sell their land as a natural area to an organization. Other organizations were given ownership of land from previous landowners who bought land for the sole purpose of conservation, land management, or land stewardship.

Figure 8.

History, domicile, and legal structure of field station organizations.

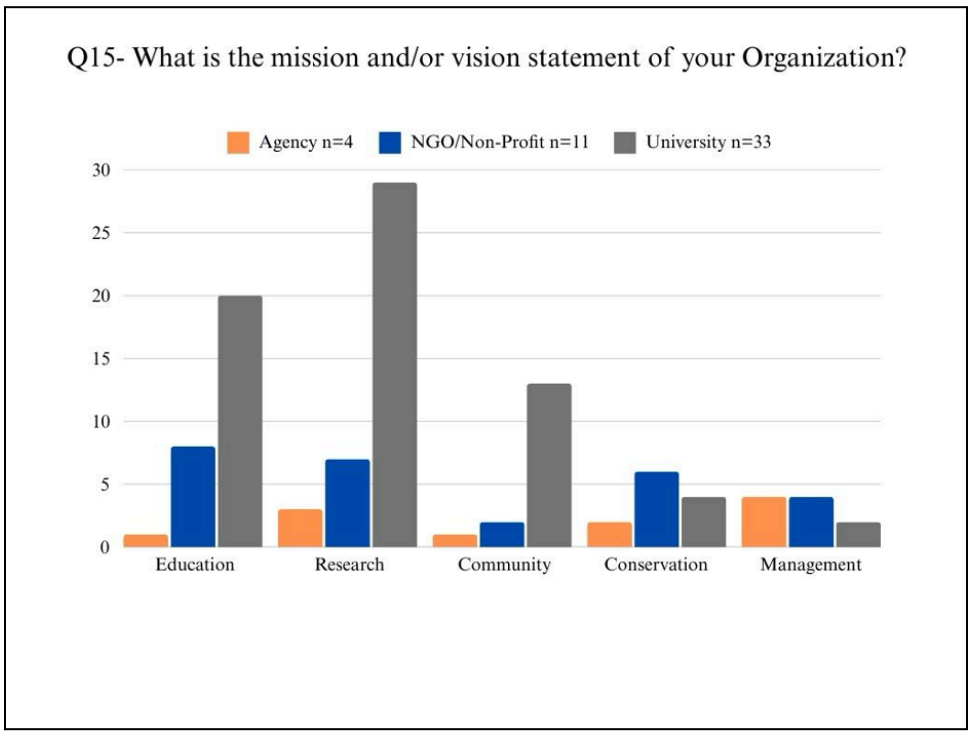


3. Field Station Mission and Land Management

Education is a goal that was reported by all respondents. These organizations in the study sample value the importance of education within a field station setting. Many of these organizations use their natural areas for the education of students and/or visitors. Second to research, many stations also conduct education, which is noted to be done by students, educators, graduate students, or seasoned scientists. Many stations mention the importance of community, conservation, and sustainability as part of their mission for their station (see Figure 9 below).

Figure 9.

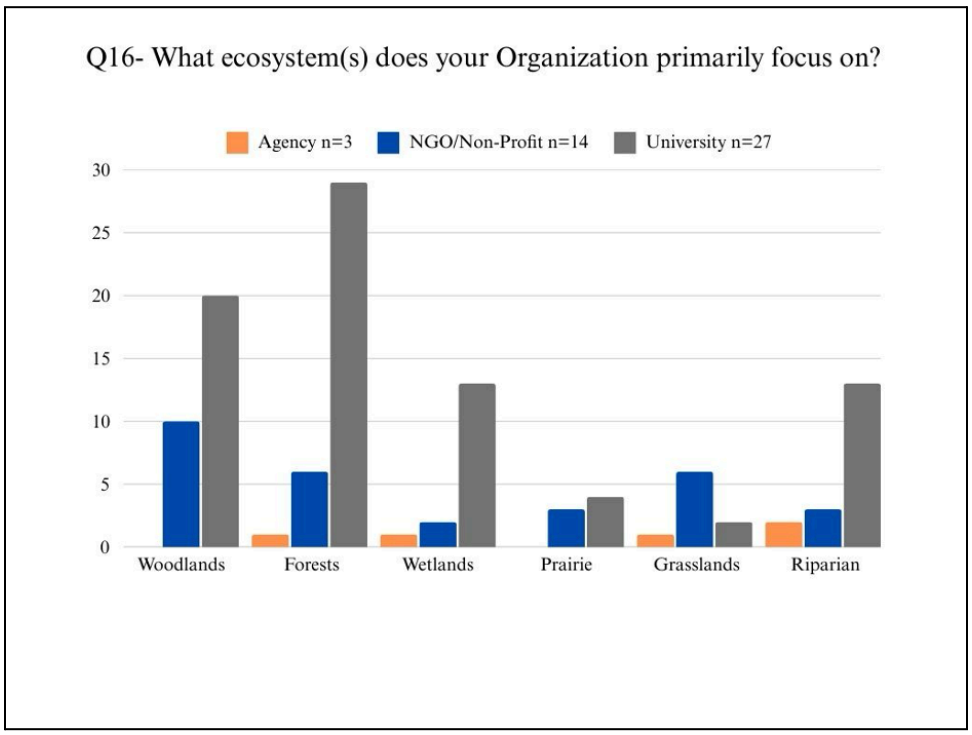
Mission and vision of field station organizations.



Respondent were also asked about the types of ecosystems they manage and their responses were sorted into the categories presented in Figure 10 below. Woodland and forest ecosystem types were the most commonly reported. This was followed by wetland and riparian areas and then grasslands and prairies.

Figure 10.

Primary ecosystem types managed by BFS.



Respondents wrote about other outreach topics important to their station. These topics (see Figure 11 and Table 7) include: aquaculture, climate change, indigenous cultural protection, native plants and coevolved pollinators, research, managing recreational activity and associated impacts, sustainable fishery management, shellfish restoration, shoreline protection, community science, public outreach, and educational spaces. The most mentioned topics are aquaculture management, climate change, and research. Most organization types choose ecological conservation/Preservation, controlling invasive species, and conserving habitat for threatened and endangered species as important topics in their organization's outreach. The least important outreach topic choices are livestock production, agricultural production, and non-timber forest

products. Non-timber products were not chosen at all by agency and NGO/non-profit respondents.

Figure 11.

Land management goals of field stations.

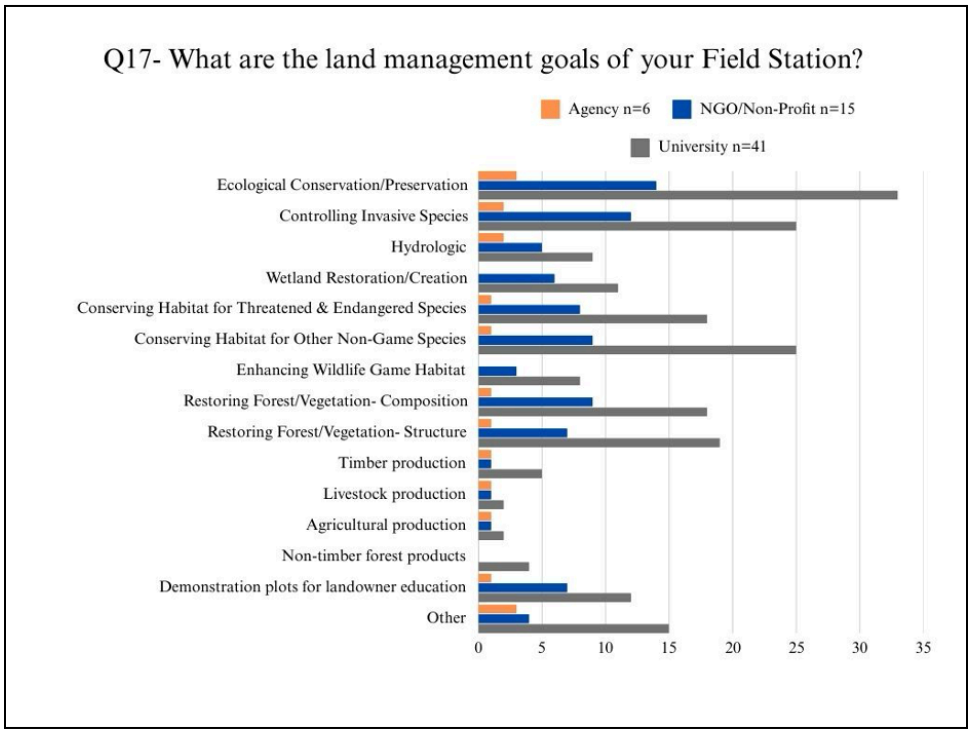


Table 7.

Land management goals provided by respondents.

Outreach Topics	Number of Times Mentioned	Univ.(U), NGO/Non-Profit (N), Agency (A)
Research	1	A
Aquaculture	1	A
Climate Change	1	N
Indigenous cultural protection	1	N
Native Plant Garden	1	N
Hosting Research	1	N
Recreation and resulting impacts	1	N
Fishery Management	1	U

Outreach Topics	Number of Times Mentioned	Univ.(U), NGO/Non-Profit (N), Agency (A)
Shoreline Protection	1	U
Deer Population Management	1	U
Arid Land Research	1	U
Education	2	U

Agency participants provided one (see Figure 12 below) species, Lake Sturgeon. Some respondents mention that they encounter, but do not protect,any specific species. Others do protect threatened (T) and/or endangered (E) species, but do not mention what they are. NGO/Non-Profit stations manage more T and E species than University stations. However, two NGO/Non-Profit respondents provided a more extensive list than any other respondent (Crane Hollow Preserve and Archbold Station, Tables 8 and 9).

Figure 12.

Threatened and endangered species of field stations.

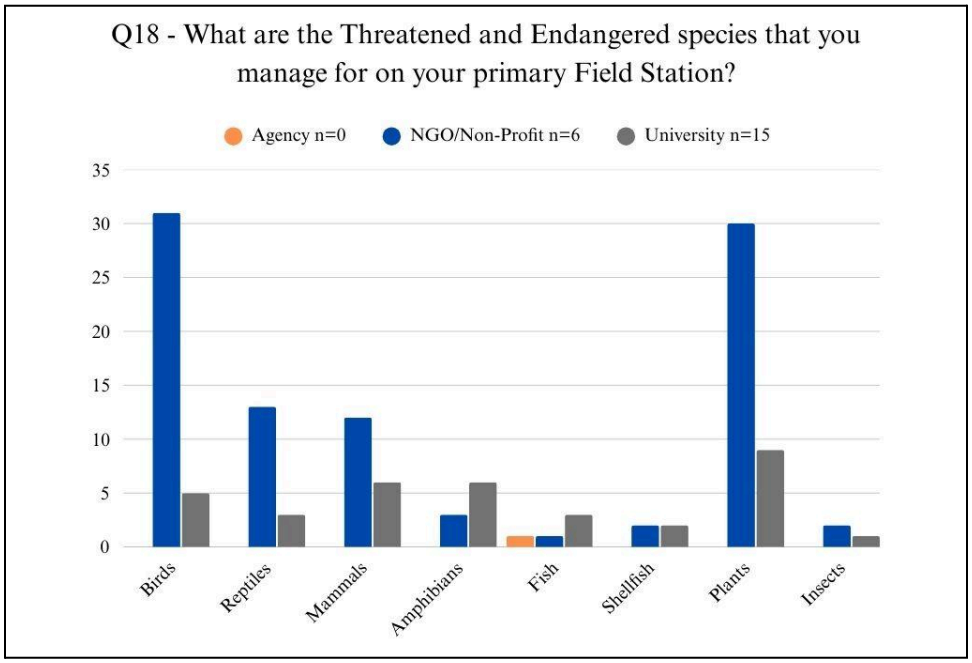


Table 8.

Crane Hollow Preserve threatened and endangered species.

Smoky Shrew,	Silver-Haired Bat	Least Flycatcher	Black-throated Blue Warbler	Tiger spiketail
Eastern Small-footed bat	Deer Mouse	Red-breasted Nuthatch	Canada Warbler	Uhler's Sundragon
Little Brown Bat	Woodland Vole	Brown Creeper	Dark-eyed Junco	
Northern Long-eared Bat	Northern Harrier	Winter Wren	Purple Finch	
Big Brown Bat	Sharp-shinned Hawk	Golden-crowned Kinglet	Four-toed Salamander	
Red Bat	Cerulean Warbler	Hermit Thrush	Eastern Hognose Snake	
Hoary Bat	Henslow's Sparrow	Magnolia Warbler	Carolina Eastern Box Turtle	
Tri-colored Bat	Wilson's Snipe	Blackburnian Warbler	Dragonfly	

Table 9.

Archbold Station threatened and endangered species.

Florida Burrowing Owl	Gopher Tortoise	Scrub Buckwheat	Cutthroat Grass	Giant Wild Pine
Florida Scrub-Jay	Florida Sand Skink	Wedge-leaved Button Snake-root	Papery Whitlow-wort	Carter's Mustard
Southeastern American Kestrel	Florida Pine Snake	Garberia	Blue flower Butterwort	Simpson's Rain Lily
Florida Sandhill Crane	Short-tailed Kingsnake	Florida Hartwrightia	Yellow Butterwort	Butterfly Orchid
Wood Stork	Florida Panther	Highland's Scrub St. John's Wort	Yellow Fringed Orchid	Cinnamon Fern
Everglades Snail Kite	Curtiss's Milkweed	Edison's St. John's Wort	Hairy Jointweed	Royal Fern
Audubon's Crested Caracara	Ashe's Savory	Nodding Pinweed	Small's Jointweed	Saw Palmetto
American Alligator	Perforate Reindeer Lichen	Scrub Blazing Star	Florida Scrub Plum	
Eastern Indigo Snake	Pigeon-wing Butterfly-pea	Catesby's Lily	Wild Pine	
Blue-Tailed Mole Skink	Lake Placid Scrub Mint	Scrub Beargrass	Common Wild Pine	

Table 10.

T&E Species of Field Stations (not Crane Hollow Preserve or Archbold Station).

T&E Species	Number of Times Mentioned	Univ. (U), NGO/Non-Profit (N), Agency (A)
Lake sturgeon	2	U, A
Eastern box turtles	1	N
Massasauga rattlesnakes	1	N
Freshwater mussel	2	U, N
Henslow's sparrow	2	U, N
Desert Pupfish	1	N
Chiricahua Leopard Frog	1	N
Beardless Chinchweed	1	N
Western Yellow-billed Cuckoo	1	N
Huachuca Water Umbel	1	N
Jaguar	1	N
Red cockaded woodpecker	1	N
Frosted elfin butterfly	1	U
Alligator snapping turtle	1	U
Gopher tortoise	1	U
Flatwoods salamander	1	U
Wood turtle	1	U
Dwarf bilberry	1	U
Northern long-eared bat	2	U
Algae-leaved pond weed	1	U
California red-legged frog	1	U
Steelhead	1	U
Yellow Club	1	U
Blanding's Turtle	1	U
Short-tailed Bat	1	U
Foothill Yellow-Legged Frogs	1	U
Western Pond Turtles	1	U
Red Cockaded Woodpecker	1	U
Four-toed salamander	1	U
Everglades Snail Kite	1	U
Crested Caracara	1	U
Indiana Bat	1	U
Rough Pennyroyal	1	U
Slender blazingstar	1	U
Snow squarestem	1	U
Prairie milkweed	1	U

T&E Species	Number of Times Mentioned	Univ. (U), NGO/Non-Profit (N), Agency (A)
Tricolored Bat	1	U
False Broomweed	1	U
Jeferson Salamander	1	U
Four-Toed Salamanders	1	U
Grizzly bears	1	U
Bull trout	1	U

Respondent were asked about non-game species that they manage at their field station. See Figures 13 and 14, and Table 11 below. Most NGO/Non-Profit stations primarily manage bird species. This is followed by insects, mammals, amphibians, reptiles, shellfish, plant, and fish species. University stations manage evenly for mammal, amphibious, and insect species.

Figure 13.

Non-game species managed by field stations.

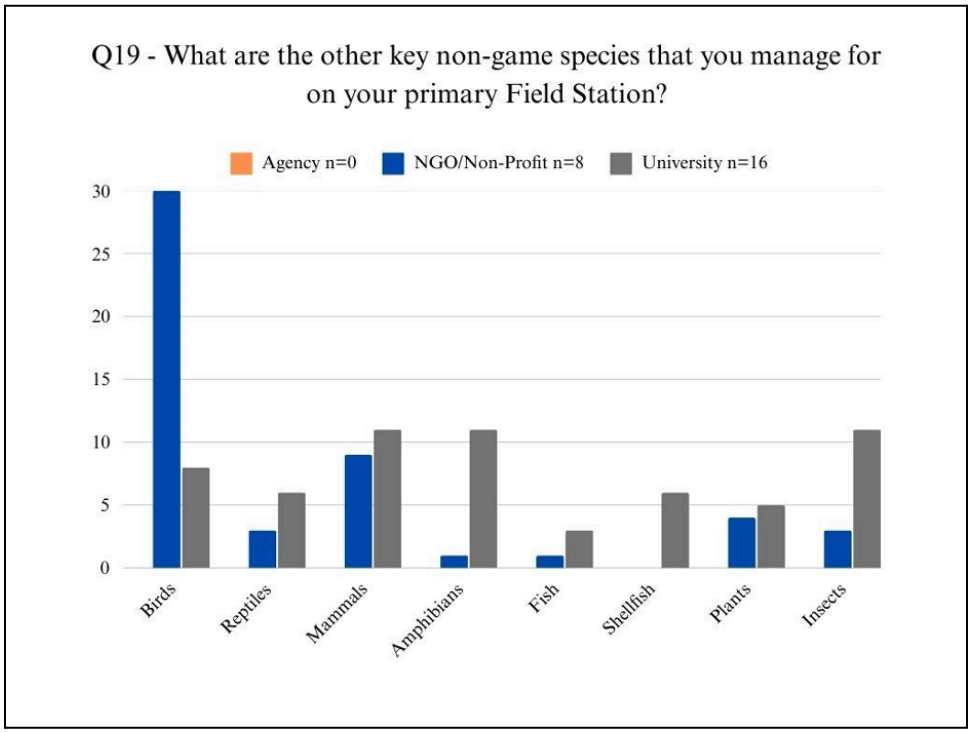


Table 11.

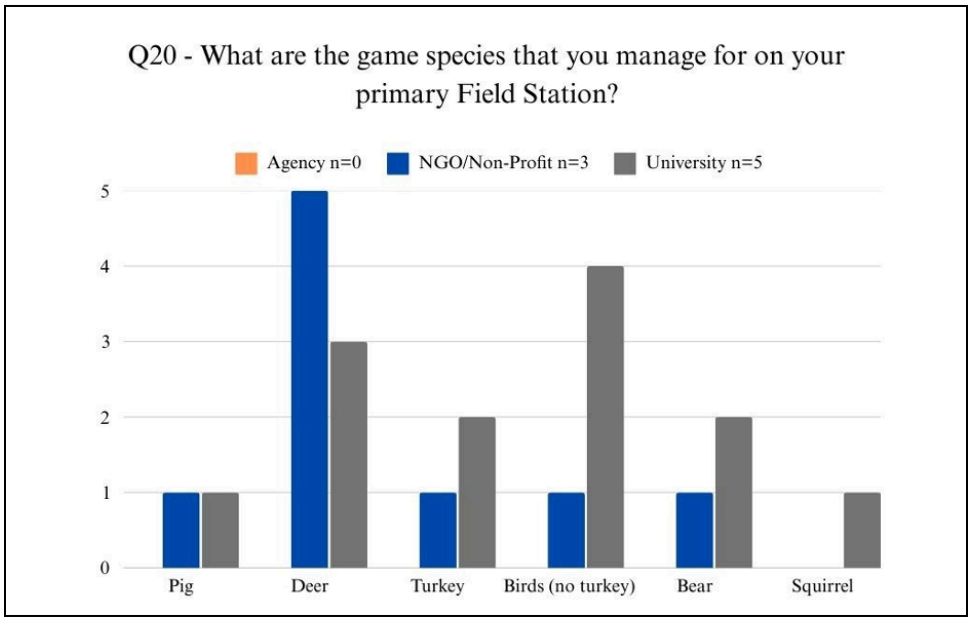
Non-game species managed by BFS.

Non-game Species	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Blackbear	2	N
Western pond turtle	3	U, N
Least Bell's Vireo	1	N
Steelhead trout	1	N
Timber RattleSnake	1	N
White Tail Deer	1	N
Raptors	1	N
Bobolink Eastern meadowlark	1	N
Savannah sparrow	1	N
Foothill yellow-legged frog	3	U, N
Purple Martins	1	N
Pileated woodpecker	1	N
Mountain Lion	2	N
Eastern Bluebird	1	N
Bats	1	N
Beaver	1	N
Bobcats	1	N
Otters	1	N
Turkey	1	N
Silkmoths	1	N
Botteri's Sparrow	1	N
Cassin's Sparrow	1	N
Grasshopper Sparrow	1	N
Chihuahuan Meadowlark	1	N

Montezuma Quail	1	N
Blackburnian warbler	1	U
Oysters	1	U
Clams	1	U
Mussels	1	U
Scallops	1	U
Finfish	1	U
Tomales Bay isopod	1	U
Fairy shrimp	1	U
California giant salamander	1	U
Monarch butterflies	2	U
Bees	2	U
Feral Hogs (quarantined due to Brucellosis)	1	U
Allegheny Woodrat Fence Lizard	1	U
Golden Mouse	1	U
Box Turtle	1	U
Prothonotary warbler	1	U
Marbled salamander	1	U
Tiger salamander	1	U
Frosted Elfin	1	U
Osprey	1	U
Yazoo Darter	1	U
Elk	1	U

Figure 14.

Game species managed by field stations.



Mechanical and chemical techniques for invasive flora species were chosen the most by NGO/non-profit and universities as a land management practice (see Figure 15). Agency respondents reported mainly practicing fire management and tree planting, and placement management strategies. This coincides with some agency respondents being a part of the USFS. The least practiced strategies by all are planting forage crops and irrigation. Some respondents mentioned that they do not do much management but primarily focus on research or monitoring. Other responses include road regulation to reduce stream erosion and aquatic practices to maintain and manage marine habitats.

Figure 15.

Management actions practiced by field stations.

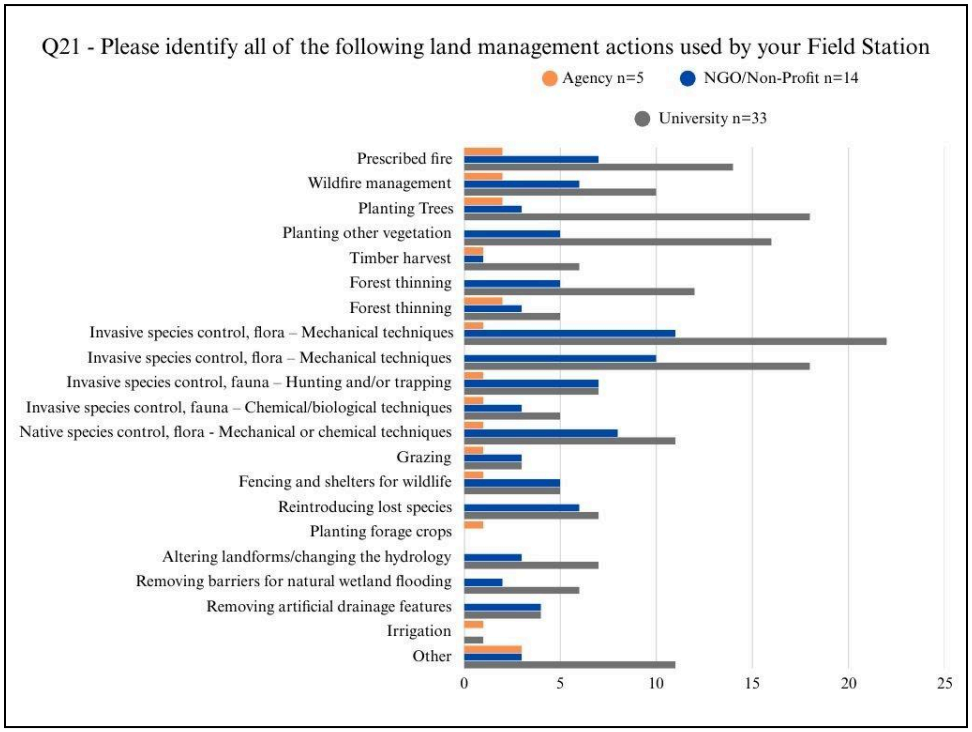


Table 12.

Practiced management actions provided by field stations.

Management Actions	**Univ.(U), NGO/Non-Profit (N), Agency (A)**
Land managed by National Parks	A
Manage mountain water drainage to prevent invasive plants from spreading	N
Deer population management (hunting)	N
Living shorelines and other coastal nature-based solutions	U
Road design to reduce erosion into streams	U
Prescribed fire	U
Monitoring	U
Fencing to protect longleaf plantings from hogs	U

Graph 16.

Percentage of organizations that have issues with pathogens.

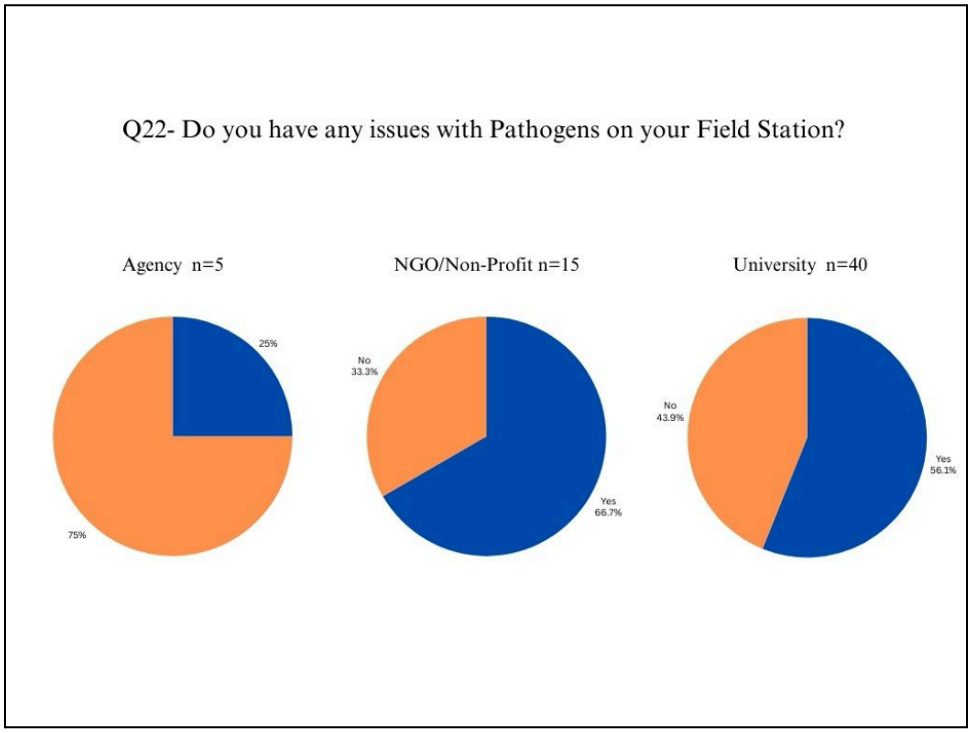


Table 13.

Pathogens field stations have issues with provided by respondents.

Pathogens	**Number of Times Mentioned**	**Univ. (U), NGO/Non-Profit (N), Agency (A)**
Chestnut Blight	2	A, N
Laurel Wilt	1	N
Beech Leaf Disease	6	N
Wooly Adelgid	1	N
Spotted Lanternfly	1	N
Emerald Ash Borer	2	N, U
Spongy Moth	1	N
Fusarium dieback	1	N
Lyme Disease	14	N, U
Alpha-gal Syndrome	1	N
Epizootic Hemorrhagic Disease	3	N, U
Beech Bark Disease	5	N, U
Tick-borne Disease	4	N, U
Dutch Elm Disease	4	N
Sudden Oak Death	3	N, U

Oak Wilt	1	U
Snake Fungal Disease	1	U
Chronic Wasting Disease	4	U
Chytrid Fungus	1	U
White Pine Blister Rust	3	U
Amillaria Root Rot	2	U
Hanta Virus	1	U
Plague	1	U
Climate Change in the Transition Zone	1	U
Brucellosis (Hogs)	1	U
Rana virus	1	U

Figure 17.

Percentage of respondents that have issues with pests.

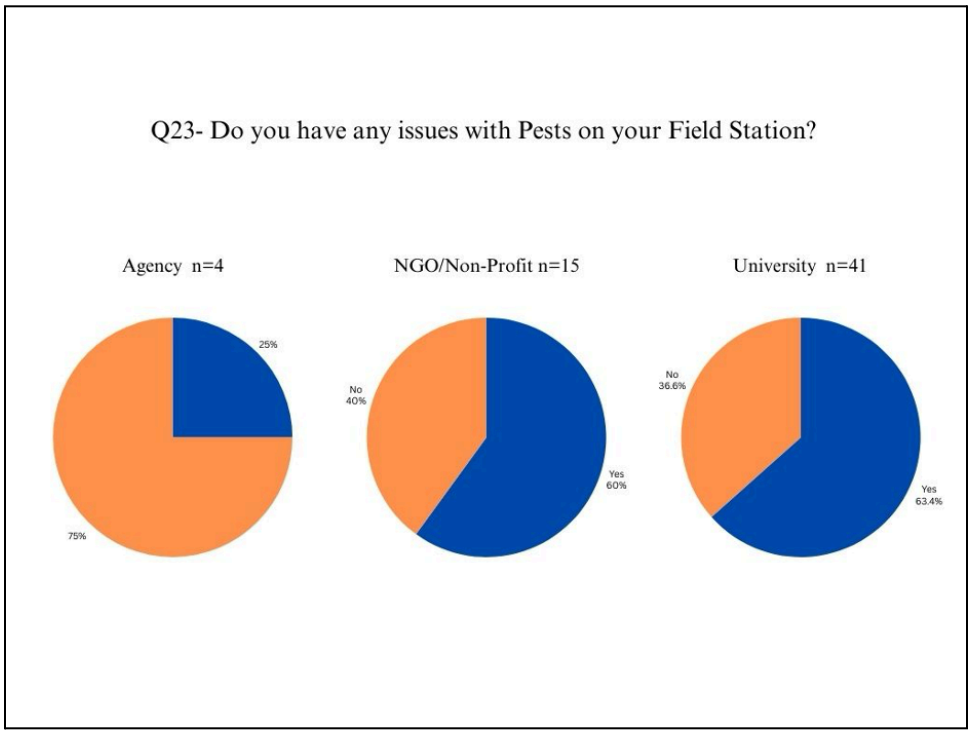


Table 14.

Pests reported by field stations respondents.

Pests	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Hemlock Woolly Adelgid	9	A, N, U
Pine Beetle	2	A
Goldspotted Oak Borer	2	N
Emerald Ash Borer	12	N, U
Gypsy Moth	1	N
Invasive Shothhole Borer	1	N
Various Defoliators	1	N
Spongy Moth	3	N
Spotted Lanternfly	3	N
Invasive Fire Ants	1	N
Eastern Larch Beetle	1	U
Boring Sponge	1	U
Bark Beetle	7	U
Beech Leaf Disease	2	U
Japanese Beetle	1	U
Turkeys	1	U
Barred Owl	1	U
Gypsy Moth	1	U
Blacklegged Ticks	1	U
Fir Engraver Beetle	1	U

Figure 18.

Percentage of field stations that have issues with invasive fauna species.

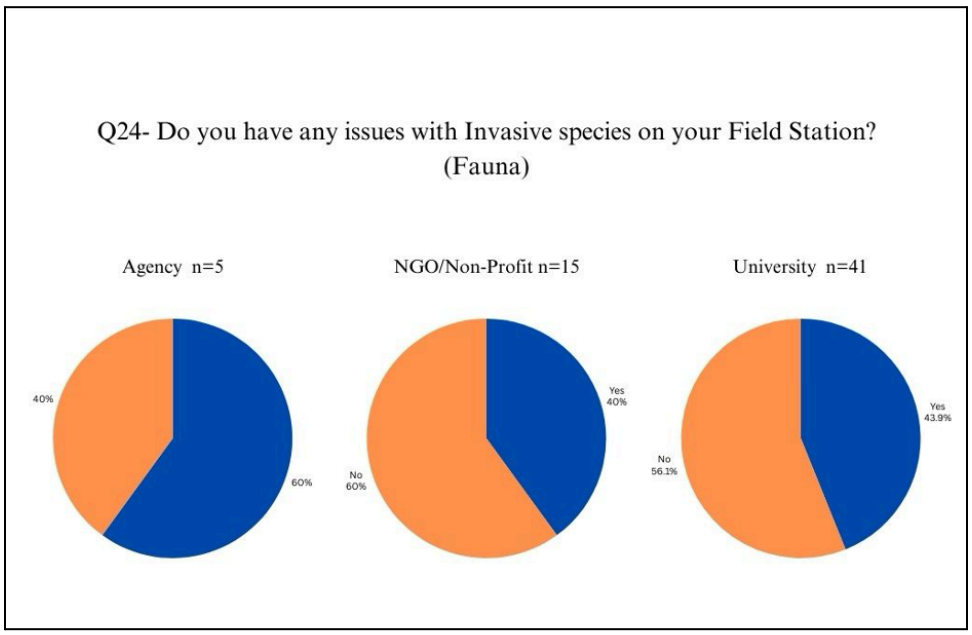


Table 15.

Invasive fauna species field stations have issues with provided by respondents.

Invasive Species (Fauna)	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Spotted Lantern Fly	1	A
Wild Hogs	6	A
European Starlings	3	N, U
House Sparrows	2	N
Jumping Worm	1	N
Asian Carp	4	A
Bull Frogs	2	N, U
Wild Turkeys	2	N, U
House Sparrow	2	N, U
American Bullfrog	1	N
Green Sunfish	1	N
Shore Crab	1	U
Syyidotea Laevidorsalis	1	U
Round Goby	1	U
Dreissena bugensis	1	U
Esoxniger	1	U

Northern Pike	1	U
Crayfish	1	U
Armored Catfish	1	U
Asian Longhorned Ticks	1	U
Aedes Japonicus Mosquitoes	1	U
Privet	1	U
Zebra Mussels	1	U
Smallmouth Bass	1	U
Round Golby	1	A

Figure 19.

Percentage of field stations that have issues with invasive flora species.

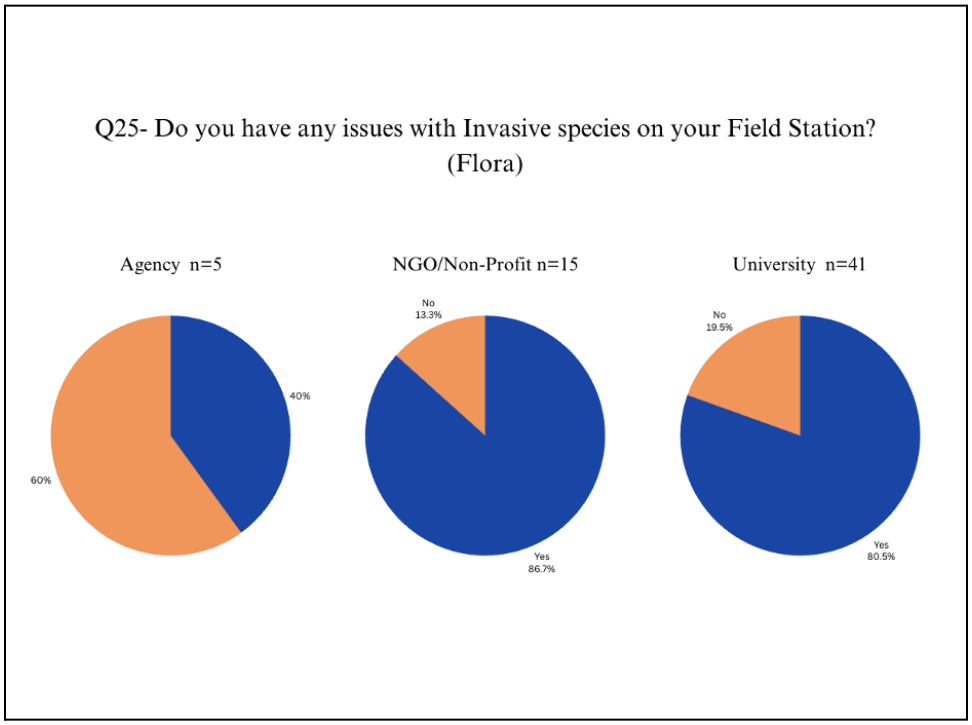


Table 16.

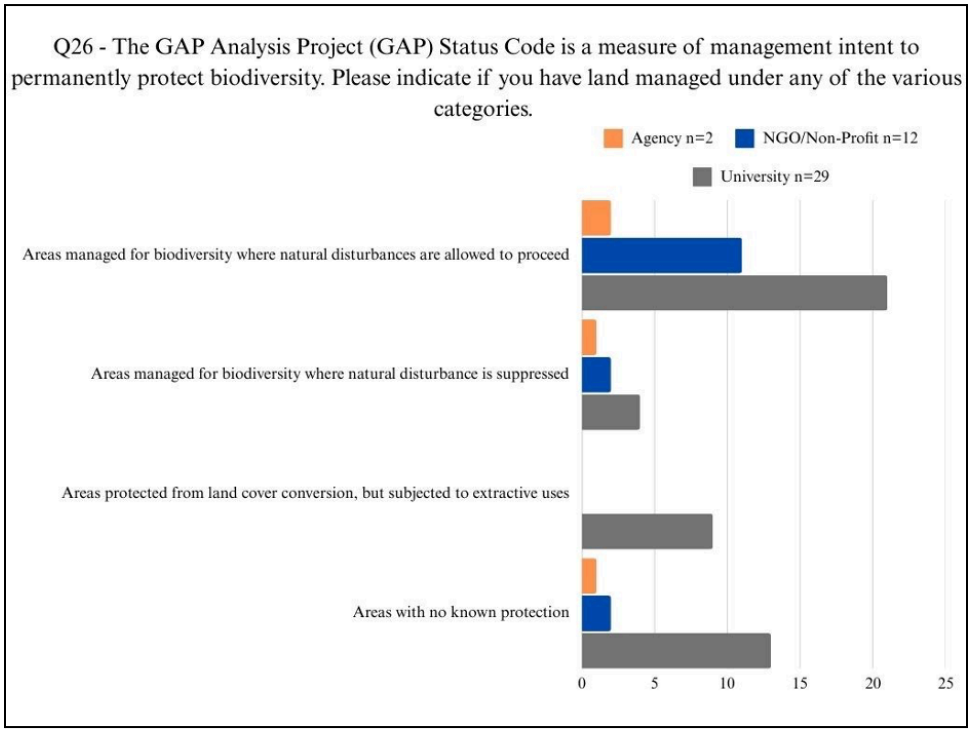
Invasive flora species reported by field stations respondents.

Invasive Species (Flora)	Number of Times Mentioned	Univ. (U), NGO/Non-Profit (N), Agency (A)
Kudzu	1	A
Privet	4	A, U
Tamarisk	2	A, U
Cheat Grass	1	A
Cogongrass	2	N
Old World Climbing Fern	1	N
Natal Grass	1	N
Aroundo	1	N
Pampas	1	N
Mexican Palm	1	N
Japanese Stilt Grass	6	N
Japanese Barberry	3	N
Artichoke Thistle	1	N
Italian Thistle	1	N
Prickly Lettuce	1	N
Sow Thistle	1	N
Multiflora Rose	4	N, U
Knotweed	1	N
Asian Bush Honeysuckle	4	N, U
Japanese Hops	1	N
Reed Canarygrass	1	N
Barbed Goat Grass	1	N
Rush Skelton Weed	1	N
French Broom	1	N
Autumn Olive	7	N, U
Lehmann Lovegrass	1	N
Boerlobegrass	1	N
Sirecea Lespedeza	1	U
Yellow Starthistle	2	U
Himalayan Blackberry	4	U
Scotch Broom	1	U
Tartarian Honeysuckle	1	U
Barberry	3	U
Eurasian Buckthorn	1	U
Typha x glauca	1	U
Myriophyllum spicata,	1	U

St. John’s wort	1	U
Purple Star Thistle	1	U
Dahurian Buckthorn	1	U
Tree of Heaven	1	U
Scotch Broom	1	U
Spurge Laurel	1	U
Glossy Buckhorn	1	U
Barbed Goat Grass	1	U
Chinese Tallow	1	U
Black Locust	1	U
West Indian Marsh grass	1	U
Brazilian Pepper	1	U
Russian Olive	2	U
Garlic Mustard	1	U
Water Chestnut	1	U
King Ranch Bluestern	1	U
Wisteria	1	U
Parrot Feather	1	U
Canada Thistle	1	U

Figure 20.

Respondents provided alignment with GAP analysis.



4. Field Station Conservation Program Enrollment

Most agency and university respondents reported that they do not have conservation easements. More than half of NGO/Non-Profit respondents reported that they do have conservation easements at their field station. These results are illustrated in Figure 21 and listed in Table 17 below.

Figure 21.

Percentage of field stations that have conservation easements.

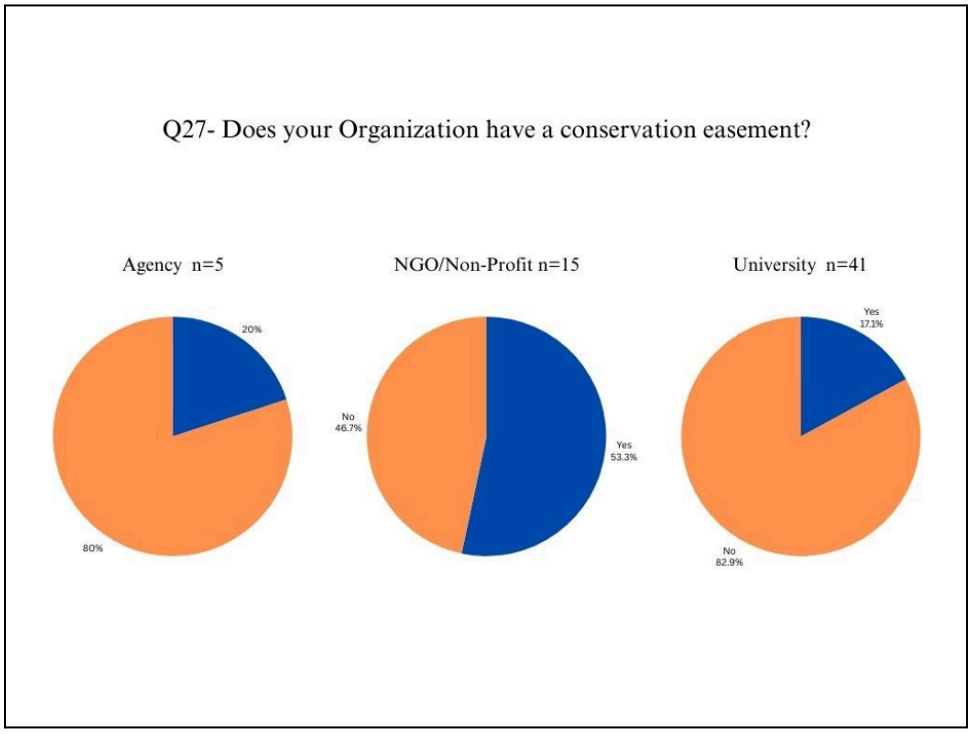


Table 17.

Acreage of organizations' conservation easements.

Q28 - How many acres is your Organization's conservation easement?			
	University n=7	NGO/Non-Profit n=8	Agency=1
1-25	1		
26-50		1	
51-100	1		
101-300	2	1	
301-500	1	2	
501-1000	1	1	
1,001-3,000		2	
3,001-5,000	1		
5,001-10,000			1
10,000-13,000		1	

What is the primary goal of the conservation easement?

The main goal of most field stations is to conserve or protect their lands. Preservation goals include conserving and preserving native habitat, ecosystems, biodiversity, and watersheds. Preventative goals aim to prevent the destruction and development of land. One NGO/Non-Profit organization specifically mentions that they work with interested landowners to protect their property through donation or sale of land to their Preserve. Reported goals mentioned by singular respondents are revenue for mission-oriented programs, cultural importance, and protection of natural beauty.

Very few respondents report being enrolled in the listed conservation programs (see below in Figure 22). Some respondents report being enrolled in other conservation programs. Programs mentioned include State Departments of Natural Resources, Natural Heritage Areas, and the Florida Rural and Family Lands Protection Program.

Figure 22.

Field stations enrolled in conservation programs.

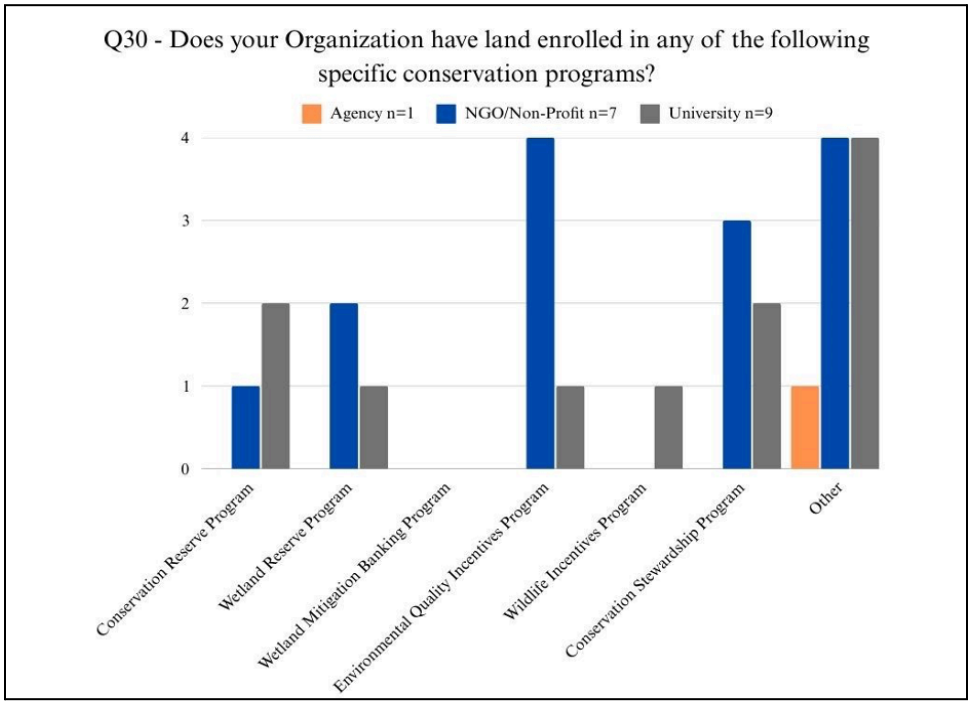


Table 18.

Conservation programs provided by respondents.

Respondent Provided Conservation Programs	
Conservation Programs	University (U), NGO/Non-Profit (N), Agency (A)
Florida Rural and Family Lands Protection Program	N
South Coast Missing Linkages: A Linkage Design for the Santa Ana-Palomar Mountain Connection	N
Ohio Department of Natural Resources, Division of Natural Areas and Preserves	U
Natural Heritage Areas	U

Table 19.

Acreage of conservation programs.

	University n=5	NGO/Non-Profit n=5	Agency=1
1-25	3		
26-50	1		
51-100	1		
501-1000		1	
1,001-3,000	3	3	
3,001-5,000		2	
3,100,000			1

5. Field Station Facilities and Employees

Dorms, Laboratories, and Classrooms are the most reported station facilities (below in Table 21). This may be due to many respondents' affiliation with a university. These types of institutions tend to have many dorms, laboratories, and classrooms to accommodate their student population. Respondents provided other facilities that their stations have. The facilities are a chemistry lab, library, workspace, caretaker housing, historical structures, staff housing, and an observatory.

Figure 23.

Facilities at organizations' primary field station.

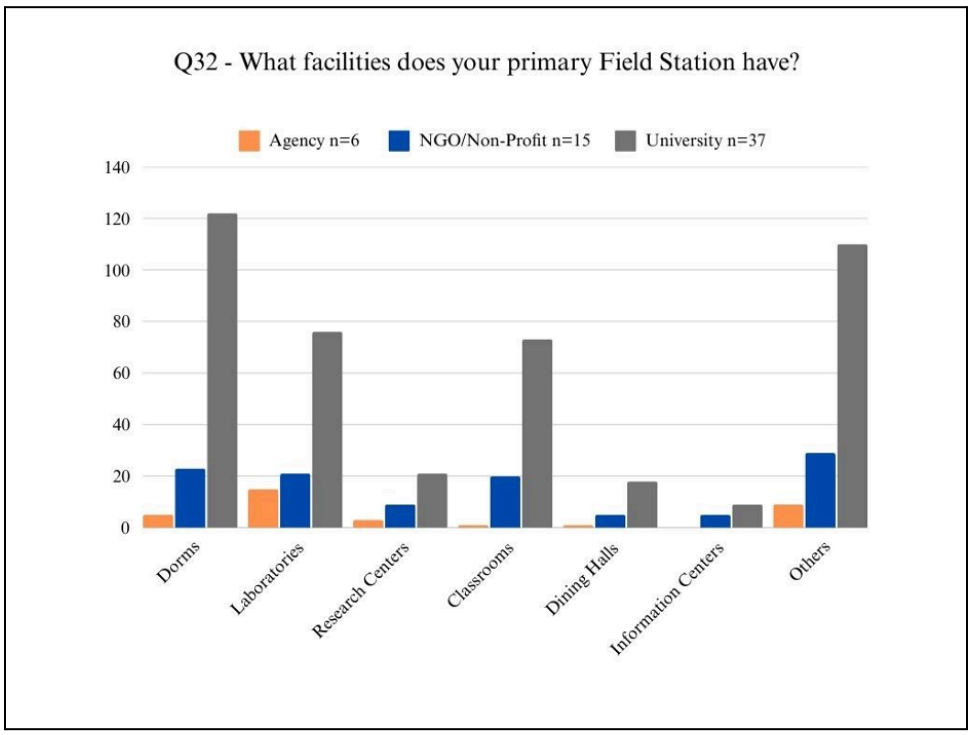


Table 20.

Other facilities reported by respondents.

Facilities	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Conference Center	1	A
Meeting Room	1	A
Tents	1	A
Chemistry Lab	1	N
Library	1	N
Caretaker housing	1	N
Original Ranch Structures	1	N
Cabins	1	N
Lodging	1	N
Workspace	1	N
Staff Housing	3	N, U
Directors Cabin	1	U

Storage Building	1	U
Offices	1	U
Greenhouse	1	U

Table 21.

Amount of people that can be supported in the BFS facility.

		Dorms	Laboratories	Research Centers	Classrooms	Dining Halls	Information Centers	Other
Agency n=6	Average	54.5	19.8	84.7	50	100		33
	Median	54.5	20	30	50	100		33
	Max	85	40	200	50	100		50
	Min	24	3	24	50	100		16
NGO/Non-Profit n=15	Average	22.9	15.7	37.4	48.5	36.4	73.3	162
	Median	19	10	30	45	30	65	15
	Max	54	40	87	100	100	180	70
	Min	2	2	7	15	20	35	7
University N=37	Average	44.3	23.7	30.1	75.5	51.7	66.4	31.9
	Median	32	20	20	50	65	27	11.5
	Max	150	80	100	500	100	500	100
	Min	2	1	4	12	15	1	2

Most respondents host or employ research assistants, graduate assistants, and maintenance workers. Respondents provided other people they may employ or host. Many of them specifically mentioned undergraduate students, AmeriCorps members, and visiting Scholars/Researchers.

Figure 24.

Type of people hosted at BFS.

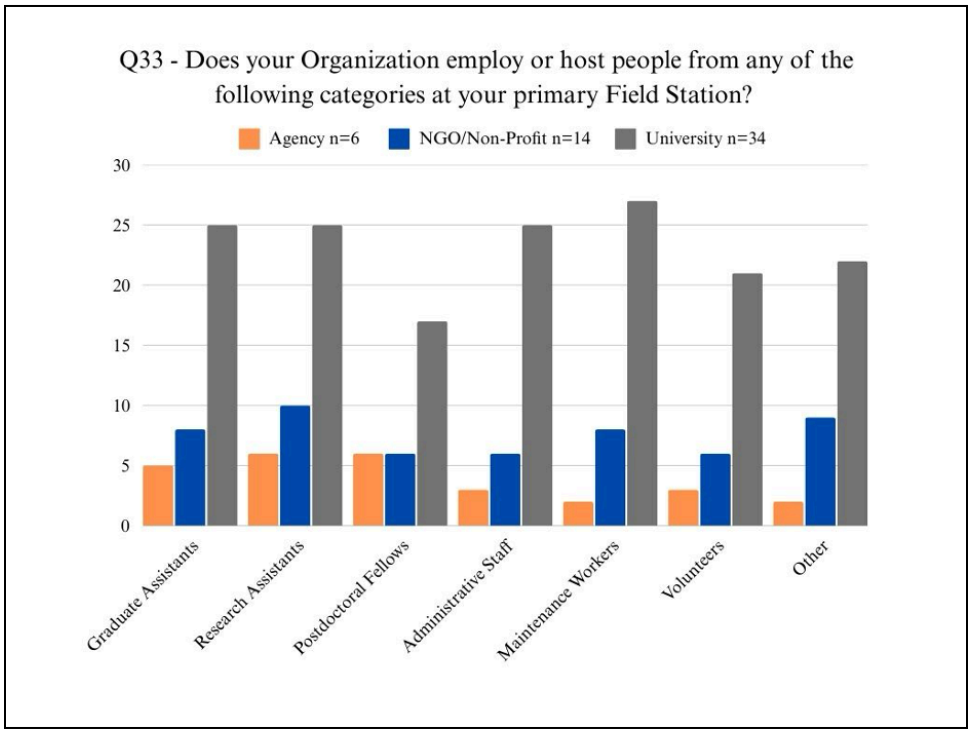


Table 22.

Type of people hosted provided by respondents.

Employment/Hosting	Times Mentioned	Univ. (U), NGO/Non-Prof(N), Agency (A)
Summer Undergrad Interns	7	A,U
Visiting Scholars	3	A,U
Conservationist Educators	1	A
Seasonal Staff	2	N
AmeriCorps Members	1	N
SCA Members	1	N
Faculty Mentors	3	N, U
Visiting birders	1	N
Program Participants	1	N
Manager	1	U
NPS/USGS Staff	1	U

NGO/non-profit Respondents employ more graduate students than hosts. All respondents employ and host research assistants, postdoctoral fellows, and administrative staff at about the same rate. NGO/non-profit and University stations host more volunteers than employ them, with an average of 56.4 and 17.8. NGO/non-profit stations still employ many volunteers, with an average of 35.

Table 23.

Amount of people employed (E) /hosted (H) at BFS.

		Graduate Assistants		Research Assistants		Postdoctoral Fellows		Administrative Staff		Maintenance Workers		Volunteers		Other	
		E	H	E	H	E	H	E	H	E	H	E	H	E	H
Agency n=6	Average	1	8.8	13	8.8	1	3.2	4.7	2	2.5			1.7	3	
	Median	1	2	13	5.5	1	1	2	2	2.5			1	3	
	Max	1	30	23	23	1	8	10	2	3				5	
	Min	1	1	3	1	1	1	2	2	2				1	
NGO/Non-Profit n= 14	Average	15	9.9	9.4	5.8	2.7	4.5	6	10. 7	3	5.5	35	56.4	32.6	1.5
	Median	15	4.5	8	4	3	1	6	1	3	5.5	25	12	3	1.5
	Max	28	24	22	20	4	15	8	30	5	10	60	60	300	2
	Min	2	1	2	2	1	1	4	1	1	1	20	20	1	1
University n=30	Average	6.5	7.6	6.9	8.7	2.4	3.7	3	1	3. 3	1	11.8	17.8	25.4	52.5
	Median	5.5	4	7	5	2	2	2	1	2	1	3	3.5	5.5	23.5
	Max	20	45	22	40	6	12	8	1	21	1	50	50	200	200
	Min	1	1	2	2	1	1	1	1	1	1	2	2	1	4

6. Organizations Partnership and Collaborations I

University/College field stations above receive the most visitors each year. Larger stations can typically take in more visitors. Universities/colleges are commonly centered near populated cities. This proximity creates more opportunities to receive local visitors. Results for this section are illustrated below.

Figure 25.

Percentage of organizations that conduct outreach to the public.

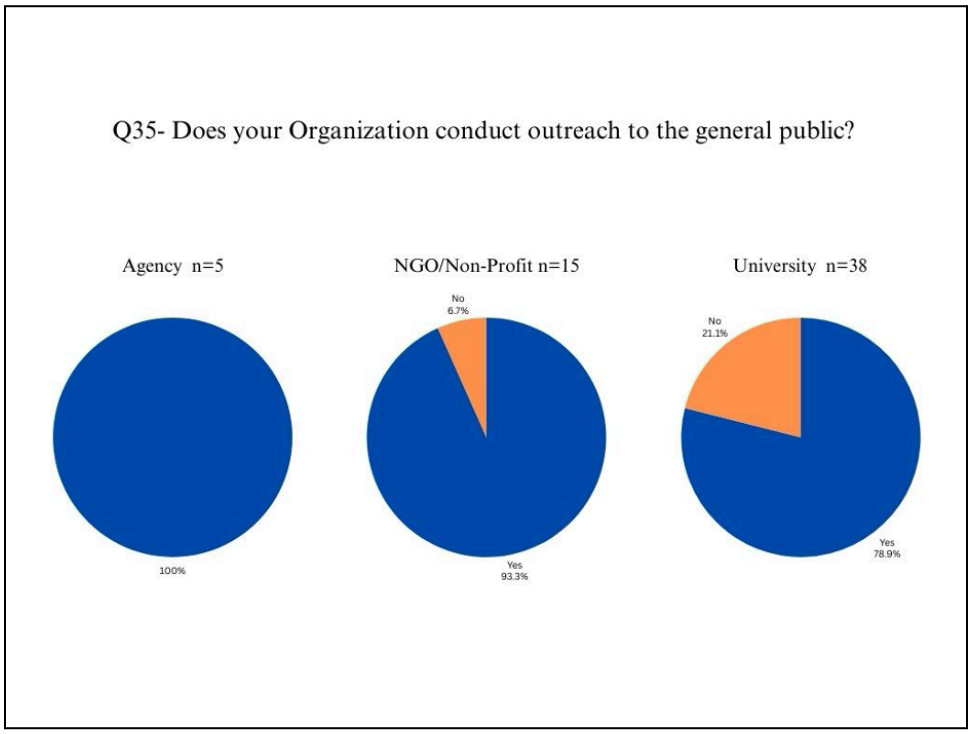


Figure 26.

Topics that are a part of an organization's outreach.

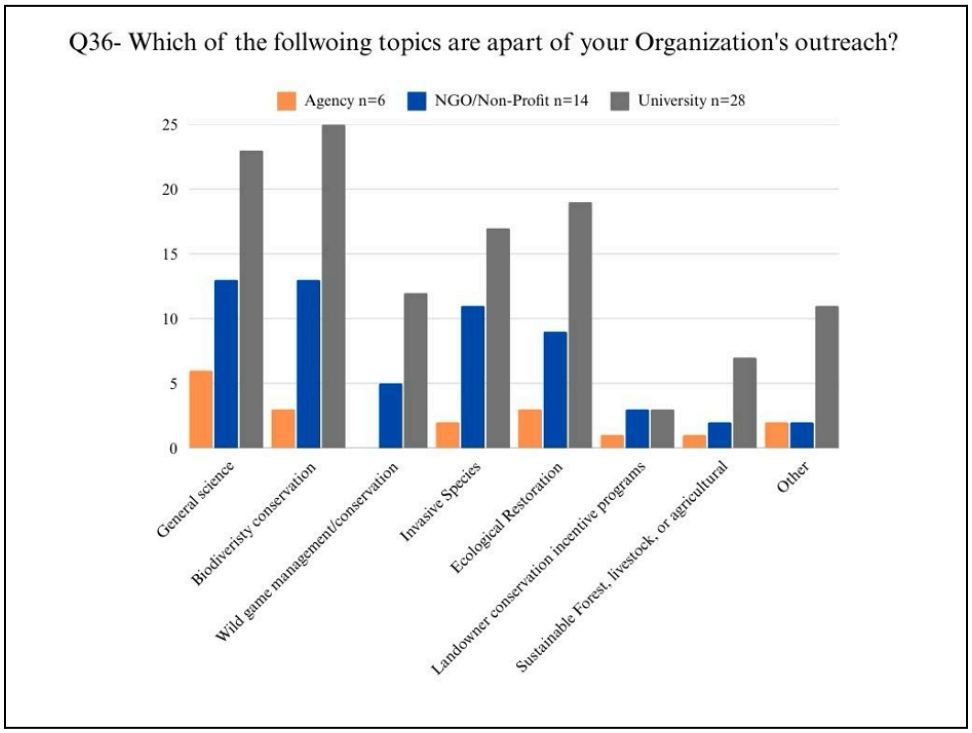


Table 24.

Outreach topics reported by respondents.

Outreach Topics	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Ecosystem Services	1	A
Aquaculture	1	A
Climate Change	4	A, U
Marine Science	1	N
Recreation	1	N
Educational Courses	1	U
Road Maintenance	1	U
Ecosystem Dynamics	1	U
Watershed Dynamics	1	U
Fish Conservation	1	U
Art	1	U

Wetland Management	1	U
Stormwater Management	1	U
Biodiversity		U

Table 25.

Amount of people who visit the field station.

Q37- On average, approximately how many people from the general public visit your primary Field Station on these programs per year?			
	University n=29	NGO/Non-Profit n=14	Agency=6
1-25	2		1
26-50	5		1
51-100	4	5	1
101-300	7	4	
301-500	3	4	
501-1000	5		2
1,001-3,000	1	2	1
5,001-10,000	1	1	
10,000-13,000		1	
100,001-300,000	1	1	

Figure 27.

Percentage of organizations that collaborate with other organizations.

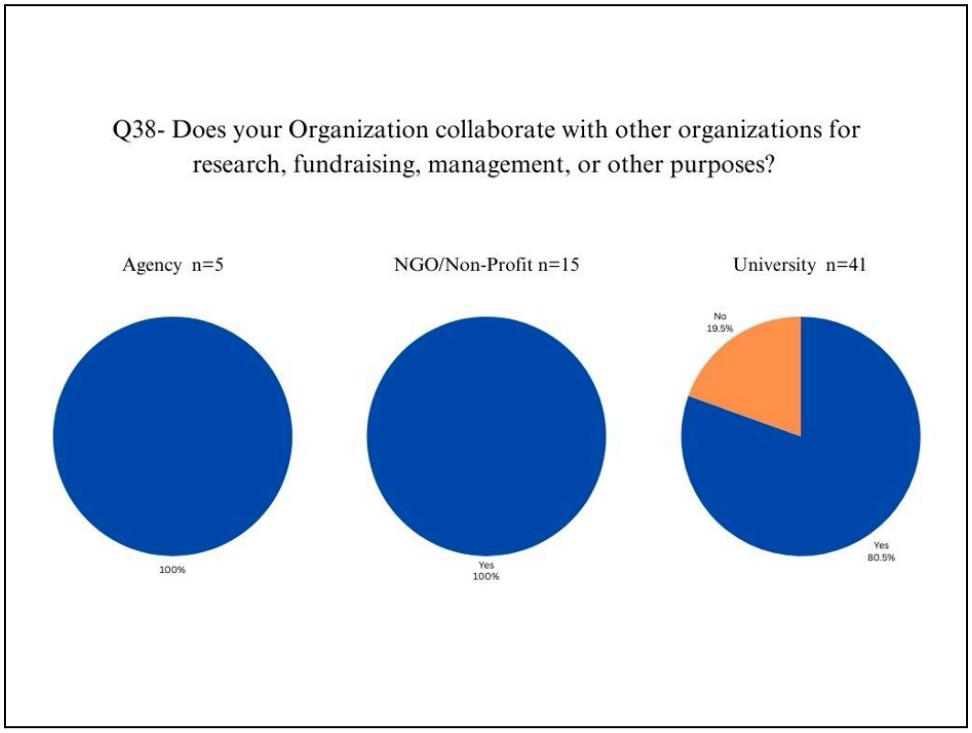


Table 26.

Amount of organizations that field stations collaborate with, as reported by respondents.

	University n=29	NGO/Non-Profit n=14	Agency n=6
1-5	15	5	3
6-10	2	2	2
11-15	1		1
16-20	3	2	
21-25		1	
26-30		1	
36-40	1		
41-45			
46-50	1	2	
51-55		1	

Table 27.

University field stations that collaborate with 1 to 5 organizations.

	1 Organization	2 Organization	3 Organization	4 Organization	5 Organization
University n=29	3	5	4	3	

Figure 28.

The orgnization type of Collaborator

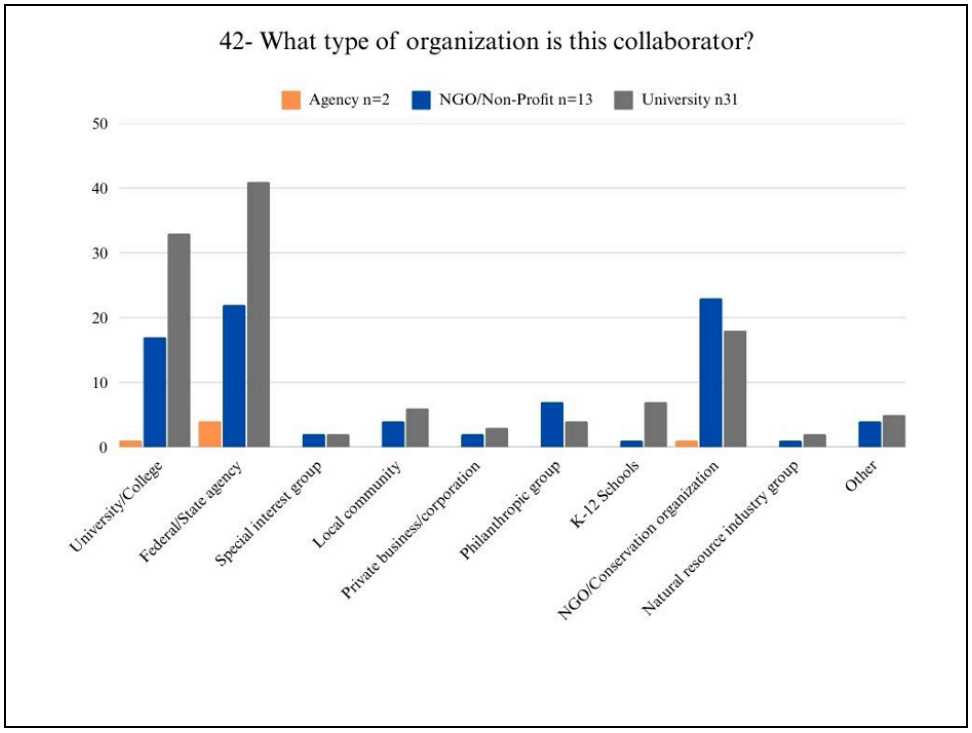


Table 28.

Organization type of organization collaboration provided by the respondent

Type of Organization of Collaborator	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Sovereign Nations	1	N

Tribal Group	1	N
Research Institute	1	U
International Treaty	1	U
Research Network	1	U
Alliance of Interested Groups	1	U

Figure 29.

Organization's purpose with a collaborator

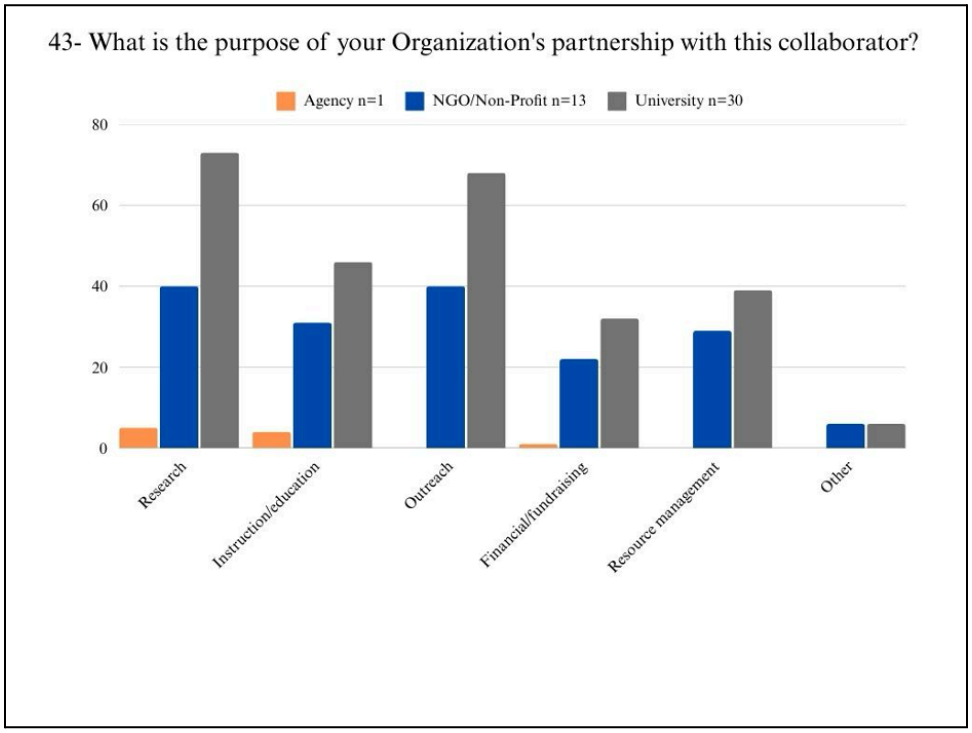


Table 29.

Organization purpose with collaborator provided by the respondent

Purpose of Collaborator	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Land Access	1	N
Drug Interdiction	1	N
Administrative Support	1	N
Natural History Museum at the Ohio Museum Complex	1	N

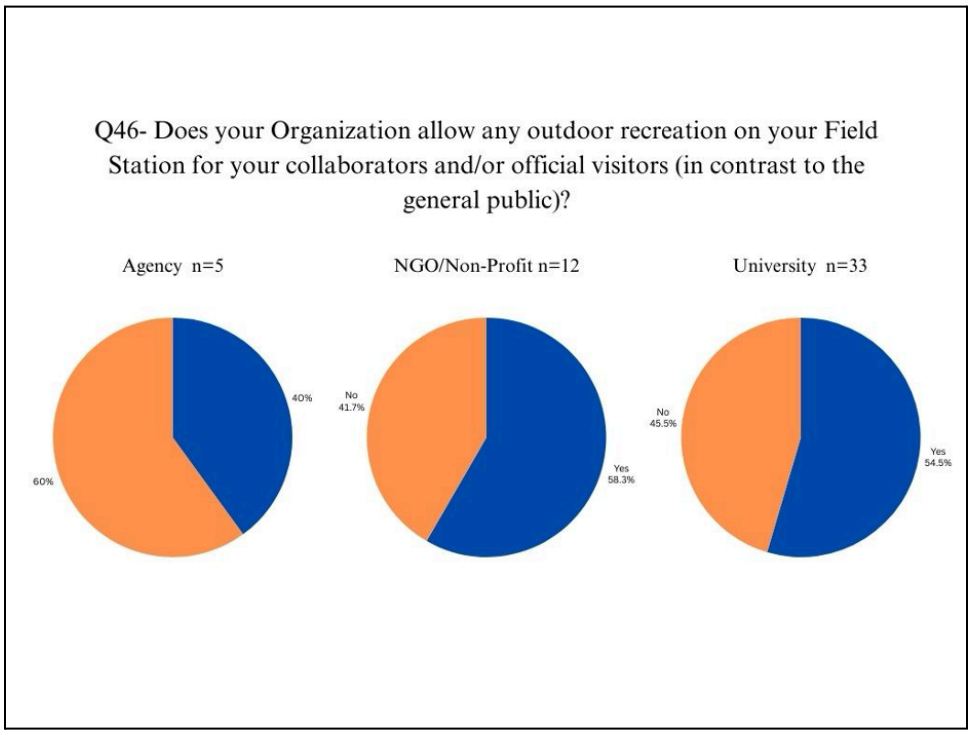
Joint Projects	1	N
National Wildlife Refuge	1	U
Administration	1	U
Grant Writing	1	U
Information Exchange		U

7. Other Group Access to Field Stations

The majority of respondents stated that their facilities are used as a meeting place. These spaces are utilized by various business groups, nonprofits, and board members. Faculties are utilized by local clubs and communities, such as Girl and Boy Scouts, garden club, art, and quilting/knitting club. Secondly, field stations are used as university outdoor classrooms for student courses and graduate research. Thirdly, the most mentioned use is for K-12 field trips and camps.

Figure 30.

Percentage of organizations that allow outdoor recreation.



9. Field station recreation

Figure 31.

Outdoor recreation activities allowed by organizations.

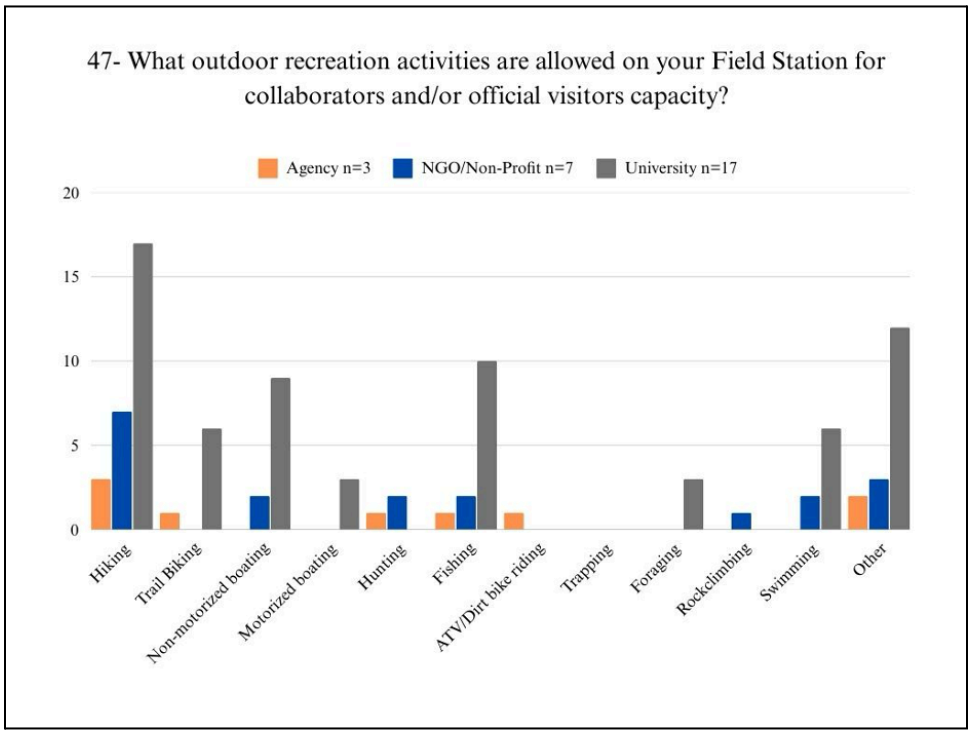


Table 30.

Outdoor recreation activities provided by respondents.

Outdoor Recreational Activities	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Cycling	1	A
Sightseeing	1	A
Birding	3	N, U
Cross Country Skiing	2	N,U
Carriage	1	N
Road Biking	2	N,U
Snowmobiling	1	U
Archery	1	U
Horse Riding	1	U
Picnicking	1	U

Figure 32.

Overnight stays allowed for collaborator/official visitors.

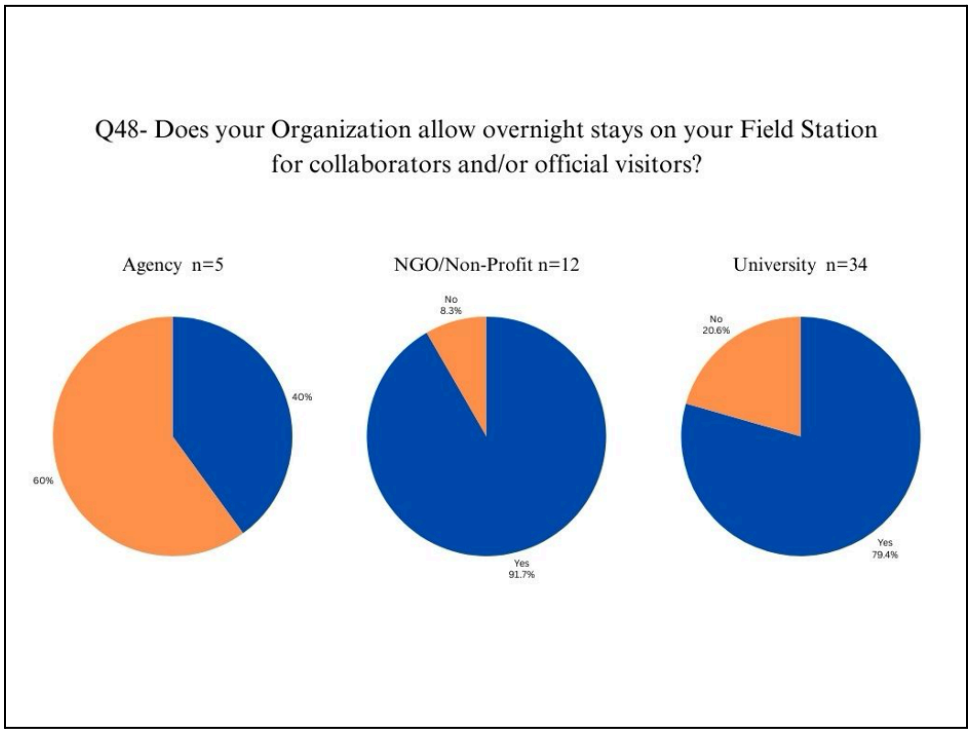


Figure 33.

Type of overnight stays allowed for collaborators/official visitors.

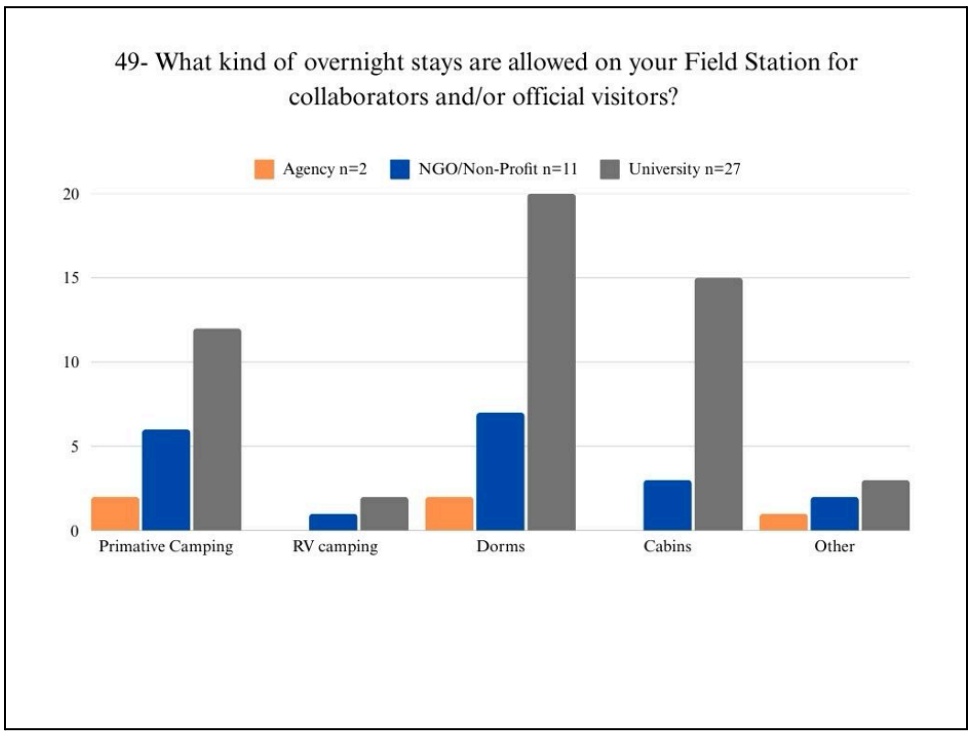


Table 31.

Type of overnight stays for collaborators/official visitors provided by respondents.

Overnight Stays for collaborators and/or office visitors	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Fixed Wall Tents	1	A
Communal Housing	1	N
Platform Tents	1	U
Camping by Approval from the Director	1	U
House	1	U

Figure 34.

Percentage of outdoor recreation open to the public.

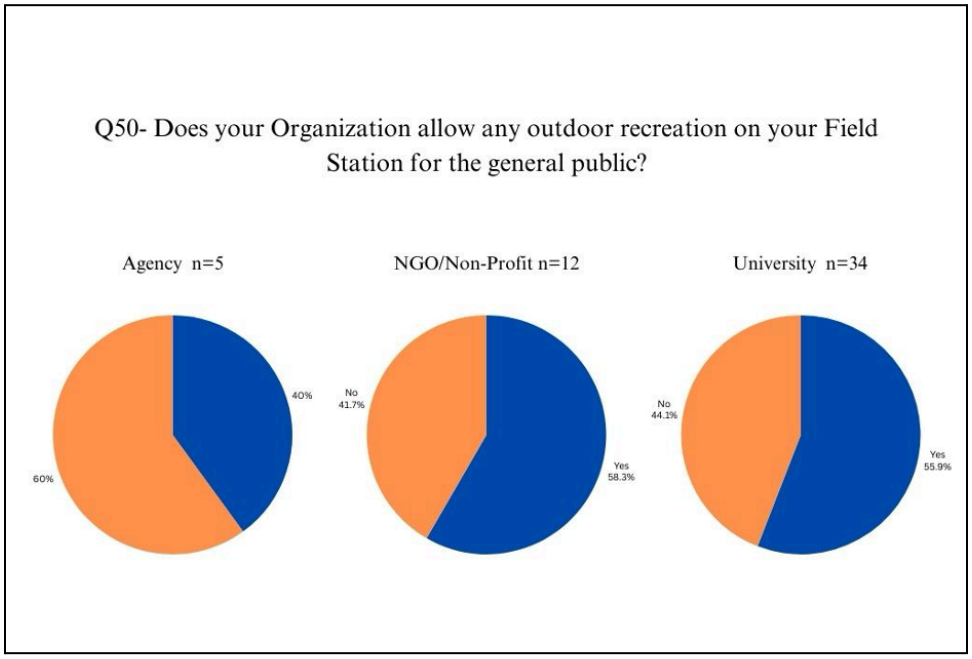
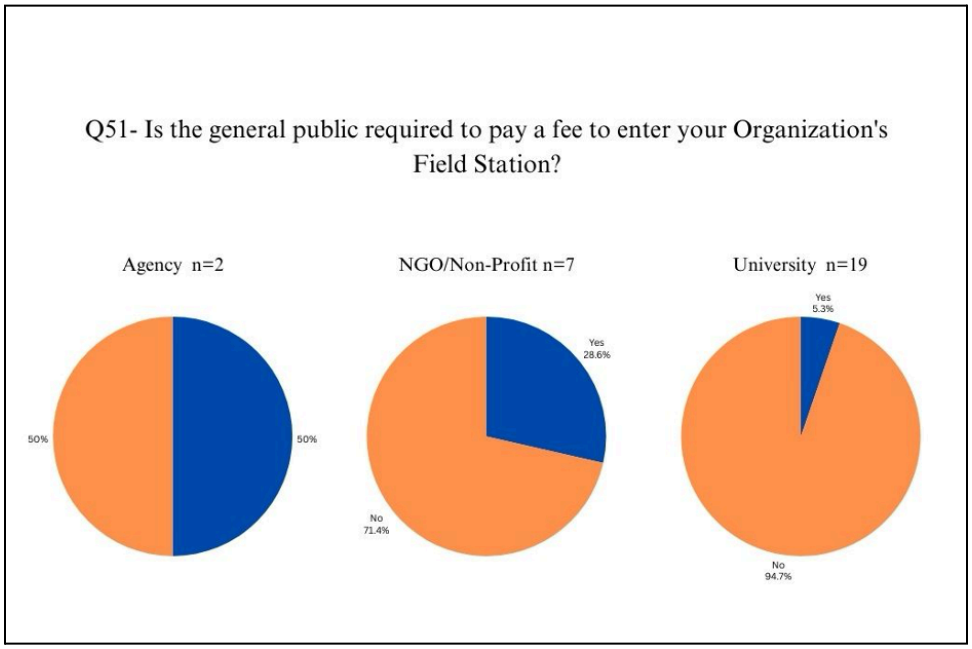


Figure 35.

Percentage of organizations that require an entry fee.



52- What is the fee for the general public to enter your Organization's Field Station?

There is no entry fee for most respondents. Those that do have a fee have various methods and criteria when it comes to their fees. National Park Entry is $20. Hawk Mountain Sanctuary has different membership levels starting at $50, $65, $125, $250, $500, $1000, and $2500. Individuals can enter for $10. Mohonk Preserve has a day fee of $15 and a yearly fee of $65. Finally, Treehaven has a $6 daily fee.

Figure 36.

Allowed outdoor recreation general public.

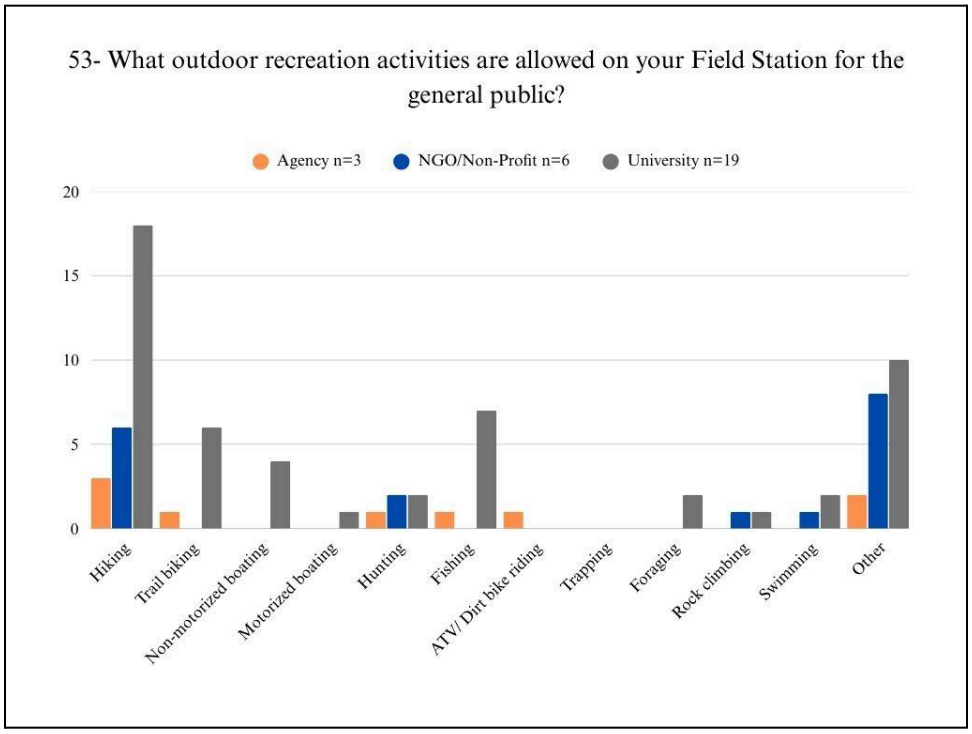


Table 32.

Allowed outdoor recreation general public provided by respondents.

Outdoor Recreation Open to the General Public	Number of Times Mentioned	University (U), NGO/Non-Profit (N), Agency (A)
Cycling	2	A, U
Sightseeing	1	A
Small Nature Trail	1	N
Birding	6	N, U
Non-Consumptive Activity	1	N
Cross-Country Skiing	3	N, U
Carriage	1	U
Road Biking	1	U
Picnicking	1	U
Playground	1	U
Photography	2	U
Snow Shoeing	2	N, U
Archery	1	U
Dogs on Leash	1	U

Figure 37.

Percentage of field stations that allow overnight stays.

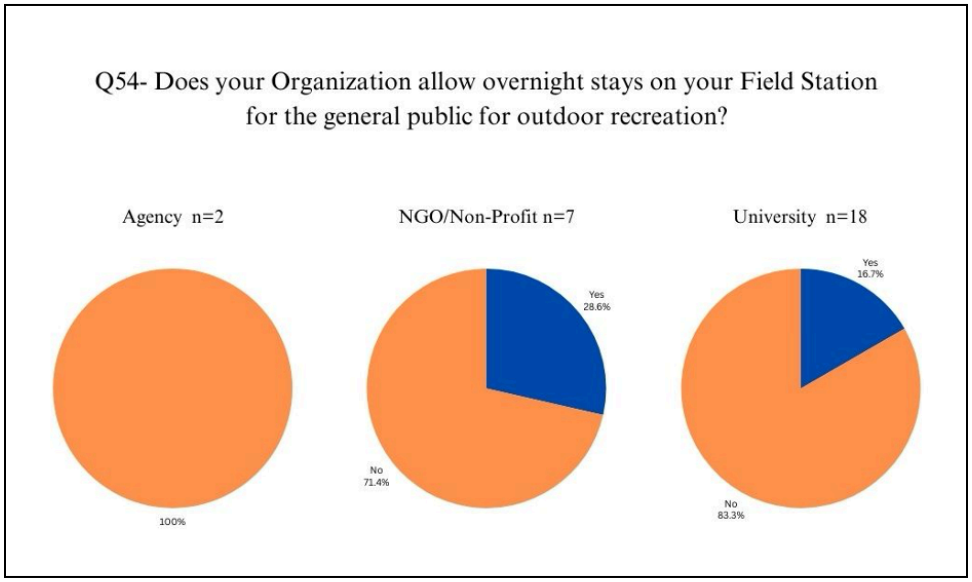


Figure 38.

Type of overnight stays allowed.

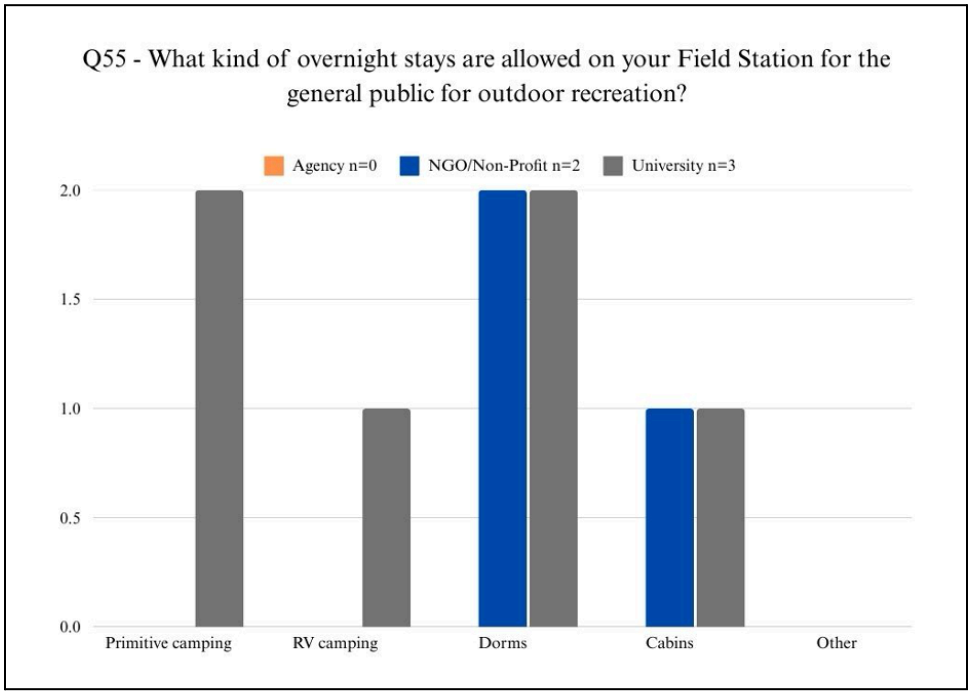
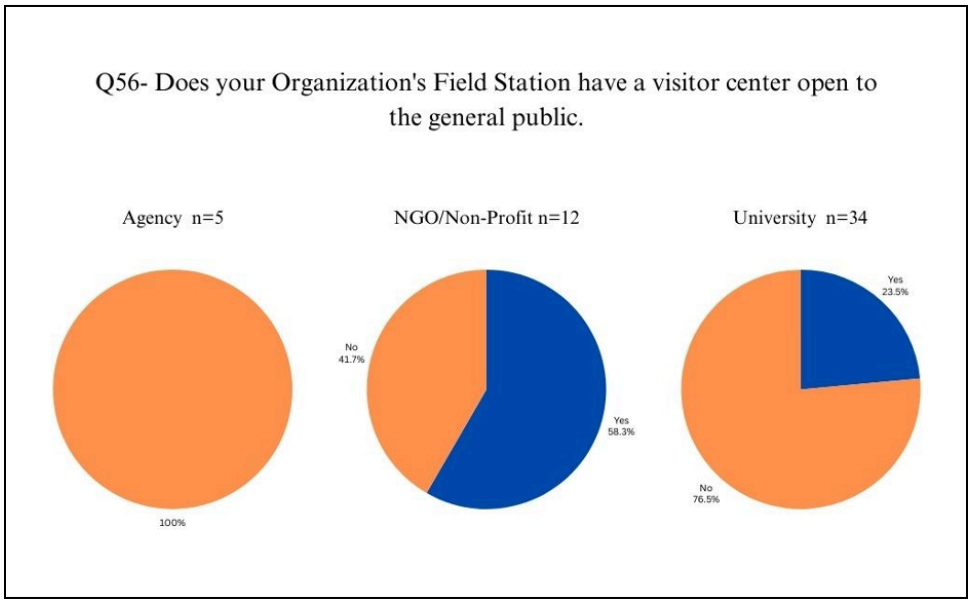


Figure 39.

Percentage of respondents that have visitor centers open to the public.



Acknowledgments

This study was conducted in collaboration with the Jones Center at Ichauway. This survey was developed in coordination with Kier Klepzig, Director of the Jones Center at Ichauway, and Co-Principal Investigator on the project, and by Principal Investigator Dr. Wayde Morse, research assistant Clay Groetsch, and graduate research assistant Helena Garrett-Paullada in the School of Forestry and Wildlife Sciences, Auburn University.

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Chapter 2: A survey of management and conservation practices of biological field stations

A manuscript prepared for publication in BioScience

Abstract

Biological field stations (BFS) are facilities that provide infrastructure and access to the environment where the scholarly community convenes to study place-based environmental research. Field stations are living laboratories located in a great variety of ecosystems around the world. Research, education, and outreach are central functions of most field stations. The study presents an analysis of the land management goals and practices of biological field stations in the United States. With a focus primarily on conservation and ecosystem management. Ecological conservation and invasive species control are central goals for field stations, with 8% of respondents prioritizing ecological conservation and 63% focusing on invasive species control. Land management practices commonly employed include invasive plant control, prescribed fires, and tree planting. Field stations manage diverse ecosystems, with woodlands and forests being the most common types. Additionally, the survey revealed significant involvement in wildlife management, with a particular focus on threatened and endangered species, and challenges related to pathogens, pests, and invasive species. Field stations are important in advancing conservation goals, ecosystem restoration, and educational outreach. Despite challenges, these stations are crucial for biodiversity preservation, research, and community engagement. We sought to understand how the diversity of place-based land management issues on field stations could contribute to research, educational, and outreach opportunities.

1| Introduction

Biological Field Stations (BFS) have been defined as; “Facilities that support sustained place-based research on environmental processes” (Billick et al. 2013). Field stations have played a critical role for scientists studying the natural world for over a century (NRC, 2014). The original terrestrial field station dates to 1843, with the Rothamsted Agricultural Experiment Station in England (McNulty et al. 2017). The Organization of Biological Field Stations was formed in 1968 with 34 members (McNulty et al. 2017). Today, there are hundreds of field stations in the U.S. and more than a thousand globally (Tydecks et al. 2016). Critical functions of BFS include providing access to natural environments, maintaining living laboratories, promoting conservation, and supporting a scholarly community focused on research, education, training, and outreach (Billick et al. 2013, NRC 2014, Stepien et al., 2017, Struminger et al. 2018). BFS are an important societal resource for environmental research and educational experiences (Klug et al., 2002), outdoor spaces where scientific research is conducted (Gerrish & Martin et al., 2024), and space for community outreach, education, and to promote environmental engagement (Castillo et al., 2021). Finally, BFS are gathering places for students, scientists, and citizens, creating a space where frequent scientific research and discoveries take place (Michener et al. 2009). They are important for developing the “ next generation of scientists and continuing training of practicing educators and natural resource professionals” (McNulty et al. 2017, p. 360).

Ecologically, BFS are located around the globe and across the spectrum of terrestrial biomes from mangroves to tundra and deserts to tropical rainforests (Tydecks et al. 2016). They provide opportunities for research and learning in each of these specific ecological systems and in specific geographic locations ,providing place-based research and educational opportunities

(Struminger et al. 2018). Research at field stations often provides the only information on ecological data for regional areas and collecting data at this scale can demonstrate larger-scale global changes in environmental systems, processes, and biodiversity (Michener et al., 2009). BFS forms a global network for place-based long-term monitoring, research, education and outreach (McNulty et al. 2017, Tydecks et al. 2016).

Administratively, field stations have many different affiliations, including universities, museums, and research institutions, non-governmental and nonprofit organizations, and government institutions/agencies (i.e., National Parks, forest lands), and combined affiliations (Tydecks et al. 2016). There is significant variation in size from stations with little to no property, to those with little property but who collaborate with large landholders (private or public), and to field stations that manage thousands of hectares (Struminger et al., 2018; Wyman et al., 2009). Each of these sites also falls on a spectrum of the degree of naturalness or human impact on the property and in the surrounding landscape mosaic.

Field stations provide the living laboratory for detailed research, hands-on field training opportunities, and formal education programs. Field stations often work in science, technology, engineering, and mathematics (STEM) fields. Additionally, field stations perform outreach and engage a variety of target audiences and local communities (Struminger et al., 2018). This allows STEM researchers to connect with the non-scientific population through informal learning with hands-on and experiential opportunities (Struminger et al., 2018). Place-based education at BFS grounds learning in a particular location and specific local environment, which has been associated with positive learning outcomes (Struminger et al. 2021). Struminger and co-authors developed a theoretical Informal STEM learning framework that integrated theories for learner engagement, STEM content, and approaches for science-learning to illustrate how BFS could be

used to facilitate place-based informal learning activities and programs to achieve desired BFS outreach outcomes (Struminger et al. 2018, Struminger et al. 2021). In this research, all of the 25 field stations respondents included outreach as core to their mission with outreach goals including reaching a particular audience (including the general public), disseminating knowledge and skills, teaching about the environment generally, encouraging conservation or environmental stewardship, and building community as the top five themes (Struminger et al. 2018).

Field stations are unique in location, topography, ecosystems, wildlife, and challenges (Baker 2015, McNulty et al. 2017). Management of biological field stations requires effective oversight that balances research, education, outreach, financial sustainability, and land management. BFS managers need to be entrepreneurial, have business and leadership skills (Baker 2015), and they need to understand how to manage the physical lands (the places). Land management goals and conservation issues are likely as diverse and specific to each field station as are the social and ecological contexts. Furthermore, there will be specific management requirements by the different management sponsors or partners (Stevens and Gilson et al. 2016). It has been suggested that the "field" for field station research be expanded to include the more modified human-influenced systems along with natural habitats (Flieschner et al. 2017). Field stations are embedded in the communities where they are located and are uniquely positioned for place-based learning opportunities (Billick et al. 2013).

How BFS land management may be incorporated into their teaching, education, research, and outreach has not been highlighted in the literature. In this study, we ask BFS key questions that give insight into land management, goals, missions, and issues they face. Our focus is place-based, we inquire about the specific management that happens at their specific location, and then look for trends. We inquire what their main goals are when it comes to land

management. We inquire about specific land management issues and actions they take regarding conservation, endangered species, invasive species, game species, ecosystem restoration, habitats, and production systems. Our overall contention is that each management intervention creates the opportunity for research, education, and community outreach.

2| Methods

2.1| Selection criteria for participant BFS

We collaborated with the Organization of Biological Field Stations (OBFS) to distribute an electronic (online) survey instrument. An invitation to complete the survey was announced on the OBFS listserv on July 8th of 2024. A follow-up reminder was sent on July 22nd. OBFS also included an invitation to take the survey in their monthly emailed newsletter. The survey was closed on September 6th, 2024.

Respondents asked to participate were managers, directors, or knowledgeable employees of a biological field station. Participants were not selected for specific demographic characteristics. These respondents were selected for their knowledge of station management and conservation practices. All stations are either or collectively terrestrial, freshwater, or marine stations located in the United States. Station respondents who completed fully or two-thirds of the survey were included in our sample for this study. U.S. stations are the main focus, therefore, U.S. territory field stations were excluded. Of 310 US biological field stations, 62 stations responded, yielding a 20% response rate.

2.2| Survey design

The survey was designed and developed with Qualtrics software. The survey used a mix of open-ended and closed-ended questions. The survey was organized into 11 sections. Section 1 included an introductory letter addressing what to expect from the survey and gratitude for the station's participation. Section 2 “Introduction Information”, inquired stations’ general information such as establishment date and land size. Section 3, “Field Station Legal Structure and Affiliations,” asked stations to describe their history, domicile, and legal structure. Section 3 “Field Station Mission and Land Management” implored stations on their central goals and mission statements as well as their land management style. Section 4, “Field Station Conservation Program Enrollment,” gathers what programs a station may or may not be a part of. Sections 5-7 “Field Station Facilities and Employees Results and Organizations Partnerships and Collaborations Part 1 & 2” assessed a station's employment statistics and collaborations. Section 8-9 “Groups Access and Recreation” asked about their accessibility and recreational opportunities to collaborators and the public. The final section, “Final Comments” asks the station's representative to voluntarily provide comments or additional information they would like to share.

2.3| Survey assessment

For this assessment, land conservation and management questions were of sole focus. Quantitative survey responses were statistically analyzed through SPSS (IBM SPSS, 2024). Narrative statements were examined through thematic coding and simply compiling lists (i.e., endangered species they manage) where appropriate.

3| Results

3.1| Mission and vision objectives

Mission or vision statements publicly and concisely communicate an organization's purpose, objectives, and values that serve as guidance and direction for the organization and stakeholders. The majority of field stations provided a copy of their mission or vision statement (77.4%). Their statements were analyzed by thematic coding and categorization. As a result, five main objectives were identified to be (1) education, (2) research, (3) community, (4) conservation, and (5) management. The majority of stations specified research (62.9%) and education (46.8%) as major objectives. University affiliates provided 53.2% of the mission or vision statements, which are consistent with these results. Community support was listed as a priority for 25.8% of participants. Conservation (19.4%) and management (16.1%) were also identified as primary objectives within the mission statements, but lower than the research, education, or community support objectives.

3.2| Land Management Goals

Results regarding BFS land management indicated a broad range of goals. Management goals are specific to an area of land, depending on the ecological issues they may or may not have. All stations reported their land management goals. Their goals can be singular or a combination of the goals listed that help guide their management decisions to reach desired outcomes.

Land Management Goals	Percentage (%)
Ecological conservation/preservation	80.7%
Controlling invasive species	63%
Hydrologic modifications	25.8%
Wetland restoration/creation	27.4%
Conserving habitat for threatened & endangered species	43.6%
Conserving habitat for other non-game species	54.8%
Enhancing wildlife game habitat	17.7%
Restoring forest/vegetation- composition	32.3%
Restoring forest/vegetation-structure	43.6%
Timber production	11.3%
Livestock production	6.3%
Agricultural production	6.3%
Non-timber forest products	6.3%
Demonstration plots for landowner education	32.3%
Table 28: Land management goals. Percentages add up to more than 100% as BFS could list multiple goals.	

The majority of respondents have land management goals that concern ecological conservation and preservation (80.7%). Invasive species control (63%) is another common goal many stations share. Land managers value conserving habitat to keep their ecosystems healthy, improve their biodiversity, and ensure the longevity of native species, including threatened or endangered species. Habitat conservation of threatened and endangered species are priority for 43.6% of respondents. Habitat conservation of non-game species is a priority for 54.8% of respondents. Respondents value forest structure (43.6%) and composition (32.3%) restoration. Hydrology (25.8%) and wetland restoration (24.7%) are priorities of respondents, but less so when compared to previously mentioned goals; ecological conservation/preservation, controlling invasive species, conserving habitat for threatened and endangered species, and restoring

forest/vegetation structure. Some respondents have livestock production (6.3%), agricultural production (6.3%), and non-timber forest products (6.3%). These consumptive land management goals centered around production were least likely to be a part of a field station management plan.

3.3| Land management practices

A large majority of stations are involved in some land management practice and/or technique (83.9% of respondents).

Land Management Practices	Percentages (%)
prescribed fire	44.2%
wildfire control/management	34.6%
planting trees	44.2%
planting other native vegetation	(40.4%)
timber harvest	15.4%
forest thinning	(32.7%)
forest gap creation	(19.2%)
invasive flora species control (chemical techniques)	(53.9%)
invasive fauna control (hunting/trapping)	(28.9%)
invasive fauna control (chemical/biological techniques)	(17.3%)
native flora species control (mechanical/chemical techniques)	(38.5%)
grazing	(13.5%)
fencing and shelters for wildlife	(21.2%)
planting wildlife forage crops	(1.9%)
altering landforms/changing hydrology	(19.2%)
removing barriers for natural wetland flooding	(15.4%)
removing artificial drainage feature	(15.4%)

Irrigation	(3.9%)
Table 29: Land management actions. Percentages add up to more than 100% as BFS could list multiple goals.	

Invasive flora species control was the most common management action of field stations. Most stations remove invasive flora (65.4%) through mechanical means, and 53.9%) remove it through chemical techniques. Secondly, planting other vegetation (40.4%), planting trees (44.2%), and prescribed fire (44.2%) are other popularly used land management practices by field stations.

A moderate number of respondents reported partaking in native plant control (38.5%), forest thinning (32.7%), and wildlife management (34.6%).

3.4| Ecosystem focus

Biological field stations within the US have a diversification of ecosystem types. Out of all our respondents, 80% provided the ecosystems they manage or are found at their field station. Respondents may manage one or several types of ecosystems, that include terrestrial and semi-aquatic ecosystems. Most respondents describe their station as woodlands (61.4%) and forested (50%). Wetlands (25%) and grasslands (25%) are the third most reported ecosystem type. Prairies were a minority (15.9%) reported ecosystem of respondents. Riparian zone ecosystems are reported by 20.5% of respondents.

3.5| Wildlife management

If a BFS reported that they managed for endangered species, non-game species, pathogens, pests, and invasive species, we followed up with questions to better understand specific place-based management issues. Combined, 33.9% of respondents report managing endangered or threatened

species at their field station. Within this 33.9%, 13 field stations manage bird species, 8 stations for reptiles, 13 stations for mammals, 7 stations for amphibians, 3 stations for fish, 2 stations for shellfish, 4 stations for plants, and 7 stations for insects. A total of 54.8% of stations conserve habitats for non-game species. Of all stations, 38.7% of respondents provided what species type they manage. There are reported to be 13 stations that manage bird species, 8 stations for reptiles, 13 stations for mammals, 7 stations for amphibians, 3 stations for fish, 2 stations for shellfish, 4 stations for plants, and 5 stations for insect species. Of the stations that manage habits (17.7%) of game species, 12.9% of respondents provided species that they manage. From the 12.9%, 2 stations manage for pigs/wild hogs, 8 stations for deer, 3 stations for turkey, 5 stations for birds, 3 stations for bears, and 1 station for squirrels. Over fifty percent (54.8%) of stations have issues with pathogens on their field stations. The most commonly named disease by respondents is Lyme disease, 14 field stations reporting trouble with it, and 6 with Beech Leaf Disease. Many stations also have problems with pests (58%), 12 have difficulties with Emerald Ash Borers, nine with Hemlock Woolly Adelgid, and 7 with Bark Beetle. Slightly less than half of the stations have issues with invasive animals (43.6%), but many more stations have issues with invasive plants (77.4%).

4| Discussion

The results from this inquiry provided valuable information and insight into land management of field stations regarding their land management goals and actions regarding vegetation, hydrology, wildlife/biodiversity, and production systems. While previous literature related to BFS focuses on the research occurring at these sites (Hodder et al. 2009; Beck et al. 2019), it is clear from our study that most stations are also actively managing at least some portion of their lands. Our sample demonstrates that BFS are not purely natural ecosystems that are being

studied ‘out there’ and apart from human disturbances. Many sites may have historical alterations that they are trying to restore or processes that they are trying to reintroduce. Many of these sites have issues with invasive species (flora and fauna) and are actively managing for them (both mechanically and chemically). It is also clear that each of these management interventions are on topics directly related to the science, education, and outreach missions of field stations. Each management intervention is an opportunity to conduct research, education, or outreach.

Working with local landowners and the public on how to manage lands for these issues would directly satisfy the outreach mission of disseminating knowledge and skills, encouraging stewardship, and building community (Billick et al. 2013; McNulty et al. 2017; Strumminger et al. 2021). We found the centrality of outreach in mission statements similar to that found by others (Strumminger et al. 2018). These will be unique, place-based understandings regarding the needs for habitat, forest, hydrological restoration and wildlife conservation, and invasive species management. An additional element for the theoretical Place Based Informal Learning framework (Struminger et al. 2018) would be to identify management as a specific tool within the learner engagement approaches. A significant percentage of published conservation research is done at BFS, however, it is unclear how much of that came from utilizing land management interventions for research, education, and outreach. Billick and others (2013) state that BFS are “embedded within local communities, they are on the front lines of integrating science into decision-making and of communicating science to the general public” (p.1). Sharing place-based conservation land management techniques with local landholders as a form of outreach would, perhaps, be some of the most direct conservation outreach that can be done. Perhaps we can enhance the ’field’ of field stations to be more inclusive and to step a bit outside the academic

paradigm and add managers to what McNulty et al. (2017) envisions to be a key goal of BFS: "Developing the next generation of scientists, educators, *MANAGERS*, and science literate citizens" (p. 363).

Results of this study underline the important role field stations have in conservation and land management. These stations are situated in a wide range of environments that are perfect hubs for research, education, community engagement, and conservation (Gerrish & Martian, 2024). A notable finding is the prominence of ecological conservation and preservation as a central goal for field stations, with 80.7% of respondents making it a priority of their land management practice. This reflects on the rising awareness of the importance of biodiversity in the age of escalating environmental threats (Hardi, Pathy & Pozsgai, 2024). Such threats affect field stations, as 34 stations report issues with pathogens such as Lyme disease (14 stations), beech bark (6 stations), and leaf (5 stations) disease. Other threats include pests that threaten 36 stations, 12 of these stations report evidence of Emerald Ash Borer, 9 report Hemlock Wooly Adelgid, and 7 report bark beetles.

Managing invasive species has emerged as one of the most widely practiced management strategies, with 65% of respondents utilizing mechanical removal methods and 53.9% employing chemical techniques. Invasive animal species affect 27 stations, and 48 stations are impacted by invasive plant species. Invasive species are the second most greatest threat to biodiversity globally (Wotton et al., 2004). In some regions of the world 80% of endangered species are threatened by invasives (Waldner, 2008). This further highlights the importance of land management that a field station provides. Effective land management mediates the interactions

between nature, human activities, environmental issues, and combating current threats (Guerra et al.,2019; Martian & Root, 2020).

Reported land management techniques by stations also emphasize the importance of restoration practices. Planting trees (23 field stations), prescribed fires (23 field stations), and planting other vegetation (21 field stations) are all common methods used to enhance the health of field station ecosystems. These management styles align with ecosystems reported most by station, forests (22 field stations), and woodlands (27 field stations). Managers utilize tree planting, burning, and vegetation planting for their forest and woodland ecosystem types. Burns are often used before seeding or planting, which makes them suitable for forest regeneration (Abraham, Dowling & Florentine, 2018). As well as preventing the spread of aggressive plants, pests, and diseases (Awad et al., 2021), which are a concern for 48 stations (invasive plants), 36 stations (pests), and 34 stations (diseases). Despite these popular management practices, challenges remain. Forest thinning (17 field stations), wildlife management (18 field stations), and hydrology (10 field stations) remain secondary goals for many field stations. These practices remain complex due to the interactions of varied ecological, social, and economic factors (Treves, Zenezini & Comino, 2025). This suggests these practices remain important, but may not be frequently implemented.

Field stations are also facing challenges related to the conservation management of threatened and endangered species. Respondents report managing threatened and endangered species (27 field stations), with many focusing on plants (39 field stations), birds (36 field stations), and mammals (18 field stations). It is understandable that these species are reported to be at risk. Birds and mammals are vulnerable to modern climate change and land use changes, since this affects their habitat and food availability (Payne et al., 2023). Similarly, plants are vulnerable to

the complex interaction of environmental stressors, pollution, pests, and pathogens, which compound with climate change (de Oliveria Neves, Salgado & Lira, 2024). Protection of these species are crucial for the resilience of field station ecosystems in which these species play essential roles in regulating ecological processes (Daily et al, 2000).

The diversity of ecosystems managed by field stations is a reflection of the unique ecological value of these areas. As mentioned previously, forests (27 field stations) and woodlands (22 field stations) are the most mentioned ecosystem types for field stations. However, respondents also mentioned their field stations having wetland (11 field stations), prairie (7 field stations), grassland (11 field stations), and riparian (9 field stations) ecosystems. These results indicate that managers come from a range of ecosystems and practice tailored management strategies to address their local environmental issues. For instance, the majority of field stations practice tree planting, prescribed burning, and vegetation planting, which are integral practices for forested (22) field stations and wooded (27) field stations,which a majority of respondents have. Similarly, wetland (11 field stations) and riparian (9 field stations) field stations are a secondary ecosystem type, and 27.4% of stations participate in wetland restoration or creation.

Finally, this study highlights the importance of education and community to field stations. With 46.8% of respondents identified education as an important objective. Field stations are not only spaces for conservation, but also centers for public engagement and community togetherness. Educational awareness helps promote the importance of conservation and its ability to change attitudes (Mketo et al., 2022). Which can help foster the relationships between managers,

landlords, and nearby communities. (Bernedo Del Carpio et al., 2021; Price, Randriamiharisoa & Klings, 2023).

Further analysis on field station networking would be a beneficial addition to BFS research. Station networking entails analyzing the relationships and interactions between these stations, and between stations and agencies, universities, funding organizations, local landowners, and communities to better understand their impact on education, research, outreach, and land management. This analysis can reveal valuable insights into how field stations contribute to environmental goals and highlight areas for improvement for future exchange of land management practices.

Conclusion

In conclusion, field stations are valuable resources for understanding place based ecological processes across a variety of ecosystems. They provide a central role for research, education, and outreach, and for developing future scientists and a science-aware public. They also must address local place-based issues with endangered species, invasive species (flora and fauna), pests and pathogens, legacy hydrological issues, altered disturbance regimes, and vegetative restoration needs. As experts managing and restoring field station lands, there is a great opportunity to use those management actions for their research, education, and outreach. Local landowners are most likely facing many of the same issues as the field stations, and the learning opportunities of these interventions could be significant. With outreach as a central focus of almost all field stations, highlighting the role that their land management plays in their research and education could

further connect local communities and develop future researchers and conservation land managers.

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Appendix I: Survey Instrument

Field Station Conservation and Management

Start of Block: Introduction

Q1
Greetings field station directors, administrators, and managers, Private conservation lands are an important part of protecting ecosystems and preventing habitat loss throughout the country. Field stations, in particular, contribute to conservation and provide opportunities for research, education, and training for our future environmental scientists and leaders. Auburn University College of Forestry, Wildlife and Environment (CFWE) together with The Jones Center at Ichauway have developed a survey to document and investigate the 1) background and missions, 2) conservation focus and land management strategies, 3) collaborative partnerships, and 4) outdoor recreation opportunities of field stations. We are asking that one representative from each field station located in the United States respond to this survey. The survey was developed independently of the Organization of Biological Field Stations. However, OBFS has reviewed the survey and provided guidance and support. Though limited, a few questions OBFS has asked in the past may also appear on this survey. The survey will take approximately ten to fifteen minutes to complete. Your answers will further document the important conservation role of field stations. We will be sharing our final report with the OBFS and all respondents. Respondents will also receive a 2-page information sheet demonstrating how their specific field station fits within the larger conservation network. We anticipate two peer-reviewed academic papers from this study. The survey will be opened on Monday, July 8th, and close on **Friday, September 6th.** We ask that the survey be completed by a representative familiar with the field station's land management and administrative organization. The survey is about field stations and there are no personal questions. Your participation is voluntary and we do not foresee any risks. We appreciate and value your input and look forward to receiving your completed survey.

Sincerely,
Wayde Morse
Professor, Conservation Social Scientist
College of Forestry, Wildlife and Environment
Auburn University

If you have questions about the survey, please contact Dr. Wayde Morse at: wcm0005@auburn.edu.

End of Block: Introduction

Start of Block: Field Station Introductory Information

Q2 What is the name of your Field Station? *If your managing Organization is not the same as your Field Station, please enter: Organization name, Field Station name. This survey will reference your "Organization" when asking about management and "Field Station" when asking about location, access, and facilities.*

_____

_____

_____

_____

_____

Q3 What year was your Organization established?

_____

Q4 Does your Organization manage multiple Field Stations?

- ○ Yes (1)
- ○ No (2)

Skip To: Q5 If Does your Organization manage multiple Field Stations? = Yes

Q5 How many other Field Stations does your Organization manage?

_____

_____

_____

_____

_____

Q6 How many acres is your primary Field Station? *We will use the word "primary" to indicate the main Field Station in case an Organization has more than one.*

_____

Q7 Does your primary Field Station have lands under cooperative agreements for use or management or other non-formal access options?

- ○ Yes (1)
- ○ No (2)

Skip To: Q8 If Does your primary Field Station have lands under cooperative agreements for use or management or... = Yes

Q8 Approximately how many acres do you have access to under cooperative agreements for use or management or other non-formal access options with your primary Field Station.

_____

End of Block: Field Station Introductory Information

Start of Block: Field Station Legal Structure and Affiliations

Q9 Is your Organization a non-governmental organization (NGO)?

- Yes (1)
- No (2)

Q10 Is your Organization a non-profit?

- Yes (1)
- No (2)

Q11 Does your Organization belong to the Natural Areas Association?

- Yes (7)
- No (8)
- Not sure (10)

Q12 Does your Organization belong to the World Database of Protected Areas?

- ○ Yes (1)
- ○ No (2)
- ○ Not sure (4)

Q13 Is your Organization found within the USGS PAD-US Private Land Database?

- ○ Yes (4)
- ○ No (5)
- ○ Not sure (7)

Q14 What is the history, domicile and legal structure of your Organization? (If you have this information elsewhere, please feel free to copy and paste it in.)

_____

_____

_____

_____

_____

End of Block: Field Station Legal Structure and Affiliations

Start of Block: Field Station Mission and Land Management

Q15 What is the mission and/or vision statement of your Organization? *(If you have this information elsewhere, please feel free to copy and paste it in.)*

_____

_____

_____

_____

_____

Q16 What ecosystem(s) does your Organization primarily focus on? *(e.g. woodlands, desert, prairie, estuary, or specific systems such as longleaf pine, etc.)*

_____

_____

_____

_____

_____

Q17 What are the land management goals of your primary Field Station? *(Check all that apply)*

☐ Ecological conservation/preservation (1)

- [ ] Controlling invasive species (3)
- [ ] Hydrologic restoration (4)
- [ ] Wetland restoration/creation (5)
- [ ] Conserving habitat for T&E species (6)
- [ ] Conserving habitat for other non-game species (16)
- [ ] Enhancing wildlife game habitat (7)
- [ ] Restoring forest/vegetation - composition (8)
- [ ] Restoring forest/vegetation – structure (9)
- [ ] Timber production (10)
- [ ] Livestock production (11)
- [ ] Agricultural production (12)
- [ ] Non-timber forest products (13)
- [ ] Demonstration plots for landowner education (14)
- [ ] Other (15) _____

Display this question:

If What are the land management goals of your primary Field Station? (Check all that apply) = Conserving habitat for T&E species

Q18 What are the Threatened and Endangered species that you manage for on your primary Field Station? *(List several if applicable)*

_____

_____

_____

_____

_____

Display this question:

If What are the land management goals of your primary Field Station? (Check all that apply) = Conserving habitat for other non-game species

Q19 What are the other key non-game species that you manage for on your primary Field Station? *(List up to 5 non-game species)*

_____

_____

_____

_____

_____

Display this question:

If What are the land management goals of your primary Field Station? (Check all that apply) = Enhancing wildlife game habitat

Q20 What are the game species that you manage for on your primary Field Station? *(List up to 5 game species)*

_____

_____

_____

_____

_____

Q21 Please identify all of the following land management actions used by your Field Station. *(Check all that apply)*

- ☐ Prescribed fire (1)
- ☐ Wildfire management (e.g. suppression, control, etc.) (2)
- ☐ Planting trees (3)
- ☐ Planting other vegetation (4)
- ☐ Timber harvest (5)

- [ ] Forest thinning (6)
- [ ] Forest gap creation (7)
- [ ] Invasive species control, flora – Mechanical techniques (e.g. mow, hoe, girdling, etc.) (8)
- [ ] Invasive species control, flora – Chemical techniques (9)
- [ ] Invasive species control, fauna – Hunting and/or trapping (10)
- [ ] Invasive species control, fauna – Chemical/biological techniques (11)
- [ ] Native species control, flora - Mechanical or chemical techniques (e.g. reduce competition, fuel management, restoration, etc.) (12)
- [ ] Grazing (e.g. reduce competition, fuel management, restoration, etc.) (13)
- [ ] Fencing and shelters for wildlife (20)
- [ ] Reintroducing lost species (14)
- [ ] Planting forage crops (15)
- [ ] Altering landforms/changing the hydrology (16)
- [ ] Removing barriers for natural wetland flooding (17)
- [ ] Removing artificial drainage features (18)

☐ Irrigation (19)

☐ Other (21) _____

Q22 Do you have any issues with Pathogens (Chronic wasting disease, Lyme disease, Brown patch fungus, Dutch elm disease, White pine blister rust, etc.) on your Field Station?

○ Yes, please list up to 3 of the most important to your management (1)

_____

○ No (2)

Q23 Do you have any issues with **Pests** (bark beetle, Hemlock woolly adelgid, Emerald ash borer, Gypsy moth, etc.) on your Field Station?

○ Yes – please list up to 3 of the most important to your management (1)

_____

○ No (2)

Q24 Do you have any issues with **Invasive species - Fauna** (e.g. Feral hogs, Burmese Python, European Starlings, Asian Carp, etc.) on your Field Station?

○ Yes, please list up to 3 of the most important to your management (1)

_____

○ No (2)

Q25 Do you have any issues with **Invasive species - Flora** (e.g. Kudzu, Chinese privet, Golden bamboo, Cogongrass, etc.) on your Field Station?

- ○ Yes, please list up to 3 of the most important to your management (1)

  _____

- ○ No (2)

Q26 The GAP Analysis Project (GAP) Status Code is a measure of management intent to permanently protect biodiversity. GAP produces data and tools that help meet critical national challenges such as biodiversity conservation, recreation, public health, climate change adaptation, and infrastructure investment (ArcGIS, 2023). **Please indicate if you have land managed under any of the various categories.** *(Please check all that apply.)*

- ☐ Areas managed for biodiversity where natural disturbances are allowed to proceed (4)
- ☐ Areas managed for biodiversity where natural disturbance is suppressed (5)
- ☐ Areas protected from land cover conversion, but subjected to extractive uses (6)
- ☐ Areas with no known protection (7)

End of Block: Field Station Mission and Land Management

Start of Block: Field Station Conservation Program Enrollment

Q27 Does your Organization have a conservation easement?

- ○ Yes (1)
- ○ No (2)

Display this question:

If Does your Organization have a conservation easement? = Yes

Q28 How many acres is your Organization's conservation easement?

_____

Display this question:

If Does your Organization have a conservation easement? = Yes

Q29 What is the primary goal of the conservation easement? *(If you have this information elsewhere, please feel free to copy and paste it in.)*

_____

_____

_____

_____

_____

Q30 Does your Organization have land enrolled in any of the following specific conservation programs? *(Check all that apply)*

☐ Conservation Reserve Program (1)

- [ ] Wetland Reserve Program (7)
- [ ] Wetland Mitigation Banking Program (11)
- [ ] Environmental Quality Incentives Program (2)
- [ ] Wildlife Incentives Program (3)
- [ ] Conservation Stewardship Program (10)
- [ ] Other (8) _____
- [ ] Other (9) _____

Carry Forward Selected Choices - Entered Text from "Does your Organization have land enrolled in any of the following specific conservation programs? (Check all that apply)"

Q31 Please provide the acreage of your Organization's conservation programs.

	Acreage (4)
Conservation Reserve Program (x1)	
Wetland Reserve Program (x7)	

Wetland Mitigation Banking Program (x11)	
Environmental Quality Incentives Program (x2)	
Wildlife Incentives Program (x3)	
Conservation Stewardship Program (x10)	
Other (x8)	
Other (x9)	

End of Block: Field Station Conservation Program Enrollment

Start of Block: Field Station Facilities and Employees

Q32 What facilities does your primary Field Station have?

	Number of Facility Type (1)	In total, how many people do these facilities support? (2)
Dorms (1)		
Laboratories (2)		
Research Centers (3)		
Classrooms (4)		
Dining Halls (5)		
Information Centers (6)		
Other (7)		
Other (8)		

Q33 Does your Organization **employ or host** people from any of the following categories at your primary Field Station? *(Check all that apply)* ***Hosting*** *indicates that they stay at your facility for longer durations (e.g. semester, summer, field season) but are not paid as a direct employee by your organization.*

- ☐ Graduate Assistants (1)
- ☐ Research Assistants (2)
- ☐ Postdoctoral Fellows (3)
- ☐ Administrative Staff (4)
- ☐ Maintenance Workers (5)
- ☐ Volunteers (6)
- ☐ Other (7) _____
- ☐ Other (8) _____

Carry Forward Selected Choices - Entered Text from "Does your Organization employ or host people from any of the following categories at your primary Field Station? (Check all that apply) Hosting indicates that they stay at your facility for longer durations (e.g. semester, summer, field season) but are not paid as a direct employee by your organization. "

Q34 Please enter how many people in the following categories your Organization **employs and/or hosts** over an average year at your primary Field Station. ***Hosting*** *indicates that they stay at your facility for longer durations (e.g. semester, summer, field season) but are not paid as a direct employee by your organization.*

	Number employed (1)	Hosted (2)
Graduate Assistants (x1)		
Research Assistants (x2)		
Postdoctoral Fellows (x3)		
Administrative Staff (x4)		
Maintenance Workers (x5)		
Volunteers (x6)		
Other (x7)		
Other (x8)		

End of Block: Field Station Facilities and Employees

Start of Block: Organizations Partnerships and Collaborations Part 1

Q35 Does your Organization conduct outreach to the general public?

- ○ Yes (1)
- ○ No (2)

Display this question:

If Does your Organization conduct outreach to the general public? = Yes

Q36 Which of the following topics are part of your Organization's outreach? *(Check all that apply)*

- ☐ General science (6)
- ☐ Biodiversity conservation (2)
- ☐ Wild game management/conservation (3)
- ☐ Invasive Species (4)
- ☐ Ecological Restoration (5)
- ☐ Landowner conservation incentive programs (8)
- ☐ Sustainable Forest, livestock, or agricultural production (1)
- ☐ Other (7) _____

Display this question:

If Does your Organization conduct outreach to the general public? = Yes

Q37 On average, approximately how many people from the general public visit your primary Field Station on these programs per year?

_____

Page Break

Q38 **We are interested in understanding the networks that Field Stations develop to achieve their goals.** Does your Organization collaborate with other organizations for research, fundraising, management, or other purposes? *(e.g. universities, NGOs, philanthropy groups, industry, business, municipal, state, or federal agencies, local communities, etc.) Please create a list of all the organizations you work with before moving on to the next question.*

- ○ Yes (1)
- ○ No (2)

Display this question:

If We are interested in understanding the networks that Field Stations develop to achieve their goal... = Yes

Q39 How many different organizations does your Organization collaborate with?

_____

_____

_____

_____

_____

End of Block: Organizations Partnerships and Collaborations Part 1

Start of Block: Organizations Partnerships and Collaborations Part 2

Q40 Please answer these three questions about your collaboration/partnerships. *If you have indicated that your Organization collaborates with more than one Organization, these questions will repeat.*

Q41 Please enter the name of your collaborator/ partner.

_____

_____

_____

_____

_____

Q42 What type of organization is this collaborator? *(Select one)*

- ○ Federal/State agency (5)
- ○ University/College (4)
- ○ K-12 Schools (10)

- ○ Local community (7)
- ○ NGO/Conservation organization (14)
- ○ Private business/corporation (8)
- ○ Natural resource industry group (15)
- ○ Philanthropic group (9)
- ○ Special interest group (6)
- ○ Other (11) _____
- ○ Other (12) _____

Q43 What is the purpose of your Organization's partnership with this collaborator? *(Check all that apply)*

- ☐ Research (4)
- ☐ Instruction/education (5)
- ☐ Outreach (6)
- ☐ Financial/fundraising (7)
- ☐ Resource management (8)
- ☐ Other (9) _____

☐ Other (10) _____

End of Block: Organizations Partnerships and Collaborations Part 2

Start of Block: Other Group Access to Field Stations

Q44 Does your Organization allow other *outside groups not mentioned in your list of Collaborators* to rent or use your Field Station for meetings or specific events?

○ Yes (1)

○ No (2)

Display this question:

If Does your Organization allow other outside groups not mentioned in your list of Collaborators to... = Yes

Q45 Please briefly describe these other groups and how they use of your Field Station.

_____

_____

_____

_____

_____

End of Block: Other Group Access to Field Stations

Start of Block: Field Station Recreation

Q46 Does your Organization allow any outdoor recreation on your Field Station for your **collaborators and/or official visitors** *(in contrast to the general public*)?

- ○ Yes (1)
- ○ No (2)

Display this question:

If Does your Organization allow any outdoor recreation on your Field Station for your collaborators... = Yes

Q47 What outdoor recreation activities are allowed on your Field Station for collaborators and/or official visitors capacity? *(Check all that apply)*

- ☐ Hiking (1)
- ☐ Trail biking (2)
- ☐ Non-motorized boating (3)
- ☐ Motorized boating (15)
- ☐ Hunting (4)
- ☐ Fishing (5)
- ☐ ATV/ Dirt bike riding (6)
- ☐ Trapping (7)

- [ ] Foraging (8)
- [ ] Rock climbing (9)
- [ ] Swimming (10)
- [ ] Other (13) _____
- [ ] Other (14) _____

Q48 Does your Organization allow overnight stays on your Field Station for collaborators and/or official visitors?

- ○ Yes (1)
- ○ No (2)

Display this question:

If Does your Organization allow overnight stays on your Field Station for collaborators and/or offic... = Yes

Q49 What kind of overnight stays are allowed on your Field Station for collaborators and/or official visitors? *(Check all that apply)*

- [ ] Primitive camping (1)
- [ ] RV camping (2)
- [ ] Dorms (3)

- [ ] Cabins (4)
- [ ] Other (5) _____
- [ ] Other (6) _____

Page Break

Q50 Does your Organization allow any outdoor recreation on your Field Station for the **general public**? *(Beyond your collaborators or official visitors)*

- ○ Yes (1)
- ○ No (2)

Display this question:

If Does your Organization allow any outdoor recreation on your Field Station for the general public?... = Yes

Q51 Is the general public required to pay a fee to enter your Organization's Field Station?

- ○ Yes (1)
- ○ No (2)

Display this question:

If Is the general public required to pay a fee to enter your Organization's Field Station? = Yes

Q52 What is the fee for the general public to enter your Organization's Field Station?

_____

Display this question:

If Does your Organization allow any outdoor recreation on your Field Station for the general public?... = Yes

Q53 What outdoor recreation activities are allowed on your Field Station for the general public? *(Check all that apply)*

- ☐ Hiking (1)
- ☐ Trail biking (2)
- ☐ Non-motorized boating (3)
- ☐ Motorized boating (13)
- ☐ Hunting (4)
- ☐ Fishing (5)
- ☐ ATV/ Dirt bike riding (6)
- ☐ Trapping (7)
- ☐ Foraging (8)
- ☐ Rock climbing (9)

- [ ] Swimming (10)
- [ ] Other (11) _____
- [ ] Other (12) _____

Display this question:

If Does your Organization allow any outdoor recreation on your Field Station for the general public?... = Yes

Q54 Does your Organization allow overnight stays on your Field Station for the general public for outdoor recreation?

- ○ Yes (1)
- ○ No (2)

Display this question:

If Does your Organization allow overnight stays on your Field Station for the general public for out... = Yes

Q55 What kind of overnight stays are allowed on your Field Station for the general public for outdoor recreation? *(Check all that apply)*

- [ ] Primitive camping (1)
- [ ] RV camping (2)
- [ ] Dorms (3)

☐ Cabins (4)

☐ Other (5) _____

☐ Other (6) _____

Q56 Does your Organization's Field Station have a visitor center open to the general public.

○ Yes (1)

○ No (2)

End of Block: Field Station Recreation

Start of Block: Sharing Information and Final Comments

Q57 Is there anything you would like to share or any additional thoughts or remarks you may have about topics on this survey and/or your Organization and Field Station?

_____

_____

_____

_____

_____

Q58 If available, please attach any related documents, fact sheets, and/or annual reports about your Organization and Field Station that you would be willing to share.

End of Block: Sharing Information and Final Comments