



The 2021-22 Southeast New England Program Stewardship Mapping and Assessment Project Report

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ABSTRACT

In this technical report, we describe the outcomes of a survey of civic environmental stewardship groups in the Southeast New England Program (SNEP) region, which includes the watersheds of Narragansett Bay, Buzzards Bay, Cape Cod, and adjacent Islands. Data collection occurred from November 2020 to June 2021 and involved the creation of a database of environmental stewardship groups (n = 718) who were contacted to participate, resulting in a final sample of 149 valid survey responses. This document reports on the attributes of responding organizations activities (e.g., primary stewardship activities, stewardship foci, etc.) and capacities (e.g., budget, number of staff / volunteers, etc.), organizational network (n = 740 to 638 organizations depending on the level of sub-program and regional chapter aggregation), and geographies of stewardship organizations in the SNEP region. The project culminated in an online interactive map that allows people to view the data with the aim of learning about the groups stewarding specific places, their activities, and their networks. The interactive map is meant to help groups build capacity to enhance environmental stewardship. The report discusses several ways in which the data might be used to build such capacity, including working towards addressing specific environmental justice-oriented activities in the region.

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EXECUTIVE SUMMARY

Addressing the challenges of stormwater management and habitat restoration requires innovative solutions through collaboration from a range of actors. As we seek to respond to complex problems through strategies that connect land use to water quality, prioritize community-based restoration, respond to shrinking regulatory oversight, and enhance social-ecological system resilience more broadly, it is important to understand the network of existing non-governmental stewardship organizations in the region. The Stewardship Mapping and Assessment Project (Stew-MAP) was conducted in the Southeast New England Program (SNEP) region, as a part of the larger stormwater and habitat restoration efforts of the Southeast New England Program Network (SNEP Network). For the purposes of this project, stewardship organizations are defined broadly as civic organizations with 2 or more people who focus on at least one of the following twelve functions of stewardship: to conserve, manage, monitor, transform, care for specific living things, build partnerships, engage in place-based traditional gathering of resources for consumption, restore native habitat, prepare for environmental disturbances, fund or provide in-kind material support, and educate on and/or advocate for the environment across a defined city, region, or landscape.

In order to understand these organizational dynamics, we utilized the Stew-MAP methodology (Svendsen et al. 2016) to develop a survey and public database to map the range of stewardship activities and networks, with the goal of strengthening community capacity for stewardship in this region. From this approach, we have the opportunity to learn about groups who take care of this region, where they are working, the issues they are working on, and which topics and areas have a concentration of care as well as where gaps may lie.

Data were collected in 2020 to 2021 in the southeastern New England region. A survey asking about attributes, geographies and network relationships was sent out to 718 potential environmental stewardship groups. Completed responses from 149 groups were used to establish a southeastern New England stewardship network that reported a total of 740 network partners that includes sub-programs or regional organizational chapters. For analytical reasons any sub-programs or regional chapters were aggregated to their largest organizational unit resulting in a final network of 638 organizations.

Key Takeaways

Organizational characteristics

- 57% of the organizations' primary stewardship focuses are on the environment, followed by education (5.4%), community improvement (5.4%), food (4.7%) and climate change (4.7%).
- The primary site, system or green infrastructure type worked on by groups was conservation lands (27%), followed by watersheds (14.2%) and the response "no single type" (7.4%)
- Participating groups had on average been established for 36 years, with a median of 32 years; the median staff was 0 full time, 1 part time, and 100 members and 40 volunteers. Budgets also range from over \$40 million to 51 groups reporting no budget at all. The most common funding source was individual donations, with fees, fundraisers and foundation support rounding out the top three most common funding sources.

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Stewardship Geography

- Groups work in a variety of places and at different geographic scales, from small school gardens to expanses beyond the geography of the SNEP region.
- A number of groups overlap multiple estuary basin watersheds with the majority of organizations in our database working in either the Narragansett Bay watershed, or spanning the Narragansett Bay and Buzzards Bay watersheds.
- The data can be viewed in a publicly available online interactive map. Groups can be selected by point location or watershed area, which will generate a summary of stewardship activities and capacities of groups in the selected area.

Network patterns

- The total reported network included 740 organizations, which includes regional chapters and sub-programs for certain agencies. When aggregated, the network is 638 organizations.
- The knowledge network is much larger than the funding and other key collaborator networks.
- The networks were decentralized, meaning no single group acts as a central unifying actor. They had a relatively low density, meaning that the existing number of relationships are a small fraction of the total possible relationships.
- The knowledge network was contiguous, meaning that in theory, information can

travel throughout the network; i.e., it was not fragmented. The funding network was fragmented.

- Survey respondents also reported who they would like to collaborate with, but had not been able to, and the reasons why they wanted to work with the other groups. These data illustrate opportunities for enhancing collaboration in the region, including several specifically stated desires to work more closely with tribes in a meaningful way and to support environmental justice initiatives.

More is Possible!

We acknowledge that this report represents a top-level reporting of the possible questions that could be asked to the information collected in this Stew-MAP survey. Therefore, and in line with many other [Stew-MAP efforts](#), we created an online [publicly-accessible dashboard tool with the Stew-MAP data](#) already included for spatial and attribute query, as well as for network viewing. Additionally, the geospatial, attribute and network data is available for download on this dashboard and the SNEP Network website. Links to these resources can be found at the end of this report.

Finally, we are available to discuss the SNEP Stew-MAP data and analyses that might be of interest to you. Please contact Bryce DuBois (bdubois@holycross.edu) and Jesse Sayles (jessesayles@gmail.com), and we will do our best to answer your questions.

1. INTRODUCTION

1.1 Stewardship in Southeast New England

Southeast New England encompasses the estuary watersheds of Narragansett Bay, Buzzards Bay, and Cape Cod and adjacent Islands, spanning the states of Rhode Island and Massachusetts, USA (Figure 1.1). These watersheds are economically, socially, and ecologically important and include a patchwork of forested, agricultural, and urban lands, plus estuaries, rivers, and coastal shores. Eelgrass, saltmarsh, and floodplain areas weave into the region, providing critical storm and flood protection. Conserving and restoring this green infrastructure is an important issue for many of the region's stakeholders (EPA 2021a).

While several watershed management programs have existed since the late 20th century, many groups throughout the region recognized the potential benefits of a broader regional funding and coordination framework. In response, the US Congress established the Southeast New England Program (SNEP) in 2012 (boundaries shown in Figure 1.1), an interagency group that would be administered by the US. Environmental Protection Agency (EPA 2021a).

The SNEP program consists of committees and subcommittees with representatives from federal, state, tribal, and local governments, nongovernmental organizations (NGOs), and regional planning associations (EPA 2021a). Committees guide the network's allocation of several grant programs as well as technical assistance networks (i.e., the SNEP Network) that provides direct assistance, trainings, and capacity building activities to the region's 133 municipalities (located wholly or partially within the SNEP watershed boundary; 94 in MA and 39 in RI), tribes (two federally recognized, i.e., having a formal relationship with the US federal government and holding rights to a certain level of self-government and federal benefits, and

four non-federally recognized) and numerous NGOs.

To better understand the diversity of organizations working on environmental issues in the SNEP region, along with supporting knowledge and funding networks, several SNEP Network partners implemented a stewardship mapping (Stew-MAP) project.



Figure 1.1 Study area map of the SNEP region, which constitutes the three major estuary watersheds: Narragansett Bay, Buzzards Bay, Cape Cod and adjacent Islands (colored borders in map), spanning the states of Rhode Island and Massachusetts, USA. Watershed boundaries are derived from publicly available data from the Narragansett Bay Estuary Program, the Buzzards Bay Estuary Program, and the US Geological Survey.

1.2 About Stew-MAP

Stew-MAP is a research approach developed by the United States Forest Service (USFS) to identify environmental stewardship organizations working in a given region, to record various information about their organizational capacity and stewardship foci, to spatially map where they work, and document their information exchange, funding, and collaboration networks (Svendsen et al. 2016). The Stew-MAP research process and resulting data and visualizations are meant to support community organization and build stewardship capacity. Stew-MAP projects generally culminate in an interactive public online mapping tool to visualize and query that data to support and enhance stewardship capacity in the area. Stew-MAP projects have been carried out in numerous locations throughout the United States and internationally. You can learn more about Stew-MAP at <https://www.fs.usda.gov/research/projects/stew-map>.

1.3 About the SNEP Network

In the fall of 2019, the US Environmental Protection Agency (US EPA) awarded a five-year cooperative agreement to the New England Environmental Finance Center to establish a technical assistance network for the Southeast New England region.

The [South East New England Program \(SNEP\) Network](#) is a collaboration between universities, local community organizations, regional planners and consultants whose mission is to empower communities to achieve healthy watersheds, sustainable financing, and long-term climate resilience through management of stormwater and restoration projects in Rhode Island and southeastern Massachusetts. The SNEP Network offers a full complement of free training and leadership development, technical assistance, and financial services. The Network works collaboratively with municipalities, organizations, and tribes within the SNEP region to build their local capacity and advance their level of practice for stormwater and watershed management.

Many non-profits, stewardship groups, and local institutions work day-in and day-out in the region's watersheds and shorelines. Working with water, one is constantly reminded how everything flows together, how regional and local efforts can be more than the sum of parts. Through stewardship mapping, the links between these efforts become better known, partnerships can be better supported, and new ones fostered in an effort to enhance the social infrastructure underlying climate resilience, stormwater management, and restoration.

2. METHODS

2.1 Site Description

The SNEP region (Figure 1.1) includes diverse biophysical habitats including forested, agricultural, and urban lands, estuaries, rivers, and coastal shores. Eelgrass, saltmarsh, and floodplain areas weave into the region, providing critical storm and flood protection. Conserving and restoring this green infrastructure is an important issue for many of the region's stakeholders (EPA 2021a).

The SNEP region has a population of about 2,558,732 people, 74.8% who identify as white non-hispanic, 11.5% who identify as Hispanic non-white and 6.1% who identify as Black / African American (ESRI 2021). Household median income is \$63,912 (mean \$66,208, interquartile range = \$44,451 - \$84,324; (ESRI 2021)). The region includes both rural and urban lands, working farms, aquaculture, a large fishing industry, several universities and colleges, and the state capital of RI. There are 133 municipalities located wholly or partially within the SNEP watershed boundary (94 in MA and 39 in RI), three federally recognized Tribes (the Narragansett Indian Tribe, the Wampanoag Tribe of Gay Head (Aquinnah) and the Mashpee Wampanoag Tribe, i.e., having a formal relationship with the US federal government and holding rights to a certain level of self-government and federal benefits) and four non-federally recognized Tribes and Tribal bands (the Manisseean Tribe, the Hassanamisco Nipmuc Band, Quinsigamond Band of Native Peoples, and the Pokanoket Tribe / Pokanoket Nation). There are a number of environmental justice (EJ) communities of concern (EPA 2021b), as defined as neighborhoods or communities

composed predominantly of persons of color or a substantial proportion of persons below the poverty line, which have an unfair and disproportionate burden of environmental impacts and often lack access to many of nature's benefits. EJ communities have often been historically underrepresented in environmental decision making processes (Bullard 1993). Supporting and building partnerships with EJ communities is an important goal of SNEP (EPA 2021a).

2.2 Research Timeline

We conducted this work in three phases (Figure 2.1). Beginning in October 2019, we sought to create an inventory of organizations and to develop the survey and approach. From November 2020 to June 2021 we surveyed the network and their alters, i.e., the individuals not in our original organizational inventory but who were named as part of organizations networks. Subsequently, from July 2021 through June 2022, the data were then processed, analyzed and the results were disseminated through several public workshops.

This survey was planned before the 2019 Covid-19 pandemic began, but we used the opportunity to add on a question related to Covid-19. The survey was launched in November 2020, nine months after a state of emergency was declared in the region, which shutdown local businesses, non-profits, and governmental agencies. This report includes all of the metrics collected, with the exception of questions about the impacts of the pandemic, which we report on elsewhere (see Merkle et al. 2022).

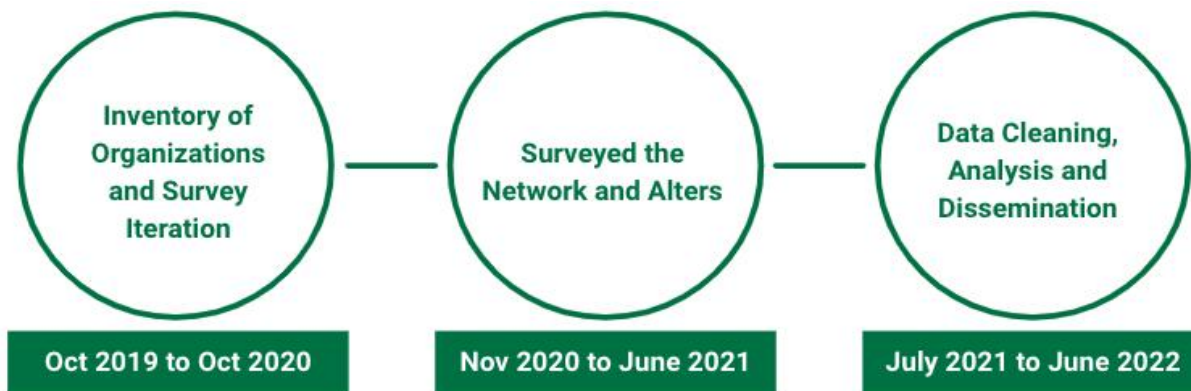


Figure 2.1 Study Timeline

2.3 Survey Approach

To understand environmental stewardship in the region, we collected data using the Stewardship Mapping and Assessment Project (Stew-MAP) methodology (Svendsen et al. 2016), which uses a standardized survey to 1) document groups’ environmental stewardship actions, organizational capacity (e.g. staff, volunteers, funds), and similar attributes, 2) map locations and the extent of where these organizations work, and 3) record the knowledge sharing and funding networks that support them, or network relationships yet to be established.

2.4 Participants and Sample

A stewardship group was defined as an organization of two or more whose work is to “conserve, manage, monitor, transform, care for specific living things, build partnerships, engage in place-based traditional gathering of resources for consumption, restore native habitat, prepare for environmental disturbances, fund or provide in-kind material support, and educate on and/or advocate for the environment across a defined city, region, or landscape” (Svendsen et al. 2016). Working with a US Office of Management and Budget (US OMB)-cleared survey format (that is required of federally supported research), we adapted the question series on organizational impacts to include a question Using this Stew-MAP methodology.

The initial database (n = 390) was developed from lists of stormwater coalitions and green infrastructure collaboratives, and through organizational lists shared by a group of large environmental organizations. Initially, this included municipal actors participating in these coalitions, but we ultimately focused only on non-governmental organizations and Native American Tribes. We recruited survey participants through snowball sampling. Following the initial data collection phase, we engaged in two additional rounds of survey recruitment to contact any new groups that were named in the network questions (see Table 2.1).

In total we contacted 718 groups and had 170 responses to the survey. While responses represent approximately 20% of the initial list, this does not represent a survey response rate. Our sampling relied on groups to self-identify as doing stewardship in the SNEP region based on a broad definition of stewardship as outlined above (also see Appendix 2). Several groups declined to participate because they did not consider what they were doing as stewardship work, or were excluded because they did not work in the region (but may have been listed as an information provider in the network questions, for example).

Researchers contacted groups with emails listed in the final sample list. For groups with no email,

but phone numbers, groups were called at least one time. Initial contacts were used to confirm contact information, discuss the Stew-MAP project, and clarify questions about the survey and SNEP Stew-MAP project. Three reminder emails were sent at 1- to 2-week intervals to groups, with additional follow up emails and contacts made once the survey was sent. From the 170 completed survey responses, researchers validated and narrowed the focus on civic society “like” groups, which involved some subjectivity. Groups were asked to identify the highest level of their organization that functioned as a unique entity. For some organizations, this led them to request that

they be broken up into unique sub-groups of the larger organization. We retained this disaggregated structure throughout the report, with the exception of the network diagrams where we collapse sub-groups into the highest parent organization. This is because there was no way of reliably knowing what, if any subprogram a group was referring to if they only mentioned the parent organization. Finally, after validating the responses and removing duplicate responses, the final count was 149 (143, less groups that requested to be omitted from the public database).

Table 2.1 Sampling Frame and Final Sample

Sampling Round	Sample
Initial sampling frame	390
Groups in final sampling frame	718
# of total responses	170
Final (less groups that requested to be omitted from public database)	149 (143 public dashboard)

3. RESULTS AND DISCUSSION

3.1 Organizational Characteristics

3.1.1 Organizational Function and Focus

Through the Stew-MAP survey, we collected information about various attributes of organizations' stewardship activities (see Appendix 1 for a complete list). Conservation and preservation of the local environment was the most common activity, followed by educating the about and advocating for the

environment (Figure 3.1). Organizations really have a single focus. So, in addition to a primary activity, groups could select all activities that they were involved in. Several stewardship activities were moderately co-occurring. Conservation, monitoring, restoring, and caring for the environment all went hand in hand with each other. Care and management were also correlated (Table 3.1, Figure 3.2).

Primary Stewardship Activities

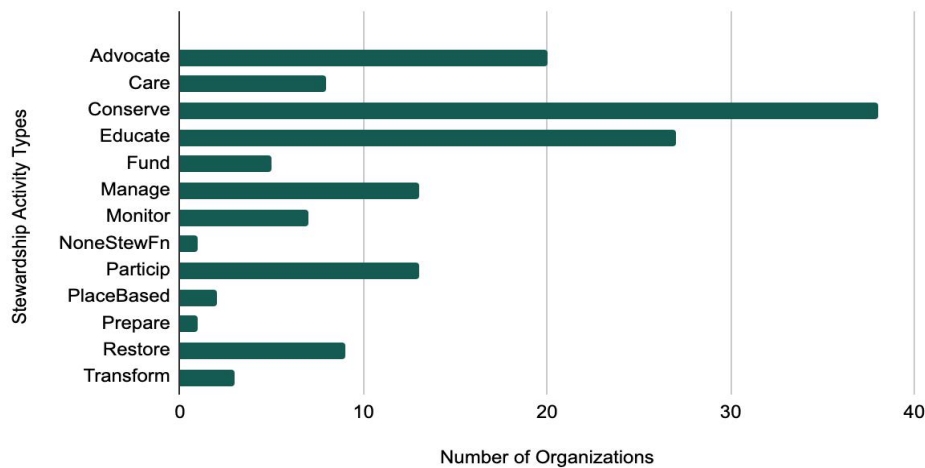


Figure 3.1 Self-reported primary stewardship activities (n = 149)

Table 3.1 Measure of association among stewardship activities (n = 149). The phi coefficient measures association among two dichotomous variables and is mathematically equivalent to the Pearson's correlation coefficients applied to dichotomous data, which was done here (Revelle 2023). Coefficient values range from -1 to 1, where ± 1 indicates perfectly negative or positive agreement (respectively) and 0 indicates no relationship. Asterisks (*) indicate a moderate to strong agreement for values more extreme than ± 0.49 .

n=149	Advocate	Care	Conserve	Educate	Fund	Manage	Monitor	Participation	Place Based	Prepare	Restore	Transform
Advocate	1.00											
Care	0.10	1.00										
Conserve	0.13	0.49*	1.00									
Educate	0.10	0.22	0.25	1.00								
Fund	0.09	0.12	0.03	0.04	1.00							
Manage	-0.03	0.50*	0.38	0.18	0.10	1.00						
Monitor	0.26	0.49*	0.49*	0.33	0.27	0.32	1.00					
Participation	0.33	0.13	0.16	0.34	0.09	0.05	0.24	1.00				
Place Based	0.14	0.27	0.21	0.16	0.11	0.16	0.22	0.16	1.00			
Prepare	0.08	0.22	0.27	0.17	0.14	0.20	0.21	0.17	0.33	1.00		
Restore	0.01	0.53*	0.57*	0.29	0.23	0.48	0.60*	0.20	0.27	0.33	1.00	
Transform	0.34	0.10	0.19	0.11	0.29	-0.04	0.27	0.15	0.26	0.22	0.14	1.00

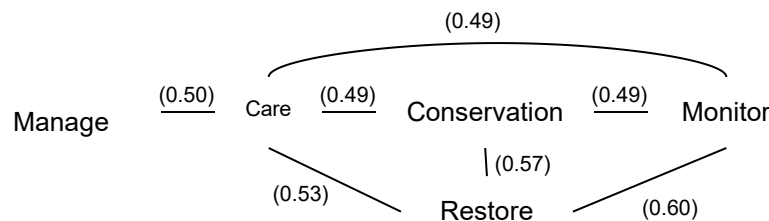


Figure 3.2 Relationships among five stewardship activities displaying moderate association, defined as having a phi coefficient equal to or stronger than ± 0.49 . Associated activities are connected by lines. Numbers report association strength. All associations were positive.

Organizations reported working on a large number of biophysical systems or linked technology- environmental systems (e.g., stormwater systems; Figure 3.3), as well as environmental sites or places (Figure 3.4). These items were not mutually exclusive, and groups could self-identify with as many systems or sites as they felt relevant. The most common systems that organizations worked on included the atmosphere, forests, wetlands, and watersheds. The most common sites included conservation lands, greenways, and parks.

Because the SNEP Network focuses on green infrastructure, we also asked organizations what aspects of green infrastructure they worked on (Figure 3.5). Again, organizations were free to select as many green infrastructure activities as they wanted. The three most common replies were conservation and protection of open spaces, lands, and waters, restoring natural features, and “none.” The relatively large number of groups reporting no green infrastructure focus is telling. These groups self-identify as active stewards of the

SNEP region but may not relate to green infrastructure goals. When trying to connect with these groups, the SNEP Network may wish to think about alternative framings to green infrastructure to help relate and convey messages to these groups.

When asked to pick a single focus from the items above (i.e., Figures 3.3, 3.4, 3.5) the most common choices were working on watersheds and conservation lands (Figure 3.6). The aforementioned focus on forestlands that was present when groups were allowed to pick multiple options drops dramatically. This shift might imply that there is more of a water focus than terrestrial one among the stewardship groups that replied to the survey.

When asked to describe what their groups primary organizational focus is, inclusive of all of their activities, the most common was environment, followed by much smaller sets of groups focused on education, community improvement, food and climate change (Figure 3.7).

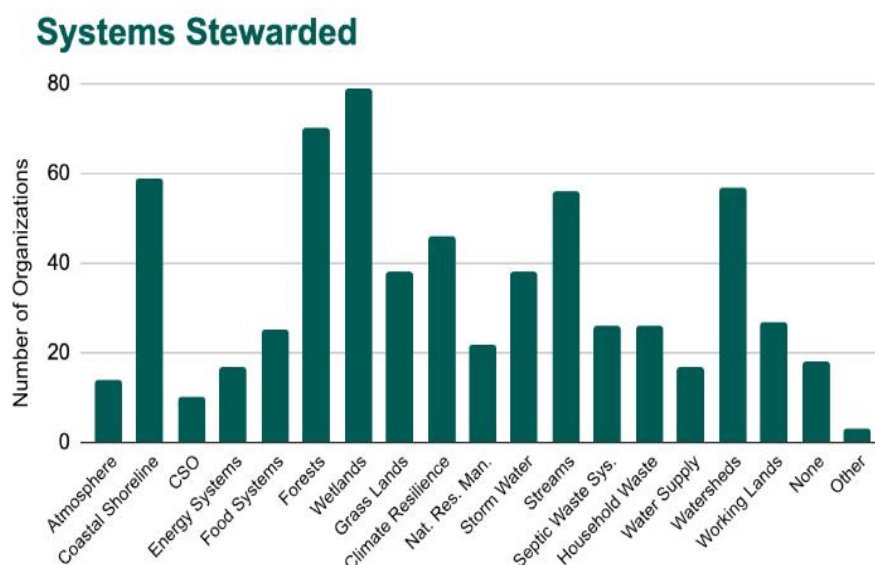


Figure 3.3 Stewardship groups’ self-identified focus on different environmental systems. Choices were not mutually exclusive and groups could select as many systems as they wanted to.

Stewardship Sites

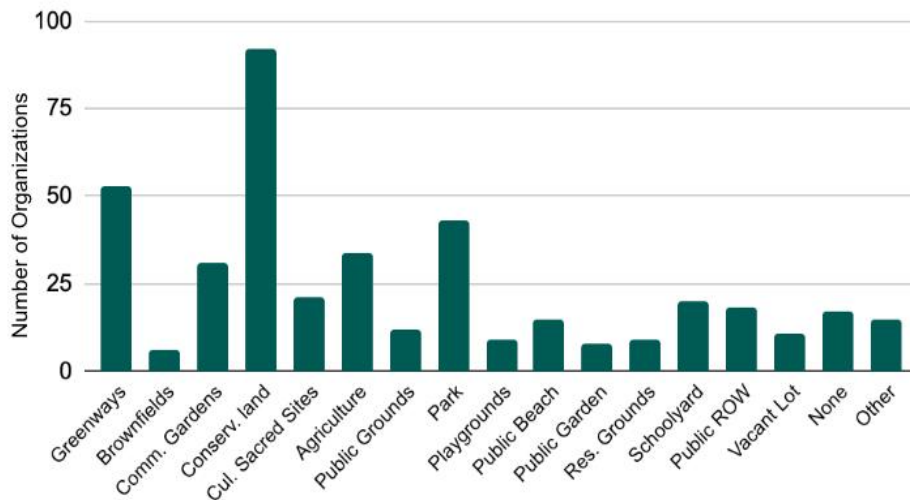


Figure 3.4 Stewardship groups' self-identified focus on different environmental sites. Choices were not mutually exclusive and groups could select as many systems as they wanted to.

Green Infrastructure Stewardship Activities

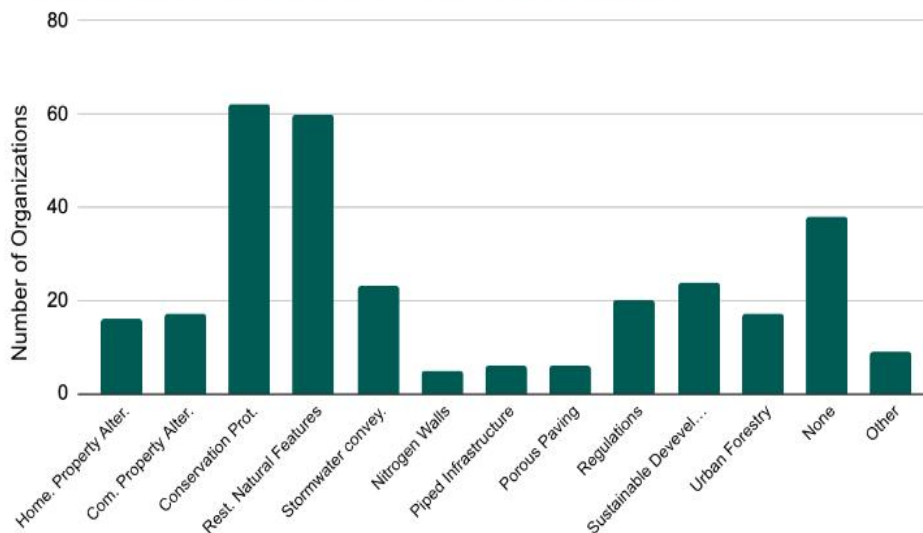


Figure 3.5 Stewardship groups' self-identified focus on different facets of green infrastructure. Choices were not mutually exclusive and groups could select as many systems as they wanted to.

Primary Sites, Systems and Green Infrastructure Activities

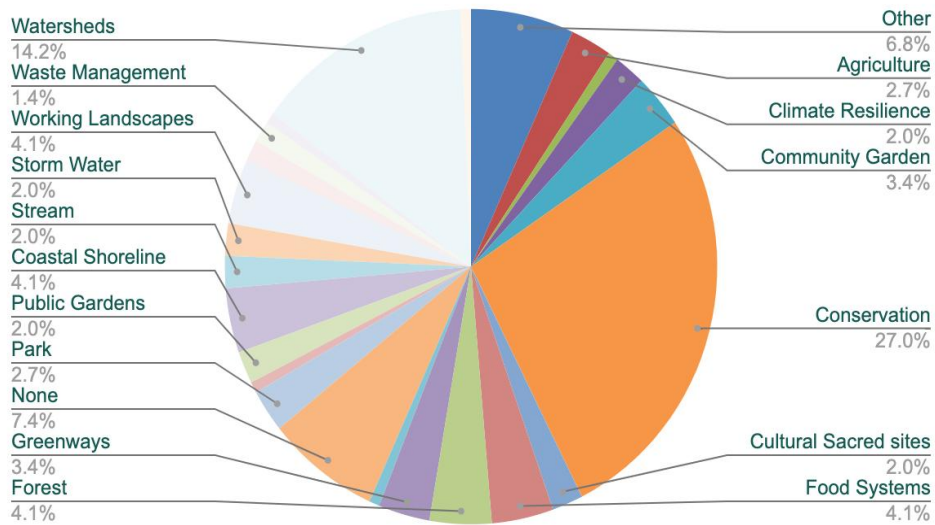


Figure 3.6 Stewardship groups' self-identified focus on a single system, site, or facet of green infrastructure. Choices were mutually exclusive and groups could only select a single item.

Primary Organizational Focus

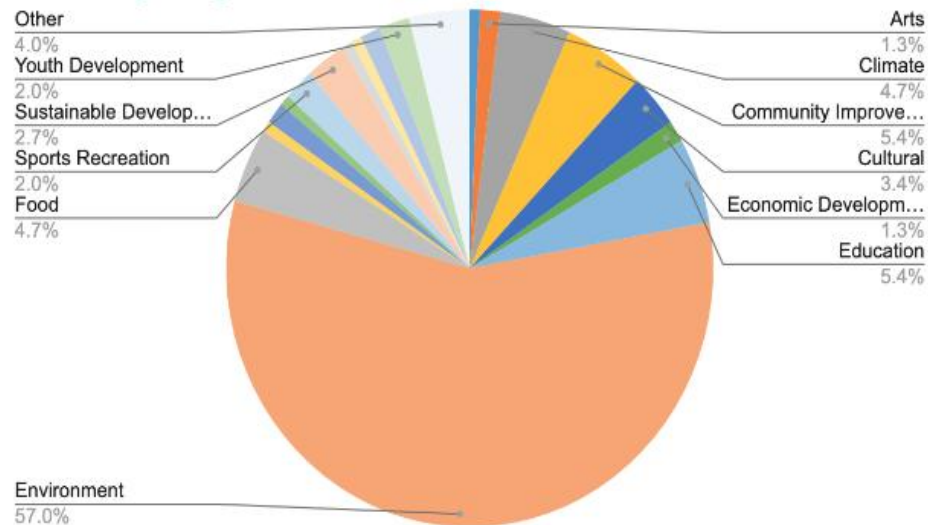


Figure 3.7. Stewardship groups' self-identified primary organizational focus.

3.1.2 Mission Statements

When stewardship groups were asked to describe their missions, the most common words or phrases were community and conservation, with 56 and 48 mentions,

respectively. Subsequent common words and phrases are listed in Table 3.2 and Figure 3.8.

Table 3.2. Ten most common words and phrases, and their frequency, used as part of stewardship groups' missions statements.

Word or Phrase	Count
Community	56
Conservation	48
Rhode Island	37
Watershed	33
People	26
Benefits	20
Natural resources	18
Open space	16
Water quality	15
Advocacy	14



Figure 3.8 Word cloud showing the frequency of different words and phrases used in stewardship groups' mission statements. The size of the font indicates the relative frequency that a word or phrase was used.

3.1.3 Organizational Capacity

Groups were also asked to report the number of years they had been in existence (i.e., age), their full time and part time staff, membership

and volunteer numbers, and budget (Table 3.3). These attributes provide insight about levels of professionalization (Johnson et al. 2019).

Table 3.3 Organizational capacity metrics including staff and budget (n = 149)

	Org. Age (yrs)	Staff			
		Full Time	Part Time	Members	Volunteers
Mean	36	81	27	7,105	374
Median	32	0	1	100	40
Max	181	1,000	600	170,000	15,000
Min	<1	0	0	0	0

3.1.4 Organizational Budgets

The most common funding source was individual donations, with fees, fundraisers and foundation support rounding out the top three. The mean organizational budget was

\$1,068,840.01, with a median budget of \$75,000.00. The largest budget was \$40,121,000.00 and 34% of organizations (51) reported no budget at all (Figure 3.9).

Types of Group Funding

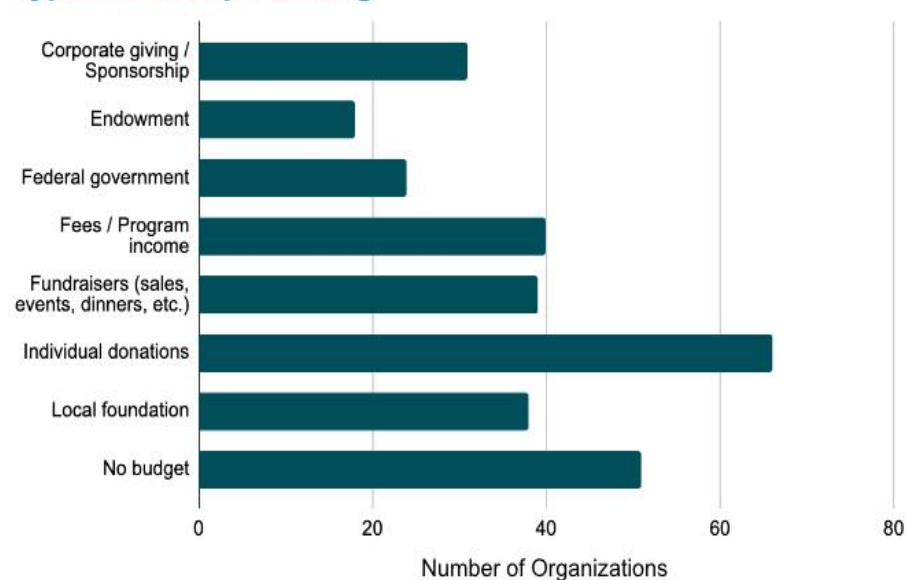


Figure 3.9. Funding sources reported.

3.1.5 Services Provided and Services Seeking

Participating groups reported the services they were seeking as well as those they provided. Ideally the services provided by half of the groups would be mirrored by the other half of the groups, providing a perfect match between supply and need. While we do not observe a perfect match, there are some service needs that seem to match demand, e.g., labor, technical assistance, and educational training. In these cases regional programs, such as the SNEP Network, looking to build capacity may simply need to help facilitate partnerships among these groups using the SNEP Stew-MAP data as a guide to understand supply and demand. Several other service supplies are well below demand, e.g., grants and legal support. In

these cases, fostering partnerships is not sufficient and programs like the SNEP Network might look to help groups develop certain skills and sharing capacity. An important caveat, however, is that we did not survey federal, state, and similar entities that likely provide a number of grants and their inclusion in the survey may have changed the supply and demand patterns observed in Figures 3.10 and 3.11. Some of these federal and state funding sources are considered later in the network analysis section of this report (Figure 3.15) as groups were asked to list who they received funding from. The network data can complement the service data to better understand the role of several federal, state, and similar funding agencies.

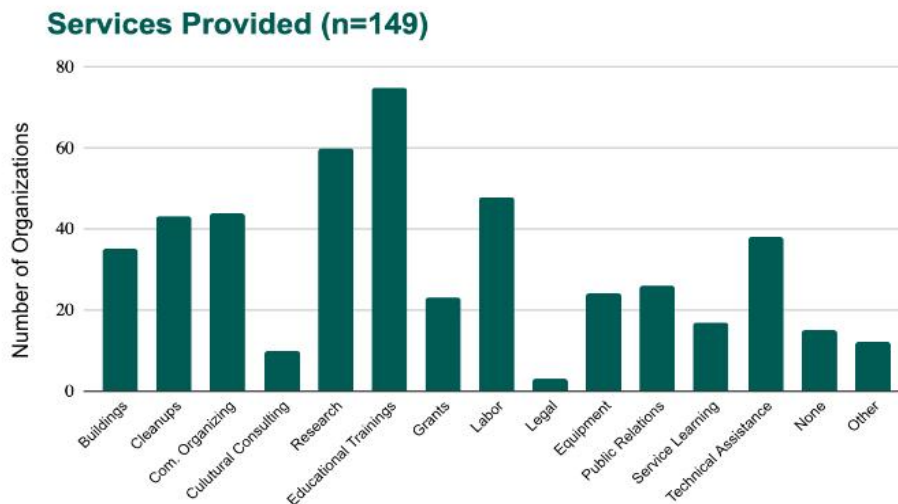


Figure 3.10. A reporting of services provided by participating stewardship groups.

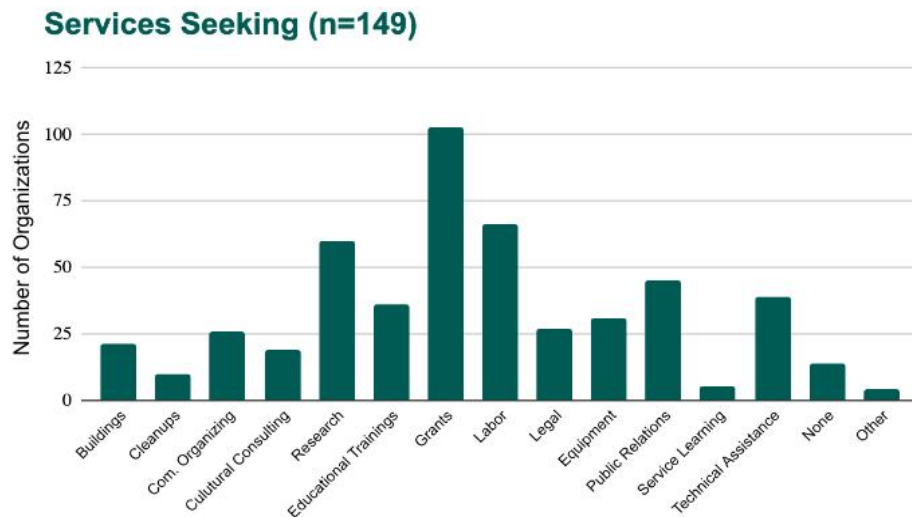


Figure 3.11. A reporting of services sought by participating stewardship groups.

3.2 Stewardship Geography and mapping

3.2.1 Interactive Stewardship Map (SNEP Stew-MAP)

As the name implies, a major part of Stew-MAP is to map where organizations work. The SNEP Stew-MAP itself, is an [interactive dashboard](#) (Figure 3.12). Each group that responded to the survey has a mapped area called a “turf,” which is the geographic area that an organization identified as being where they work. Turfs are linked to each group's attribute data (presented in section 3.1) and clicking on a turf in the interactive online mapping dashboard will allow users to see specific details about the organization, such as the primary stewardship activity, focus areas, site and system types, and other information.

Stewardship geography can be investigated in several ways using the interactive online

dashboard. Selecting an area on the map will pull up a window that allows users to scroll through and view each group whose turf intersects the area selected (Figure 3.13). Another way to explore the data geographically is by selecting a particular estuary basin (e.g., Cape Cod and the Islands, Buzzards Bay, and Narragansett Bay) or smaller watershed (e.g., the Blackstone or Taunton Watersheds).

All groups whose turfs intersect the selected basin or watershed will appear in the viewing window (Figure 3.14). Summary information about the number of stewardship groups and activities will also appear on the dashboard after making a selection (by clicking or selecting a basin or watershed). See Appendix 4 for a more detailed discussion of the interactive dashboard.

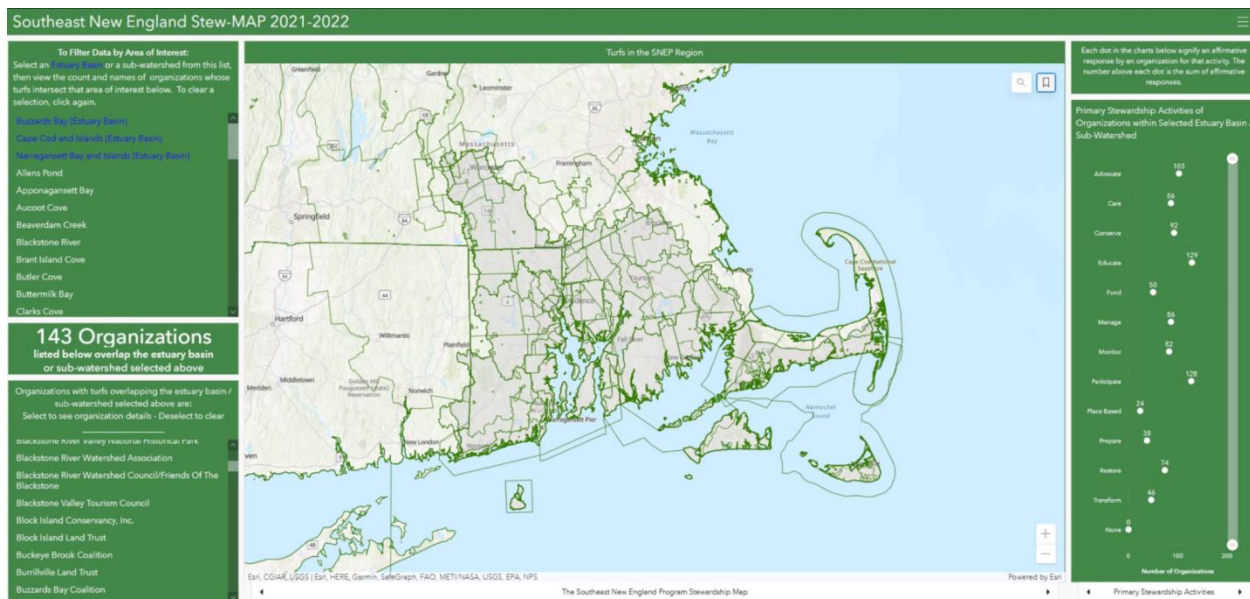


Figure 3.12. Screen capture of the [interactive online SNE Stew-MAP](#).

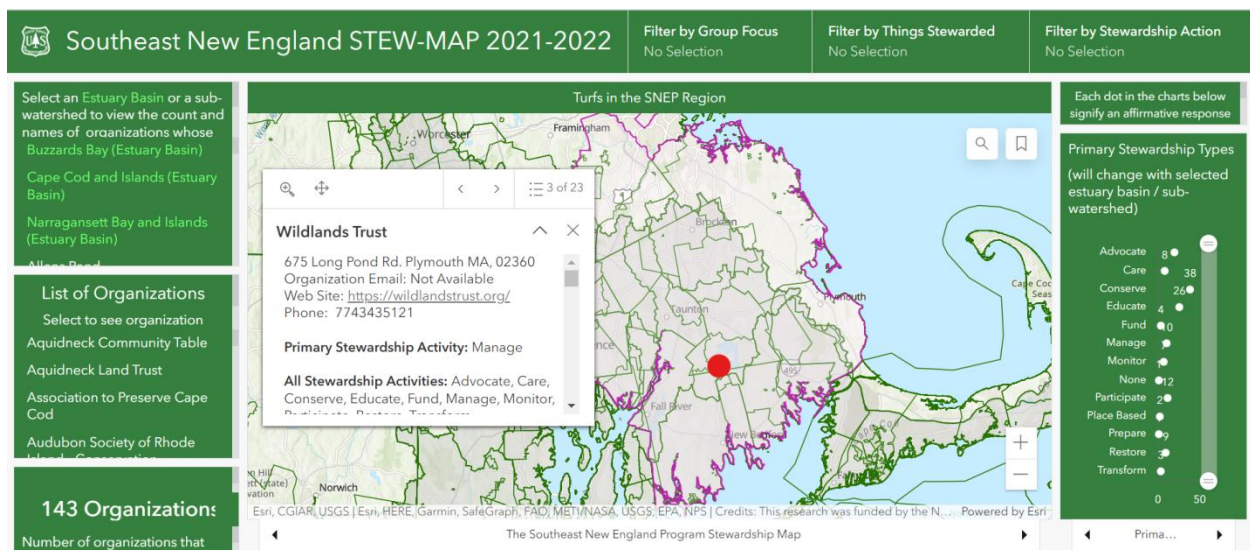


Figure 3.13. Interacting with the map by selecting a location. The map was clicked approximately at the red dot (which is added here for graphical representation). Clicking on a location in the map produces a box listing all organizations whose turfs overlap that location. In this case, there are 23 overlapping turfs.



Figure 3.14. Interacting with the map by selecting an estuary basin or watershed. In this case, the Cape Cod and Islands Estuary Basin was selected, highlighting the geography, and reducing the total list of organizations down to 46 organizations whose turfs overlap the watershed.

3.2.1. Turf Locations and Sizes

The Majority of organizations in our database work in either the Narragansett Bay watershed, or between the Narragansett Bay and Buzzards Bay watersheds (Table 3.4). Organization turfs vary in size, from small groups working on a school garden, to those working beyond the geography of the SNEP region (Table 3.4)

A number of groups' turfs overlap multiple basins (Table 3.4) with the majority of organizations in our database working in either the Narragansett Bay watershed, or spanning the Narragansett Bay and Buzzards Bay watersheds (Table 3.4).

Table 3.4. Turf size (in hectares) and number of turfs in different estuary basins in the SNEP region for the 143 organizations in the public facing data. In assigning turfs to a basin, we applied a negative half kilometer buffer in the search area to omit small overlaps which can occur when integrating geospatial data from multiple sources (Further details in Appendix 3; n=143)

Basins	Count	Turf Area (hectares)		
		Mean	Max	Min
Narragansett Bay	62	39,637.33	602,116.91	0.05
Buzzards Bay	7	3,216.70	9,619.87	0.02
Cape Cod	18	20,271.77	189,915.17	113.65
Narragansett & Buzzards Bay	28	230,311.42	432,591.23	279.57
Buzzards Bay & Cape Cod	7	94,778.33	280,107.37	92.70
Narragansett & Cape Cod	0	0	0	0
All three basins	21	6,920,020.39	37,531,652.18	9,472.80

3.3 Stewardship Networks

3.3.1. Representing the Stewardship Network

The third focus of Stew-MAP is documenting who participants receive knowledge and funding from, and other organizations that they consider to be key collaborators. These data form a set of networks that show how organizations in the SNEP region interact. The data can be used to understand who works together and why, as well as identifying opportunities for building collaborations or knowledge sharing relationships.

The total network (aggregating knowledge sharing, funding, and other key collaborators) reported by the 149 SNEP Stew-MAP participants included 740 named organizations. Many of these organizations were sub-programs, departments, or chapters of larger organizations or government agencies. Likewise, some stewardship organizations chose to participate in the SNEP Stew-MAP as regional chapters or sub-programs (e.g., individual programs of the Audubon Society within MA and RI State level chapters). Representing this information as a network requires common naming conventions and we aggregated sub-programs to larger parent organizations, resulting in a network of 638 organizations, which was further reduced to 632 for the 143 participants in the public facing data. Therefore, there are some differences between the names in the network data and in the interactive online GIS map. (If you are interested in working with the disaggregated data please contact Bryce DuBois and/or Jesse Sayles.)

3.3.2. Visualizing Stewardship Networks

A lot can be learned by simply looking at the patterns of relationships in the network. Figure 3.15 a-d shows maps of the a) knowledge sharing, b) funding, c) other key collaborators, and d) all of these combined. The arrows go from the organization, called nodes in the network, that completed the survey to the organization that they named. **Don't get**

confused by the arrow direction. The arrows are not showing the flow of information or funding. They are showing where stewardship groups go for information, or funding, or who they consider to be key collaborators.

The knowledge sharing network (n = 458) is larger than the funding (n = 243) and other key collaborator networks (n = 207). The knowledge sharing network is rather cohesive, constituting one large network with three small groups of organizations that are not connected to the larger network. Accordingly, it is likely that information can travel throughout the network. The knowledge network is decentralized (see statistical details in Appendix 5), meaning that no single, or small group of organizations, can reach everyone in the network.

Of the 891 documented knowledge sharing relationships (represented as lines connected nodes in the graph, Figure 3.15), 14.9% are two-way, where both groups said they seek knowledge from one another. This is called reciprocity, and it was only calculated among survey respondents (red nodes in Figure 3.15) as non-respondents cannot return relationships since they did not complete surveys. These reciprocal relationships likely indicate more robust partnerships as reciprocity can reinforce trust building in collaborative processes (Berardo and Scholz 2010). The funding and key collaborator networks themselves, however, had no reciprocal relationships. Zero reciprocity is not surprising in the funding network as organizations tend to receive money from funders and do not send money back to them. Reciprocity increases (16.60%) when all the networks are combined indicating that relationships in the funding and other networks help create additional two-way exchanges with the knowledge network.

In the online interactive dashboard, you can **zoom in and out** to see which groups are highly

connected or that may be working in the periphery of the network. You can **click on groups** to see their network neighbors. You might also be able to see if any groups bridge two or more otherwise disconnected sections of the network. Bridgers are often in an important position to share knowledge or coordinate among different sub-networks.

Network diagrams can reveal a lot of patterns about who is connected and in what way; however, the specific implications are often contextual. For example, a highly connected organization, one with many incoming arrows (e.g., people seek information from it), might be in a powerful position to disseminate information or coordinate activities. This organization may, however, also be overburdened and unable to work effectively if it lacks the resources to engage with all groups

seeking collaboration. Table 3.5 shows the top ten organizations based on the number of incoming connections in each slice of the network. These groups were nominated as an important source of knowledge, funding, or collaborator by others and are thus, likely central or key players in the network.

When networks are very large, it can be hard to make sense of all the connections and patterns visually. In such cases, descriptive statistics can help, however, the precise implications of a given numerical value on network function can be contextual. We therefore present numerical descriptions of the network in Appendix 5 along with a theoretical discussion of what these numbers might imply. The data in Appendix 5 are primarily meant to help scientists looking to compare the SNEP Stew-MAP network to other Stew-MAP projects.

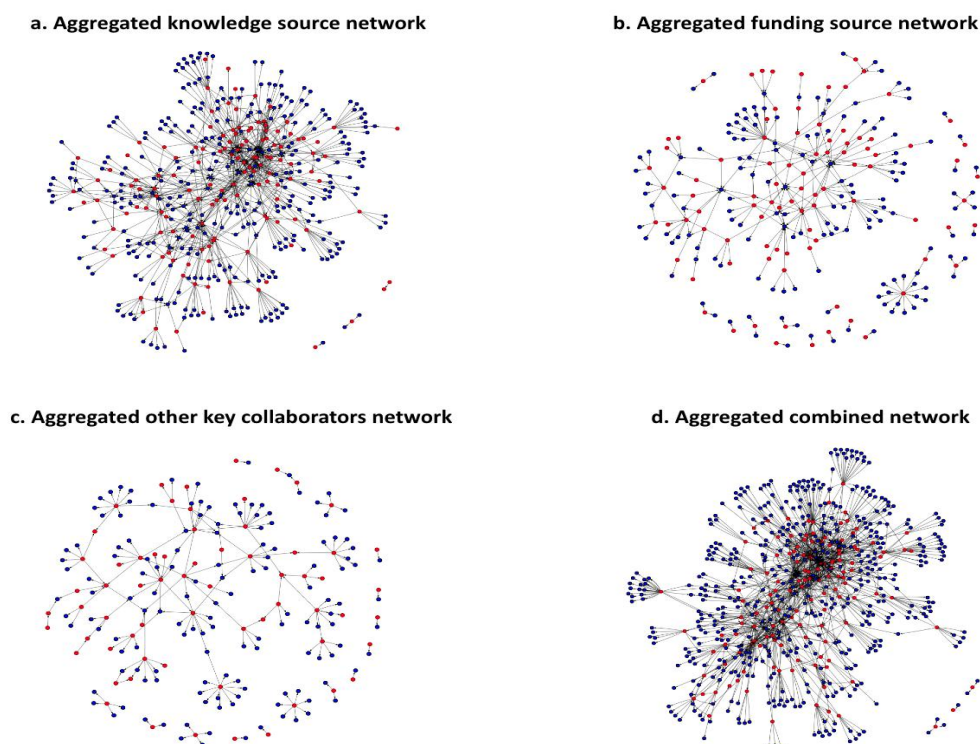


Figure 3.15. Network maps of a) knowledge sharing ($n = 458$), b) funding ($n = 243$), c) other key collaborator ($n = 207$) networks, and d) the combined network ($n = 632$) of all three. Red and blue circles depict organizations that completed or did not complete the survey, respectively. Arrows indicate who groups named; i.e., where stewardship groups go for information, or funding, or who they consider to be key collaborators.

Table 3.5. Organizations with the highest number of incoming relationships, called in-degree, (i.e., they were named by other groups) for each network type. These groups have a central role in the network.

Aggregated Combined Network		Aggregated Knowledge Source Network		Aggregated Funding Source Network		Aggregated Other Key Collaborator Network	
Organization	In-degree measure	Organization	In-degree measure	Organization	In-degree measure	Organization*	In-degree measure
RI DEM	45	RI DEM	42	Rhode Island Foundation	17	The Nature Conservancy	4
The Nature Conservancy	34	The Nature Conservancy	30	USDA NRCS	12	Mass Audubon	4
University of RI	28	University of RI	25	RI DEM	11	University of RI	4
Mass Audubon	23	Mass Audubon	20	SNEP	9	US FWS	3
USDA NRCS	21	Save The Bay	18	US EPA	5	MA DFW	3
Save The Bay	20	USDA NRCS	17	MA DCR	5	National Grid	3
US EPA	18	US EPA	16	US NPS	4	RI DEM	3
Audubon Society of RI	18	Audubon Society of RI	16	University of RI	4	City of Providence	3
Rhode Island Foundation	17	Rhode Island Land Trust Council	15	New England Grassroots Environment Fund	4		
Rhode Island Land Trust Council	17	RI CRMC	14	MA DER	4		

* In the other key collaborator network, only eight organizations are reported because numerous groups had an in-degree of 2 representing a tie for the ninth ranked spot.

3.3.3. Extending Beyond the Existing Network

In the SNEP Stew-MAP survey, we asked groups who they would like to, but had not been able to, collaborate with. Naming desired contacts, or groups that one was unable to connect with, could be a sensitive topic. We therefore informed all survey participants that this part of the data would not be included in the public facing data or dashboard. As such, the results are presented in aggregate below (Figure 3.16).

There were 56 survey respondents that provided data about desired contacts. This open-ended question allowed for a range of response types, with some respondents naming specific organizations and others listing categories of desired partners (Table 3.6). In total, 109 specific organizations or general groups (including “all”) were listed Table 3.6), highlighting ample opportunities to build network connections in the SNEP region. The nonprofit sector was the most common sector that people wanted to collaborate with (Figure

3.17). SNEP and The Nature Conservancy (TNC) were the most common named groups, each being mentioned 4 times. All other groups were only named once or twice and there were no cases where two groups named each other. These numbers, however, likely underrepresent the desired collaborations and possibility of reciprocal requests because so many respondents provided general categories as opposed to specifically named groups. For example, the Narragansett Indian Tribe was named twice and the Mashpee Wampanoag Tribe was named once, while three other respondents reported that they would like to work more with indigenous groups in the region. While we cannot be sure which indigenous groups these respondents want to work with, it is quite possible that the named tribes would receive more nominations had these participants listed specific tribes. Likewise the 24 general mentions of “nonprofits” might create several reciprocal relationships or highlight other prominent nonprofit groups had specific names been given.

Interestingly, a frequent response was “none” (n = 10) implying that some groups felt that they have been able to make all the collaborations that they want. One group, however, specifically listed another group that

said “none” (Figure 3.16) implying that the sentiment is not always reciprocal. Even if a group feels that they do not need more collaborations, it may be important to discuss with them about why other groups may be seeking to work with them and to remain open to such possibilities.

We also asked participants to describe the reason why they were seeking to collaborate with these additional partners (Figure 3.18). We aggregated their open-ended responses into a set of categories that we determined when reading the data (a process called inductive thematic coding; Table 3.6). The most common reasons for seeking collaborations were for specific projects or goals (n = 15), seeking knowledge or expertise (n = 8), seeking funding (n = 5), and on issues of coordination and collaboration (n = 5). A handful of groups described how they wanted to work with tribal groups to incorporate diverse perspectives into their work (n = 3), while two others described wanting to provide support to environmental justice groups or low-income schools. These later replies illustrate how the data could be used as a first step to building relationships that help to address environmental justice issues in the region.

Table 3.6. Response type, and counts, provided when asked who groups would like to, but had not been able to, collaborate with.

Type of response	Count
Specific group names	78
General categories reported (e.g., “nonprofits”)	28
The response: “none”	10
The response: “all groups”	03
Other open ended responses that did not name a group or type, but indicated a willingness or desire to collaborate.	03

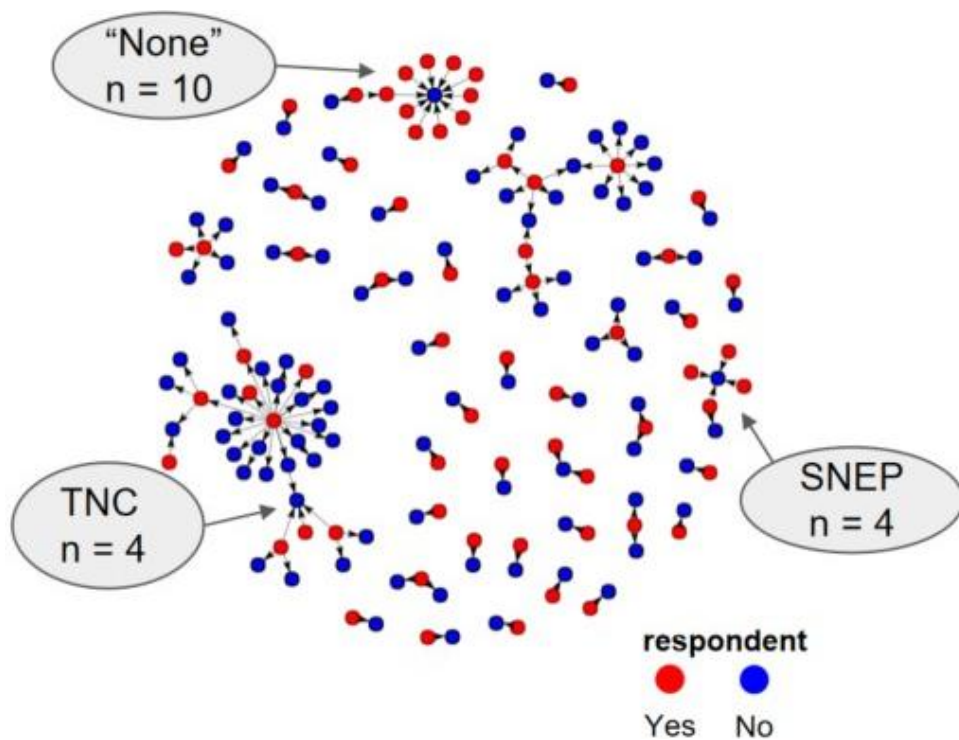


Figure 3.16. Network diagram showing data about who stewardship organizations would like to, but had not been able to, collaborate with. Red and blue circles depict organizations that completed or did not complete the survey, respectively. The network has a very fragmented structure in part because while some groups named specific organizations, others named general categories of groups that they would like to work with. The three most common responses, The Nature Conservancy (TNC), SNEP, and the response “None” are labeled in the diagram.

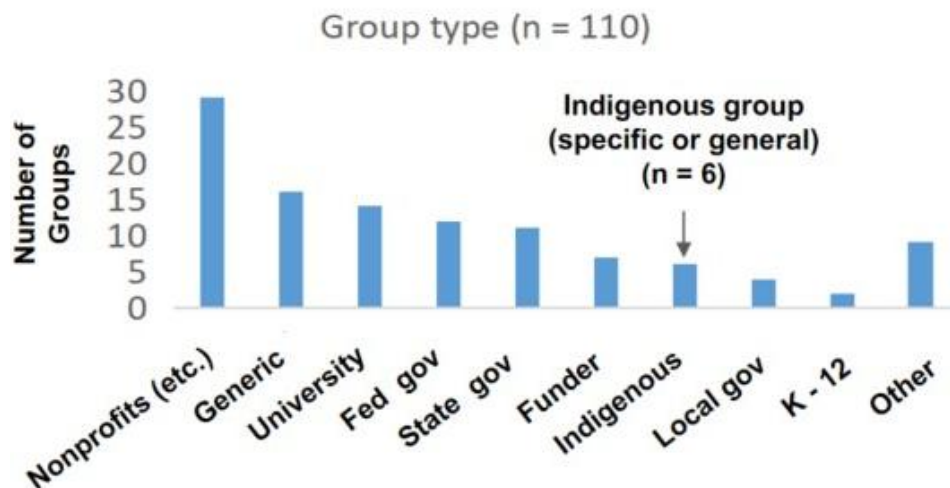


Figure 3.17. Desired collaborations by group type. “Generic” includes cases where an organization wished to work with a general category that could not be reduced to a single category, such as “environmental justice groups,” or to collaborate in general in a given region.

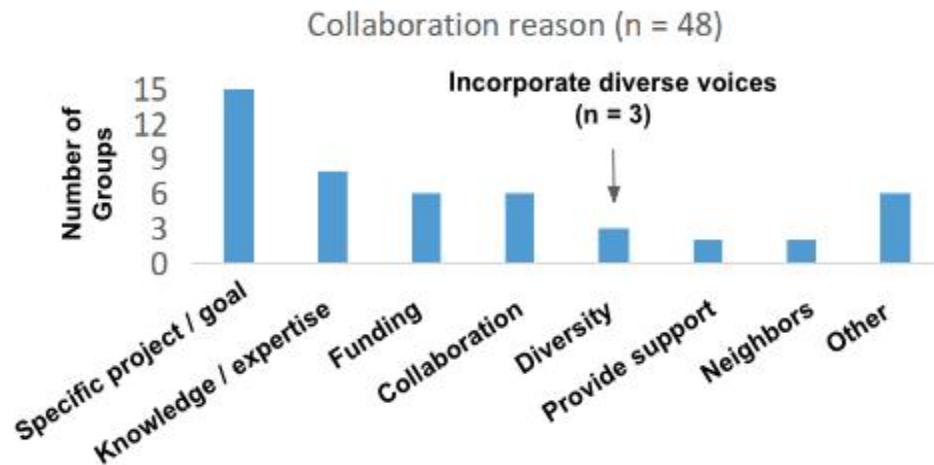


Figure 3.18. Stated reasons why survey respondents wanted to build additional collaborations. Reasons were not provided for every case, thus the total number of reasons (n = 48) is lower than the total number of named groups (specific or general).

4. CONCLUSION

4.1. Summary

The natural resource community focuses a great deal on measuring the natural environment and less on the people doing the work. SNEP Stew-MAP is a systematic analysis of environmental organizations in the Southeast New England region; making visible the groups of people who care for this region. This Stew-MAP project highlights that there are a number of groups working at different geographic scales, with diverse goals, and varying capacities to advance environmental stewardship in the SNEP region.

This report is a top-level reporting of the possible questions that could be asked to the information collected in this SNEP Stew-MAP survey. Therefore, and in line with many other Stew-MAP efforts, we created an online publicly-accessible dashboard tool with the SNEP Stew-MAP data already included for spatial and attribute query, as well as for network viewing. Additionally, the geospatial, attribute and network data is available for download on this dashboard and the SNEP Network website. Links to these resources can be found below.

4.2. Limitations and next steps

The SNEP Stew-MAP project and interactive dashboard are an important first step documenting who stewards Southeastern New England's environment, their capacity, and foci. As is the case with any public survey, the SNEP Stew-MAP cannot document every group. Indeed, the network data sets reveal that there are many more organizations ($n = 638$) and sub-programs ($n = 740$) than participated in the survey ($n = 149$). Some organizations chose not to participate because they were busy, which is not uncommon in such network studies (Borgatti et al. 2013). Others did not participate because they did not self-identify as an environmental stewardship group, even though a participating organization identified them as a

partner illustrating that environmental stewardship networks are highly dynamic, perhaps exhibiting gradients of membership.

The SNEP Stew-MAP sample is also not necessarily statistically generalizable to the region as a whole. We used a snowball sampling approach, which is common and appropriate in cases where the population is unknown. Indeed, a major focus of the SNEP Stew-MAP project was to gain a better understanding of the groups working on environmental stewardship in the region precisely because there was no comprehensive picture of how many groups were working and in what locations. We started with a large initial set of organizations ($n = 390$) and followed up with new groups that they listed in their network. We repeated this process several times. Starting with such a large initial sample should help to ensure that sampling efforts reach out to a diverse set of organizations. If an organization is truly isolated from the main network, it is possible that they would not be reached. This is a known limitation of snowball sampling (Borgatti et al. 2013).

The SNEP Stew-MAP is therefore only a partial representation of the organizations working to steward the lands and waters of the SNEP region. The project is a valuable first effort to map these groups; however any omissions of specific groups should be taken in context of the inherent limits of such a mapping effort.

These limitations are not unique to SNEP. Ways to improve Stewardship mapping are regularly discussed by the community of scientists working on Stew-MAPs across the Nation at regular meetings through a community of practice (see <https://www.fs.usda.gov/research/projects/stew-map>). Future work will investigate technological and methodological

advancements to more quickly document groups and with less resources, to facilitate efforts to allow organizations to add themselves and update information on a regular basis, and better track the change and growth in stewardship networks over time.

4.3. Opportunities for your groups

We hope that the data and visualization tools might help your organization:

- Discover new partners to help increase resources, capacity, diversity, and outreach.
- Build new or enhance existing collaboration and coordination by looking at strategic opportunities to make new partnerships.
- Support agents of change by acknowledging the work of grassroots groups in vulnerable communities.
- Examine stewardship strengths and gaps in a given area or on a given topic.
- Supporting environmental justice work.

We are available to discuss the SNEP Stew-MAP data and analyses that might be of interest to you. Please contact Bryce DuBois (bdubois@holycross.edu) and Jesse Sayles (jessesayles@gmail.com), and we will do our best to answer your questions.

4.4. Resources

- SNEP Stewardship Mapping website: <https://snepnetwork.org/stewardship-mapping/>
- Interactive SNEP Stew-MAP dashboard: <https://www.arcgis.com/apps/dashboard/index.html?appid=2fe9393c3fe343ab80cdcaf6c1a2cb33>
- Download publicly available data, reports, and recorded webinars here: <https://snepnetwork.org/stewardship-mapping-results-products-data/>
- Access information about the National project here: <https://www.fs.usda.gov/research/projects/stew-map>

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6. APPENDIX

APPENDIX 1: Table of Responding Organizations that opted to be in the public facing database (n = 143)

Aquidneck Community Table	New Bedford Whaling National Historical Park
Aquidneck Land Trust	Nipmuc Nation & Nipmuc Indian Development Corporation
Association to Preserve Cape Cod	Norman Bird Sanctuary
Audubon Society of Rhode Island - Conservation	Northern RI Conservation District
Audubon Society of Rhode Island - Education	Orleans Can
Audubon Society of Rhode Island - Policy	Orleans Conservation Trust
Barnstable Clean Water Coalition	Orleans Pond Coalition
Barrington Land Conservation Trust	Our Sisters' School
BiodiversityWorks	Park Spirit of Worcester, Inc.
Blackstone Parks Conservancy	Pawtuxet River Authority
Blackstone River Coalition	Polly Hill Arboretum
Blackstone River Valley National Historical Park	Providence Stormwater Innovation Center
Blackstone River Watershed Association	Racial Environmental Justice Committee
Blackstone River Watershed Council / Friends Of The Blackstone	Resilient Taunton Watershed Network
Blackstone Valley Tourism Council	Rhode Island Blueways Alliance
Block Island Conservancy, Inc.	Rhode Island Conservation Stewardship Collaborative
Block Island Land Trust	Rhode Island Environmental Education Association
Buckeye Brook Coalition	Rhode Island Green Infrastructure Coalition
Burrillville Land Trust	Rhode Island Infrastructure Bank
Buzzards Bay Coalition	Rhode Island Invasive Species Council
Buzzards Bay National Estuary Program	Rhode Island Natural History Survey
Cape Cod Chamber of Commerce	Rhode Island Rivers Council
Cape Cod Climate Change Collaborative	Rhode Island Tree Council
Cape Cod Commission	Rhode Island Woodland Partnership
Coalition for Social Justice Education Fund	RI Forest Conservator's Organization, Inc.
College of the Holy Cross	RI Tree Farm Committee
Common Fence Point Preparedness Committee	Roger Williams Park Conservancy
Common Ground Land Trust	Roots 2Empower
Conservation Law Foundation	Sakonnet Preservation Association
Council of Seven/Royal House/Pokanoket Tribe/Pokanoket Nation	Salt Pond Areas Bird Sanctuaries, Inc.
Cyanobacteria Monitoring Collaborative	Sandplain Grassland Network
Dennis Conservation Land Trust	Save The Lakes
DownCity Design	Sessions Street Community Garden
Ducks Unlimited, Inc	Sheriff's Meadow Foundation
East Greenwich Land Trust	Simmons Stewardship and Conservation Ecology
Eastern Rhode Island Conservation District	Sippican School Garden
Eating with the Ecosystem	South Kingstown Land Trust

Environment Council of Rhode Island	Southeastern Massachusetts Pine Barrens Alliance
Fairhaven-Acushnet Land Preservation Trust	Southeastern Regional Planning & Economic Development District
Falmouth Water Stewards	Southeastern Regional Stormwater Coalition
Farm Fresh Rhode Island	Tatnuck Brook Watershed Association
Friends of Chatham Waterways	Taunton River Watershed Alliance
Friends of Mashpee National Wildlife Refuge	The 300 Committee Land Trust
Friends of Pleasant Bay	The Attleboro Land Trust
Friends of the Moshassuck	The Brewster Ponds Coalition
Garden Time, Inc.	The Community Compost Depot, Inc.
Greater Worcester Land Trust, Inc.	The Massachusetts/Rhode Island Chapter of The American Chestnut Foundation
Harwich Conservation Trust	The Rhode Island Chapter of Trout Unlimited
Haymarket People's Fund	The Rhode Island Wild Plant Society
Historic New England	The Southern New England Heritage Forest Regional Conservation Partnership
Hope's Harvest RI	The Trustees of Reservations
Linda Loring Nature Foundation	The Watch Hill Conservancy
Little Compton Historical Society	Tiverton Land Trust
Manchaug Pond Foundation	Tomaquag Museum
Manissee Tribal Council	Town of Warren Tree Commission
Martha's Vineyard Shellfish Group, Inc.	Transportation for Massachusetts
Martin Luther King (MLK) School Community Garden	URI Watershed Watch
Mass Audubon - Islands	van Beuren Charitable Foundation
Mass Audubon Climate Program	Wampanoag Tribe of Gay Head (Aquinnah) Natural Resources Department
Mass Audubon, Shaping Climate Resilient Communities	Waquoit Bay National Estuarine Research Reserve
Massachusetts Invasive plant Advisory Group	Wareham Land Trust
Massachusetts Land Trust Coalition	Warren Land Conservation Trust
Massachusetts Rivers Alliance	Warwick Land Trust
Mattapoissett Land Trust, Inc.	West Bay Land trust
MidState Trail Committee of the Worcester chapter of the AMC	West Elmwood Housing Development Corporation
Mount Hope Community Garden	Westborough Community Land Trust
Nantucket Conservation Foundation	White Oak Land Conservation Society
Nantucket Land Council	Wildlands Trust
Narragansett Bay Estuary Program	Wood Pawcatuck Wild and Scenic Rivers Council
Narragansett Land Conservancy Trust	Wood-Pawcatuck Watershed Association
Narrow River Land Trust, Inc.	Woonasquatucket River Watershed Council
Narrow River Preservation Association	Young Farmer Network of Southeastern New England
Native Plant Trust	Youth In Action
NEIWPCC	YouthBuild Providence

APPENDIX 2: Southeast New England STEW-MAP Survey Questions Only

Stewardship Mapping and Assessment Project STEW-MAP Survey: Southeastern New England 2020 Sections and Survey Questions/Answer Types

This document lists the questions and answer types (e.g., multiple choice, open ended) for the online survey of the Southeastern New England STEW-MAP project. It is meant to provide an overview and outline of the survey. The survey itself should be taken online.

Section 1: Contact Information

Your personal information is confidential. We will not share your name, personal email, personal phone number, or other identifying information with anyone outside of the research team. We may contact you if we have questions about information you provide on this survey.

- Your Name
- Your Phone Number
- Your Email
- Are you a member of a group or organization?

Section 2: Tell us About your Group

In this section you will be asked to complete general information about your group. If you are not able to answer all of the questions, please contact us to help with filling out the survey.

- What is your group name?
- What is your website? (If applicable)
- What is your Twitter handle? (If applicable)
- What is your mailing/street address, city, state and zip code?:
- What is your group email?
- What is your group primary phone number?

[The following questions are all close ended; answers are selected from lists]

- Does your group wish to be on the online stewardship map? [Yes/No. The information associated with your group on the map will be limited to group information and stewardship territory, which will be addressed later in the survey.]
- Does your group do any of the following stewardship activities in the Southern New England region? What is your primary stewardship activity? What is your group's legal designation?

Section 3: Where Your Group Works

In this section you will be asked to complete detailed information about where your organization is located and where do you primarily work.

[Unless otherwise indicated, the following questions are close ended; answers are selected from lists]

- Does your group have a Geographic Information System (GIS) file showing the boundaries of where you have done stewardship work within the past year? [Yes/No]
- Please describe in detail the boundaries of where your group has done stewardship work within the past year. Be as specific as possible and you can list multiple locations.* [Text]

entry]

- In addition to the description you provided above, please draw the boundaries of where your group has done stewardship work within the past year. We have provided the SNEP region outline, but please draw beyond those boundaries when applicable. Be as specific as possible. [Draw area using the survey's built in online drawing / mapping tool]
- Please add anything we should know about your drawn area – details about the boundaries, problems or issues you had with the mapping tool, etc. [Text entry]
- In the last year, what kind of sites, systems, and interventions has your group's stewardship work focused on?
- What is your primary focus?
- Who owns the majority of the properties where your group worked within the past year?

Section 4: Group Characteristics

In this section you will be asked to complete detailed information about your organization.

[Unless otherwise indicated, the following questions are close ended; answers are selected from lists]

- What does your group work on?
- If you had to choose just one activity, what would you say is your group's primary focus?
- Considering all of the programs, activities, and services your group works on, what percentage of your group's effort has been for environmental stewardship during the past year?
- Please describe the mission of your group. [If you have a formal mission statement, please use that, otherwise use your own words to describe your group's goals. Text entry]
- Which of the following best describes your group's mission or focus?
- When was your group founded? [Enter date]

[The following questions ask for exact or approximate numbers; "unknown" is acceptable too]

- How many full time staff does your group have?
- How many part-time staff does your group have?
- How many members does your group have?
- How many volunteers* does your group have?
- Please estimate the total number of volunteer hours contributed.

Section 5: Networking

Please tell us about your group's relationship to other groups. These groups may be government agencies, offices of elected officials, community-based groups, nonprofits, private companies, faith-based organizations, etc. You can list each partner in any or all of these questions, where relevant.

[The following questions ask you to list group names in an open ended text entry]

- In the past year, what organization(s) have you often gone to for knowledge, data, or expertise related to environmental issues?
- In the past year, what groups provided you with funding?
- Please list any additional important collaborators that you have not yet mentioned.
- From the groups that you listed above, please identify the top three to five most critical relationships for achieving your environmental stewardship work.
- What groups would your organization like to work with, but have not been able to (for

whatever reason) and why would you like to work with them? [

Section 6: Impacts

[The following questions ask for open ended text responses, unless otherwise indicated]

- **What changes does your group want to achieve from its stewardship activities?**
- **Does your group track metrics about your activities?** *e.g., number of trees planted, number of schools visited, number of acres conserved, number of volunteers/event, program satisfaction?*
[yes/no]
- **If yes, please list metrics that your group tracks**
- **What plans, programs, or reports influence your group's work? Please list the reports and briefly describe how they influence or guide your work. (Please add organization that generated the plan or report, if appropriate)**
- **How is Covid-19 affecting your organization?**
- **What other events or disturbances have affected, or are affecting, your organization's capacity to work? Please list the event and briefly explain**

Section 7: Tell Us a Bit More About Your Group

[The following questions are close ended; responses are selected from lists]

- **What types of services does your group provide?**
- **How does your group share information with the public?**
- **What is your group estimated annual budget for the current year?**
- **Approximately what proportion of your budget comes from the following funding sources?**
- **We want to understand more about what types of information or expertise would help your organization undertake its stewardship activities. What services is your group seeking?**

Section 8: Final Section

- **We would like to contact you or another person from your group in the future about participating in follow-up interviews, focus groups, or other activities related to the STEW-MAP project. If contacted, you are under no obligation to participate. If you do not want to be contacted, please opt out below; otherwise we will assume it is ok to contact you. Please let us know if you are willing to be contacted in the future [Yes / No]**
- **Is there anything else you would like to tell us about your group or this survey? [Text entry]**

Appendix 3: Turf Digitization description

3.1. Data Processing & Analyses of Network Data

The network data includes information about three types of network relationships:

1. from whom stewardship groups seek information or knowledge (file = netKnw_agg_pubDB_EDGES.csv).
2. where stewardship groups get funding (file = netFun_agg_pubDB_EDGES.csv).
3. whom stewardship groups consider to be key collaborators, in addition to their knowledge sources and funders (file = netOth_agg_pubDB_EDGES.csv).

Data from survey responses are only included for groups that opted to be in the public dataset. Some stewardship organizations chose to participate in the StewMAP as regional chapters or sub-programs (e.g., individual programs of the Audubon Society within MA and RI State level chapters). Participants also named many network relationships by sub-programs, departments, or chapters. Representing this information as a network requires common naming conventions and we aggregated sub-programs to larger parent organizations. Therefore, there will be some differences between the names in the network data sets and those in the GIS data files. Note: there are some self-loops in the data from merging survey responses. We kept the self-loops as this is likely useful information. You may wish to remove or keep them depending on your objectives.

3.2. SNEP StewMAP Turf Digitization Description

See [Replacement Status Notes](#), [Turf Validation Next Steps](#), and [Data Cleaning Stewardship Turfs](#) for more information

Below is a summary of the steps taken to create turfs representing where a group stewards the

local environment, or turf, in southeast New England.

Turfs delineated by users responding to the original survey on behalf of an organization were very generalized, inconsistent, and in many cases, missing. This is a limitation of the Survey123 application, in that it is not feasible / efficient to create detailed delineations, and despite a video tutorial, some users may have felt uncomfortable with the application. Examples are:

- Two organizations whose turfs are self-defined as the same watershed. It is not possible for the responders to delineate the turf in exactly the same manner, resulting in two representations of the same geography
- An organization with multiple, non-contiguous turfs was only able to delineate one polygon
- An organization skipped making any attempt to delineate their turf at all.



Figure 3.1. Example of turf delineation

In order to have a comprehensive spatial database containing the most consistent representations possible, it was therefore necessary to review each turf and make adjustments to, or delineate a turf, on an organization's behalf.

3.3. Method

Upon conclusion of the survey, spatial and attribute data collected via the Survey123 app was downloaded as a file geodatabase from the ArcGIS Online environment. All corrections discussed hereafter were made using ArcGIS Pro.

Aggregated turfs (contained as a single feature class with multiple polygons) were split into individual feature classes (polygons), with care taken to retain the GlobalID and ParentGlobalID attributes, resulting in a unique record (feature class) for each organization.

Each individual turf polygon was then visually reviewed and compared to the survey respondents' qualitative answers to several of the survey questions, including but not limited to:

- Does your group have a GIS file showing the boundaries of where you have done stewardship work within the past year;
- Please describe in detail the boundaries of where your group has done stewardship work with the past year;
- Please add anything we should know about your drawn area - details about the boundaries, problems or issues you had with the mapping tool, etc.

For further clarification, an organization's web site may have been consulted for a mission statement, qualitative descriptions of where their work is focused, existing maps, etc.

In cases where the organization responded affirmatively to the question about having an existing GIS file, or it was clear from existing

maps (static or dynamic) on their web site that a GIS file existed, the organization was contacted directly via email / phone to request a copy of the digital file.

In cases where it was extremely difficult to determine an organization's turf by any means, the organization was contacted to discuss, with a draft map illustrating our interpretation of their turf provided for review and comment in order to allow them to validate the delineation.

To the extent possible, existing delineations of each organization's turf were then manually replaced using authoritative sources of existing spatial data to ensure consistent representations across the multitude of organizations. These authoritative sources included:

- RIGIS Municipal, County, and State Boundaries
- RIGIS Local Conservation Areas
- RIGIS Shoreline and Islands
- Municipal Parcel Data provided by the municipality
- MassGIS Hydro25K, DEP 2016 Integrated List Lakes
- MassGIS massgis-data-mhc-historic-inventory
- MassGIS Tax Assessor parcel
- MassGIS Town Survey Boundaries
- MassGIS Oliver; "Massachusetts Town Outlines No Coast", Open Space
- MassGIS Areas of Critical Environmental Concern
- USGS Huc8, HUC 10 and HUC 12 Watershed Delineations
 - Smaller watersheds not available via USGS were delineated using the Model My Watershed tool (<https://modelmywatershed.org/>)
- US Coast Guard Districts
- Authoritative data sets provided via ArcGIS Online
- ESRI Detailed States

- ESRI American Indian Reservations / Federally Recognized Tribal Entities
- EPA's Level III Ecoregions of Massachusetts
- National Research Reserve centralized site boundaries
- An organization's list of latitude, longitude points, or kml file, subsequently buffered to create a polygon representation, or the organization's own GIS spatial data file.

Replacing an organization's turf delineation involved three steps in ArcGIS Pro.

1. If a turf polygon had not been delineated, the Edit > Replace Geometry tool was used to create an "artificial" one connected to the attribute record.
2. Using either the original turf polygon, or the "artificial" polygon, the Edit > Transfer Attributes tool was used to replace the existing polygon (the Target) with an authoritative source polygon (the Source) by specifying the Shape attribute only. This kept the attribute

table intact with the original GlobalID and ParentGlobalID while replacing the turf delineation.

3. Saving the modification.

After all organization's turfs had been reviewed and replaced, they were compiled back into a new aggregated feature class using the Append tool.

During this process, an inconsistency arose in which organizations identifying themselves as Land Trusts gave varying descriptions of their turfs. Some defined their turfs as an entire municipality, some as a set of existing parcels owned within a municipality, and still others as a single location where a project was either currently underway or recently completed.

In order to eliminate this inconsistency, a second version of the aggregated database was made in which turfs of organizations specifically identified as Land Trusts were all delineated as the boundary of the municipality / municipalities in which they have an interest.

Appendix 4: Online Turf and Network Dashboard and Resources

We compiled an online dashboard to enable end users to view the geospatial data we have collected on environmental groups working within the southeast New England Program region. These data include their “turf”, which consists of the geographic area each organization has identified as being where they work, as well as specific details about their organization, such as their primary stewardship activity, focus areas, site and system types, and other information. Upon opening the dashboard, the end user is presented with a map of the southeast New England region with all turfs for all organizations illustrated with a green outline. On the upper left, a list of Estuary Basins and sub-watersheds is presented. Below that is an element which provides a count of organizations. This element is dynamic, meaning that it will change as the end user interacts with the list above. There are a total of 143 organizations in the database used in this dashboard. Below the counter is a list of organizations in the database by name. This list is also dynamic. Upon choosing an estuary basin or sub-watershed, the list will be updated to include only those organizations whose turfs overlap that estuary basin or sub-watershed. On the right side of the dashboard, there are a series of charts which display the number of organizations which identified in the affirmative as participating in a particular activity or focus area. For example, in the “Primary Stewardship Activities” chart, 103 organizations identified having “Advocate” as their primary stewardship activity. The end user can view other charts using the arrows at the bottom to tab through them.

These charts are also dynamic; counts will change when an estuary basin or sub-watershed is selected from the list at the top left. To interact with the dashboard, one can begin by clicking an estuary basin or sub-watershed. You will see the map zoom to and flash this geographic area with a purple outline. The counter element will update to inform you that the relevant number of organizations in the database overlap this estuary basin. The names of those organizations are shown in the list on the bottom left. The charts on the right are updated with their distribution across the various activities and focus areas. To regain the full complement of organizations in the database, simply click the selected estuary basin or sub-watershed to clear it. To find out information about a specific organization, select it from the list on the lower left of the dashboard. The map will zoom to and flash this organization’s turf in the map, as well as display the organization’s details in a pop-up window. Close the popup by clicking the x in the upper right corner. It is also possible to click anywhere on the map itself to generate a popup which shows all the organizations whose turfs overlap the location clicked. Note that due to the complexity of the data, the map will take a moment to respond. The details of each organization can be displayed using the arrows in the upper right corner of the popup. In addition to the map, the end user will find tabs along the bottom of the dashboard which can be used to display the following elements: a Project Background and Information description, and each of the five the Network Diagrams which have been compiled to illustrate social network connections with links to their individual web sites.

Appendix 5: Technical network appendix

When networks are very large, it can be hard to make sense of all the connections and patterns visually. In such cases, descriptive statistics can help. Below are some common descriptive statistics calculated for the network and the theoretical implications for network function (Table 5.1).

Table 5.1. Aggregated Network Metrics

Metric	Knowledge source network	funding source network	other key collaborator network	network combining knowledge seeking, funding, and other key collaborators
Nodes	458	243	207	632
Edges	891	263	202	1,228
Density	0.0042	0.0045	0.0047	0.0031
Centralization	0.088	0.066	0.015	0.068
Components	4	21	16	4
Median in-degree	1	1	1	1
Median in-degree (no pendants)	2	0.5	1	2
Graph diameter	17	3	4	14
Reciprocity (ratio)	14.90%	0.00%	0.00%	16.60%

5.1. Density

Density is the proportion of total possible edges that exists in the network. Density ranges from 0 to 1, where 1 means all possible edges are present and 0 means none are present. Higher density facilitates transmission of knowledge and resources, but can stifle innovation if ideas become homogeneous (Janssen et al. 2006). Dense networks tend to support cooperation and trust building (Berardo and Scholz 2010). Note, density cannot be compared between networks with vastly different numbers of nodes as density is size dependent. For example, it is more likely that everyone meets in a room of ten people than in a room with one-hundred people. If measured as an information exchange network, the room of ten will be much denser than the room of one hundred because of how small and large groups interact.

The documented stewardship networks in the SNEP region have low density. This may be due in part to the large number of listed groups that did not participate in the survey.

5.2. Centralization

Centralization indicates how edges in a network are distributed. Centralization ranges from 0, where all edges are distributed equally among the nodes, to 1, where a single node holds the network together. High centralization can be efficient in settings with high levels of trust and agreement (Berardo and Scholz 2010, McAllister et al. 2017), but can also lead to, or result from, power imbalance in the absence of trust and agreement (Ernstson et al 2008, Bodin and Crona 2009). Structurally, centralized networks can be fragmented if central nodes are lost (Janssen et al 2006).

The documented stewardship networks in the SNEP region have low centralization.

5.3. Components

Components are subgroups within a network that are weakly connected or disconnected from each other. The number and size of components indicates how fragmented a network is. Information and resources can travel faster in highly connected networks and

poorly or not at all among fragmented components; however, hyper-connectivity can stifle innovation or foster the spread of undesirable information (Bodin et al. 2006, Vargas et al. 2020).

The SNEP StewMAP knowledge network is largely one continuous network with a few small, isolated groups. Alternatively, the funding network shows many small clusters of groups seeking separate funding sources.

5.4. In-degree

The median number of incoming edges among network nodes. Highly connected organizations can be influential and act as information or resource hubs; though maintaining many relationships can be taxing if lacking adequate resources (Bodin and Crona 2009). Median in-degree can be skewed by something called “pendants,” which are nodes that only have one incoming edge. (Pendants can result from low survey response rate.) It can be helpful to consider median in-degree without pendants.

The documented stewardship networks in the SNEP region have low in-degree. This may be due in part to the large number of listed groups that did not participate in the survey.

5.5. Graph diameter

Graph diameter is the greatest distance (i.e., number of edges) between any pair of nodes. (For a disconnected network, diameter is calculated for the largest component.) Diameter indicates the potential distance that information or material might have to travel to get from one side of a network to another. All other variables being equal (e.g., levels of trust, shared objectives, etc.), shorter distances facilitate the flow of information and materials (McAllister et al. 2017).

Graph diameter is much larger for the knowledge network than for the funding and other collaborator networks.

5.6. Reciprocity

There are two ways to measure reciprocity. The one used here is the ratio, or percent, of all existing relationships in the network that are two-way: i.e., (all the two-way relationships) / (all two-way + all one-way). Reciprocity was only calculated among survey respondents as non-respondents cannot return relationships since they did not complete surveys.

Reciprocity often indicates a stronger relationship; however, this must be contextualized. It makes sense for there to be reciprocity in collaboration and knowledge sharing networks. Reciprocity is unlikely in a funding network as people tend to receive money from founders and not send money back to them. In collaborative environmental governance settings, reciprocity can reinforce trust building and reduce the risk of defection in high-risk collaborative processes (Berardo and Scholz 2010).

The knowledge network has a moderate level of reciprocity. Reciprocity slightly increases when all the networks are combined indicating that relationships in the funding and other networks help create two-way exchanges with the knowledge network.

5.7. References

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