NIFA Water Portfolio: Project Director Survey Report

Non-formula projects

Prepared August 2016 by:
Jackie M. Getson[1], Sarah P. Church[1], Laura A. Esman[1], Mike O'Neill[2], Linda S. Prokopy[1]

[1]Natural Resources Social Science Lab
Department of Forestry and Natural Resources
Purdue University

[2]College of Agriculture, Health, and Natural Resources
Extension
University of Connecticut

Recommended Citation:

Getson, J.M., Church, S.P., Esman, L.A., O'Neill, M., and Prokopy, L. S. (2016). *NIFA Water Portfolio: Project Director Survey Report Non-formula projects*. West Lafayette: Purdue University.

Table of Contents

Tables

Figures

Acronyms

BMP	Best Management Practice
HBCU	Historically Black College or University
HSI	Hispanic Serving Institution
MSI	Minority Serving Institution
NA	Not applicable
NIFA	National Institute of Food and Agriculture
NRC	National Research Council
PD	Project Director
Q	Question
RA	Research Assistant
REE	Research, Education, and Economics
REEIS	Research, Education, and Economics Information System
SPSS	Statistical Package for the Social Science
USDA	United States Department of Agriculture

1 Introduction

Over the past decade, federal agencies have been pushed to demonstrate greater accountability for programmatic funds. The increased focus on accountability has prompted renewed attention to defining and describing the impacts of federally funded programs. The National Institute of Food and Agriculture (NIFA), within the United States Department of Agriculture (USDA), has funded a variety of research, education, and extension efforts that have focused on water resource issues in the United States and abroad. The NIFA portfolio of water resource funding extends across topics from natural resources to plant science, food safety, and rural development.

In 2004, the National Research Council (NRC) conducted a broad summary of federal investments in water resources. One of their key conclusions was (NRC 2004, p. 91): "An urgent priority for water resources research is the development of a process for regularly reviewing and revising the entire portfolio of research being conducted." This call to review research portfolios signifies a shift in the expectations for research programs. In essence, the NRC was encouraging research programs to become adaptive – reflecting current and changing needs for science and technology. Gold et al. (2013) noted that synthesis of scientific results is a critical component to achieving greater success in water resource management and recommended regular and consistent evaluation of progress towards outcomes – a desirable goal for projects and funding programs.

One of the greatest challenges to ascertaining funding efficiency is identifying and quantifying measures of success for funded projects. NIFA contracted University of Connecticut and Purdue University to conduct a synthesis of the NIFA water portfolio. As a component of this synthesis, the team has evaluated Project Directors' (PDs') perception of project success for water portfolio projects funded between 2000 and 2013.

One of the objectives of this synthesis was to determine if the projects resulted in the creation and translation of knowledge, tools, and technologies to its stakeholders. This objective aligns well with the USDA Research, Education, and Economics (REE) role to (USDA REE 2012, p.16): "Develop and provide the best available science and technology to inform decision-making and improve practices on water conservation, use, and quality." Additionally, the synergies between, within, or external to the funding sources were analyzed to determine if these relationships added value to the NIFA investments and assisted stakeholders manage their water issues.

This survey report presents the descriptive results of the NIFA Water Portfolio PD Survey of non-formula funded projects. Formula-funded PDs were also surveyed which will be presented in a subsequent report.

2 Methods

2.1 Portfolio development

The NIFA water portfolio (henceforth known as the Water Portfolio) was developed to be an inclusive database of NIFA funded projects for the years 2002 through 2013 that examined water resource issues. The USDA Research, Education, and Economics Information System (REEIS) database (www.reeis.usda.gov) was queried to identify potential projects for this Water Portfolio. The initial search of the REEIS database was conducted to include "water" if it appeared individually or as part of a word (e.g. "water quality" and "groundwater") in either the project "Objectives" or "Keywords" (n=4,446 projects). The list was further refined to include only projects initiated within the synthesis study period of 2002 – 2013 (n=1,842). The REEIS database was initiated after fiscal year 2000. Data for projects from the years 2000 and 2001 were incomplete and were not included. Only projects that addressed water resource issues (quality and quantity) were included in this Water Portfolio (i.e. projects outside the Water Portfolio scope were not included [e.g., "water" used in fish tanks to study fish biology]). To distill the project list to incorporate only projects pertaining to water resource issues, three research assistants (RAs) examined each of the project's objectives and keywords then independently categorize each project as "yes", "no", or "maybe". The PD of this synthesis reviewed the RAs analysis and determined if the project would be included in the Water Portfolio. The final Water Portfolio for non-formula funded projects is comprised of 772 projects.

2.2 Project director (PD) survey

The PD Survey was designed to gather project-specific information from the Water Portfolio. We sought to identify critical findings and lessons learned, and to evaluate the effectiveness of projects in promoting solutions to water problems in agricultural, rural, and urbanizing watersheds. Researchers developed survey questions (Appendix A) that encompassed the following key categories: project scope and scale, type (i.e. research, extension, and/or education), perceived project successes, perceived project improvements, how and to whom project results were disseminated, synergies generated or capitalized upon between collaborators and other NIFA and non-NIFA funded projects, and whether and how project results were utilized by end users. The project's Advisory Group piloted the survey and provided feedback, which was subsequently incorporated into the final survey.

The survey was conducted online through Qualtrics software (Qualtrics, Provo, UT) from April to November 2015. PDs were notified with an advance email from the Water Portfolio National Program Leader, Jim Dobrowolski, to announce the forthcoming survey and to invite PDs to complete the survey. PDs with more than one project were sent an additional email noting that they would be receiving multiple emails (one for each project). Survey invitation emails were sent to each PD with unique links for each project. PDs received up to three email reminders and one phone call until the survey was completed.

Survey data were analyzed with Statistical Package for the Social Science (SPSS; IBM Corporation) and R Statistical Software (version 3.2.3; R Core Team 2015). There were three broad types of survey questions: closed, Likert, and open. This document is a descriptive report of the survey responses. The results are summarized by topic and the corresponding survey question is referenced respective to the PD survey provided in Appendix A (e.g. the first question of the survey is referred to as "Q1"). Single response closed questions are summarized into frequency tables. Multiple choice closed questions are presented with a bar plot, which includes a table indicating the number of categories selected. Likert responses are plotted presenting the percentage of respondents for each portion of the rating scale; additionally, the mean Likert score was calculated. Open questions required qualitative coding. For all open questions, an initial codebook was developed by a single researcher who coded a portion of the responses. The codebook was then used by two additional researchers to independently code the responses. This research team met to finalize the codebook and discuss any conflicting response codes. All codes were ultimately agreed upon by three researchers. Once the coding was complete and agreed upon by all three researchers, the coded responses were entered into the SPSS software.

3 Results

3.1 Response rate

A total of 389 surveys were completed. Survey distribution and response rate is based on the total projects in the Water Portfolio rather than number of PDs (one individual could have been the PD on multiple projects); therefore, each survey response is specific to a project. A total of 772 surveys were distributed and 399 were completed; upon receipt, 10 of these projects were considered a continuation of another project and were not double counted in the following analysis. The final response rate for 762 projects and 389 completed surveys was 51.0%. Not all respondents answered all questions so response rates vary by question.

3.2 Project and director demographics

The majority (70.4%, n=285) of the projects were completed at the time of response (Q1). The number of PDs on a project ranged from 1 to 22; the majority (76.8%) of projects had four or fewer PDs (Table 1). Projects with a co-PD from a Minority Serving Institution (MSI) were uncommon (28.1%; Table 2). Single and multi-university projects were the most common 51.6% and 36.8%, respectively (Table 3). The majority of projects were either extension (32.8%) or research and extension (27.3%) (Table 4). Projects were primary conducted in a single watershed (Figure 1). PDs could select more than one project focus and most projects were centered on agricultural land and watershed management (Figure 2); the majority (44.7%) of projects were on one or two broad topics (inset table of Figure 2). Additionally, 17.2% of PDs indicated their project focus didn't fit within the listed categories; of the "Other" categories identified, the majority (38.5%) had no geographical specificity (Table 5) and included topics: pathogens, species restoration, cattle, best management practices (BMPs), alternative water use, etc. Four types of individuals represented the majority of project personnel (Figure 3) which include: hydrologists, soil scientists, agricultural and biological engineers, and agronomists; the majority (43.7%) of projects had three to four different types of individuals (inset table of Figure 3). The "Other" and "Non-science professionals" open responses were coded together (Table 6); the most common distinct individual type was microbiologists (n=23). The majority of PDs were male (77%; n=330; Q25), on average 55 years old (Table 7), and at the time of funding were Full Professors (35.3%) (Table 8). PDs predominately classified their type of scientist/professional as "Other" (Figure 4), which included predominately engineers (n=18) and microbiologists (n=13; Table 9). The majority (93.6%) of PDs identified with only one or two professional fields (inset table of Figure 4).

Table 1. Directors on project.
Corresponds to closed Q8: "How many co-PDs were involved in this project?"

PD (n)	Frequency (%; n = 371)
1[a]	20.2
2	24.8
3	17.8
4	14.0
5	9.4
6	4.9
7	2.4
8	1.9
9	1.1
> 10	3.5

[a] "0" responses (n=3) were assumed to be single PD.
PD - Project Director

Table 2. Projects with PD from MSI.
Corresponds to closed Q7: "Were any of the co-PDs from a MSI such as a HBCU or a HSI?"

MSI co-PDs	Frequency (%; n = 139)
Yes	28.1
No	71.9

HBCU - Historically Black College or University
HSI - Hispanic Serving Institution
MSI - Minority Serving Institution
PD - Project Director

Table 3. Institutions on project.
Corresponds to closed Q6: "Please indicate what type of project this was: Was this a single university or multi-university project?"

Collaboration type	Frequency (%; n = 378)
Single university	51.6
Multi-university	36.8
Public/private collaboration	5.3
Other	6.3

Table 4. Project type.
Corresponds to closed Q2: "Was this project:"

Type	Frequency (%; n=381)
Extension only	32.8
Research only	6.0
Extension and education	17.1
Research and extension	27.3
Research and education	10.2
Research, extension, and education	6.6

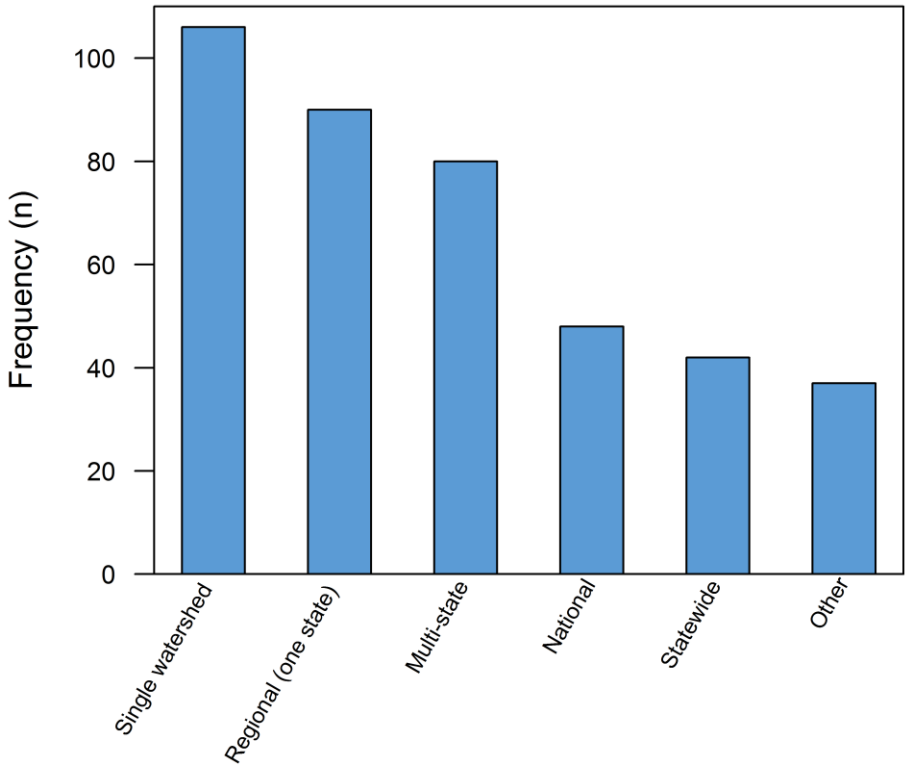
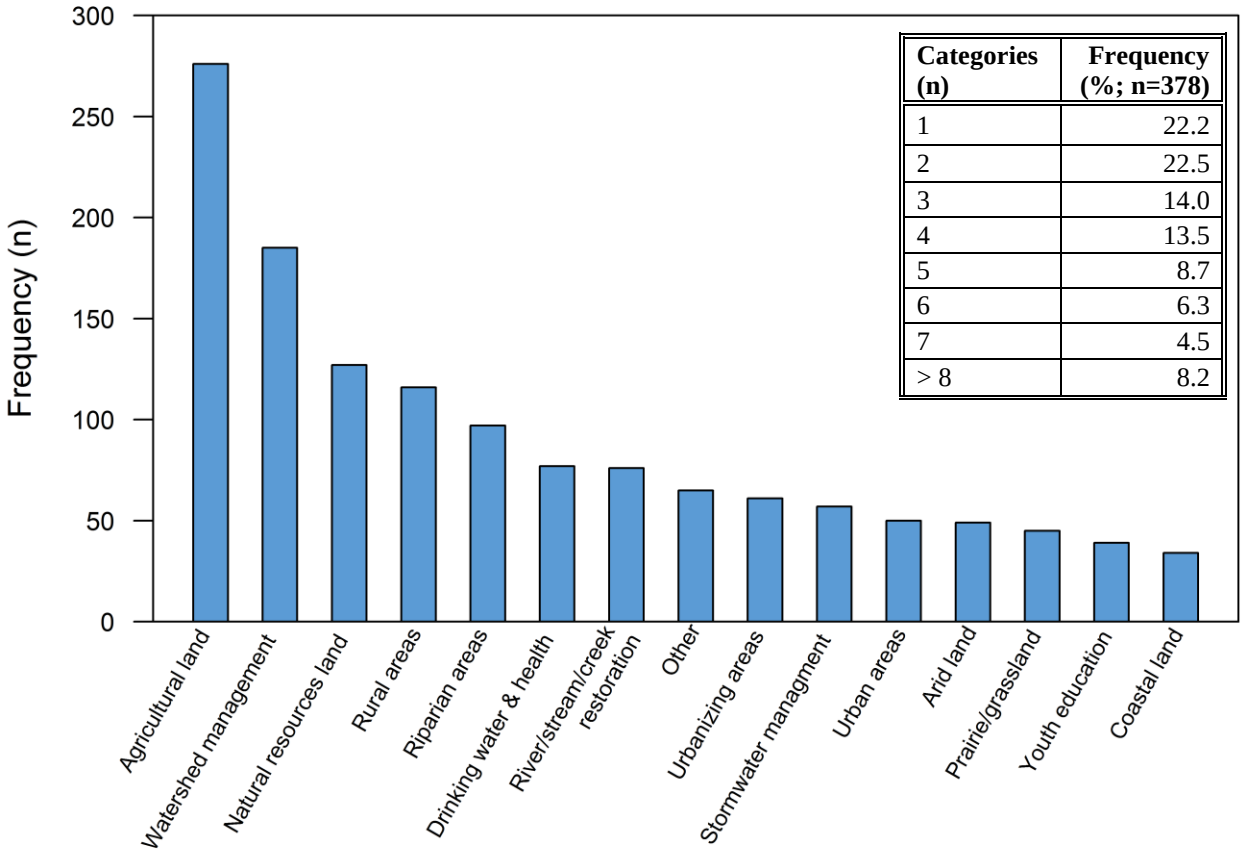


Figure 1. Project geographical scope.
Corresponds to closed Q3: "What was the geographical scope of this project?" Of the total respondents (n=382), 21 selected two categories.



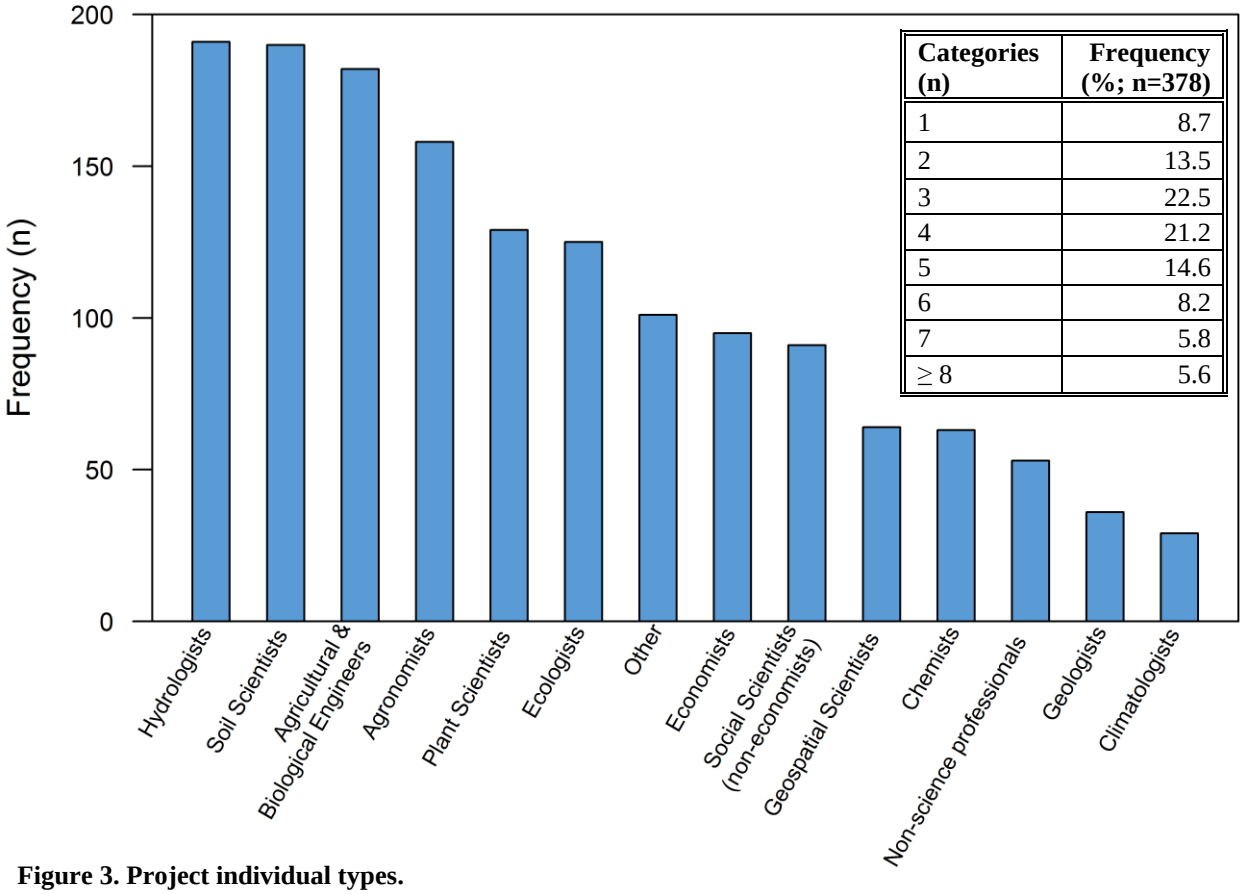
Categories (n)	Frequency (%; n=378)
1	22.2
2	22.5
3	14.0
4	13.5
5	8.7
6	6.3
7	4.5
> 8	8.2

Figure 2. Project geographical focus.
Corresponds to closed Q4: "This project focused on (check all that apply)." Table indicates the frequency of PDs to select ≥ 1 category. "Other" and "Other working land" combined into single "Other" category; the open responses were coded and described in Table 5.

Table 5. Project geographical focus "Other" codes.
Corresponds to open portion of Q4: "This project focused on:"

Code	Frequency (%; n=65)
Food Safety	6.2
Forest	6.2
Greenhouse/hydroponics	6.2
Irrigated land	10.8
Surface and/or groundwater	15.4
No geographical focus[a]	38.5
Miscellaneous[b]	12.3
Not coded[c]	4.6

[a] Geography not specified or required.
[b] Included landfill, mined lands, irrigation reservoirs, etc.
[c] Response either unclear, irrelevant, or already included in closed category(-ies).



Categories (n)	Frequency (%; n=378)
1	8.7
2	13.5
3	22.5
4	21.2
5	14.6
6	8.2
7	5.8
≥ 8	5.6

Figure 3. Project individual types.
Corresponds to closed Q5: "The following types of individuals were included on this project (check all that apply)." Table indicates the frequency of PDs to select ≥ 1 category.

Table 6. Project individual types open response codes.
Corresponds to open portion of Q5: "The following types of individuals were included on this project:"

Code[a]	Frequency (n)
Aquatic Scientist(s), Limnologist(s), Water Scientist(s) (quality/management/resource)	14
Animal Scientist(s), Wildlife and/or Fisheries Scientist(s), Veterinarian Professional(s)/Scientist(s)	14
Business/Industry Professional(s), Planner(s)	15
Communication Specialist(s), Extension/Outreach Professional(s)/Specialist(s)	15
Community/Stakeholder group(s)	7
Educator(s), Student(s), Education-related Professional(s)	15
Engineer(s), Computer Engineer(s)/Programmer(s), Physicist(s)	28
Farmer(s), Producer(s)	6
Food Scientist(s)/Specialist(s)	6
Geneticist(s), Breeder(s)	4
Lawyer(s)/Legal expert(s)	3
Microbiologist(s), Biologist(s) (non-specific), Biogeochemist(s), Environmental Scientist(s)	28
Plant Geneticist(s)/Physiologist(s), Horticulturalist(s)	4
Miscellaneous[b]	22
Not coded[c]	1

[a] "Other" and "Non-science professionals" open responses
[b] Generalized due to level of specificity given in the response.
[c] Response irrelevant.

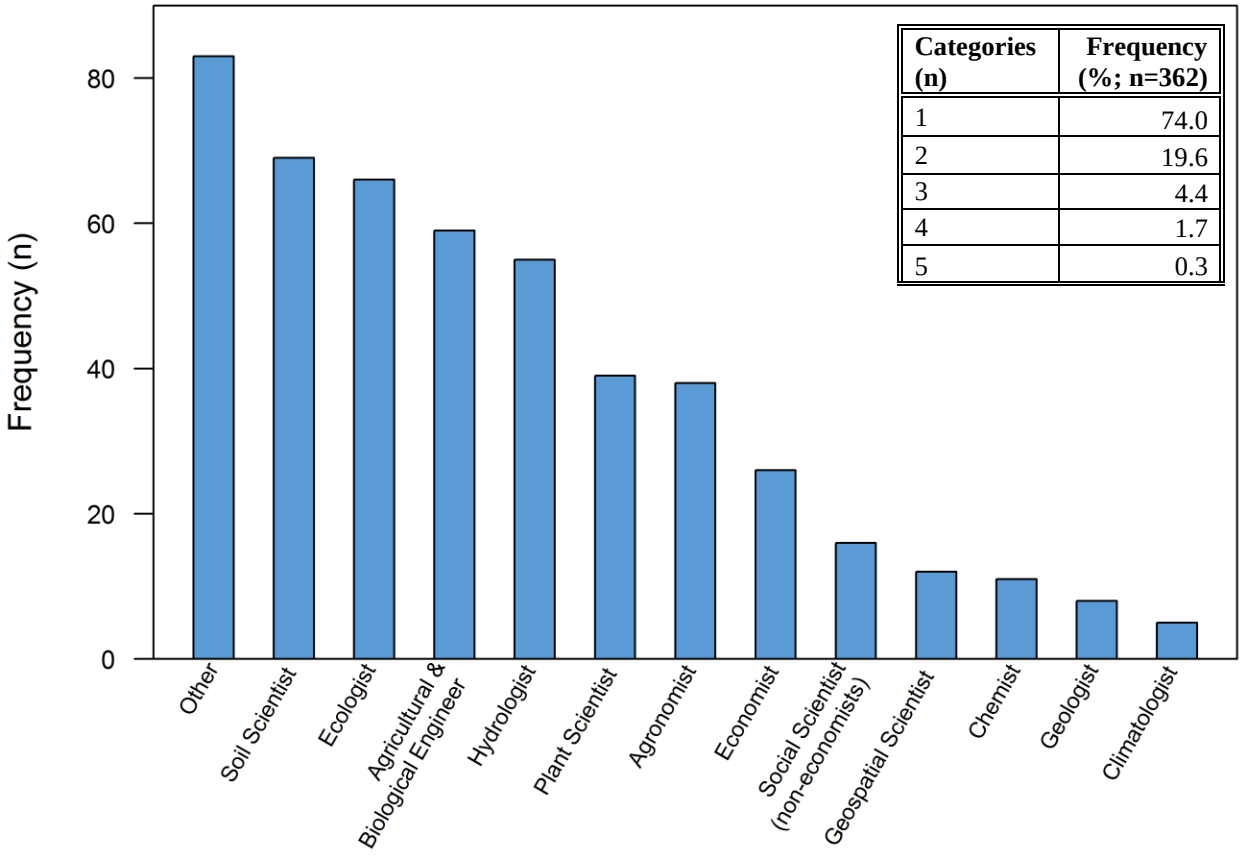
Table 7. PD age.
Corresponds to closed Q24: "What year were you born?"

	Age (year; n=339)
Range	32-81
Mean	55.4 ± 9.19 (sd)
Median	55

Table 8. PD job title at time of funding.
Corresponds to closed Q26: "What was your job title when this project was funded?"

Title	Frequency (%; n=360)
Assistant Professor	19.4
Associate Professor	20.0
Full Professor	35.3
Extension Educator	5.0
Research Staff	6.1
Other[a]	14.2

[a] "Other" predominately composed of directors/managers and administrators (n=10 and 7, respectively). PDs also reported having multiple titles (n=6).



Categories (n)	Frequency (%; n=362)
1	74.0
2	19.6
3	4.4
4	1.7
5	0.3

Figure 4. PD scientist/professional.
Corresponds to closed Q27: "What type of scientist are you?" Table indicates the frequency of PDs to select ≥ 1 category.

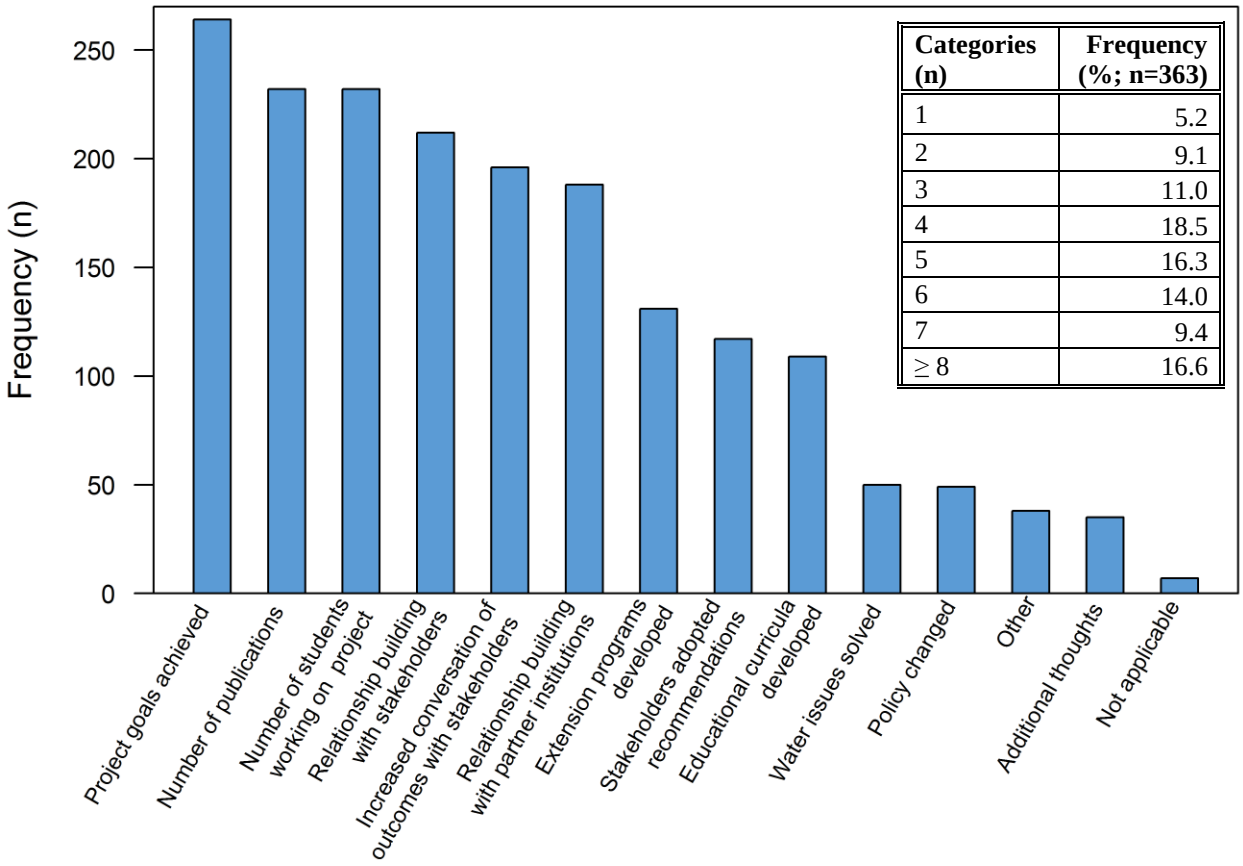
Table 9. PD scientist/professional open response codes.
Corresponds to open portion of Q27: "What type of scientist are you?"

Code	Frequency (n)
Animal Scientist	7
Biogeochemist	4
Computer Engineer/Programmer	1
Educator	5
Engineer	18
Environmental Scientist	5
Extension/Outreach Professional/Specialist	2
Lawyer	3
Limnologist	2
Microbiologist	13
Physicist	2
Plant Geneticist/Physiologist, Horticulturalist	5
Water Scientist (quality/management/resource)	6
Wildlife and/or Fisheries Scientist	4
Miscellaneous[a]	9
Not coded[b]	4

[a] Generalized due to level of specificity given in the response.
[b] Response either unclear or irrelevant.

3.3 Measure success through outcomes

To quantify the outcomes that lead to a successful project, six outcomes stood out as the front runners: project goals achieved, number of publications, number of students working on project, relationship building with stakeholders, increased conversation of outcomes with stakeholders, and relationship building with partner institution (Figure 5); few (5.2%) PDs responded that their project success hinged on a single factor (inset table of Figure 5). As seen in Figure 5, publications played an important role in project success. The majority (87.7%) of respondents published at least one type. Almost half (48.4%) of the respondents indicated that they published all three types: journal articles, thesis/dissertation, and extension materials. The most frequent (39.8%) publication type was journal articles (Table 10). Beyond publications, project knowledge was disseminated in numerous ways, the most frequent method was through conferences (Figure 6). The majority (55.0%) of PD's use two-five methods to disseminate project knowledge (inset table of Figure 6). The third most common method to disseminate project knowledge was via a website (Figure 6). The majority of websites are still publically available at the time of survey completion (Table 11). Stakeholder groups varied by project but the most common group to learn and to use project results/outcomes were researchers (Figures 7 and 8, respectively). Few (6.5%) projects only shared project results with just one stakeholder group (inset table of Figure 7); however, only one group using the project outcomes was most common (21.3%; inset table of Figure 8). The "Other" stakeholder groups were the same for both learning about and using results; respondents also indicated that their project was ongoing and too early to provide an inclusive list (Tables 12 and 13).



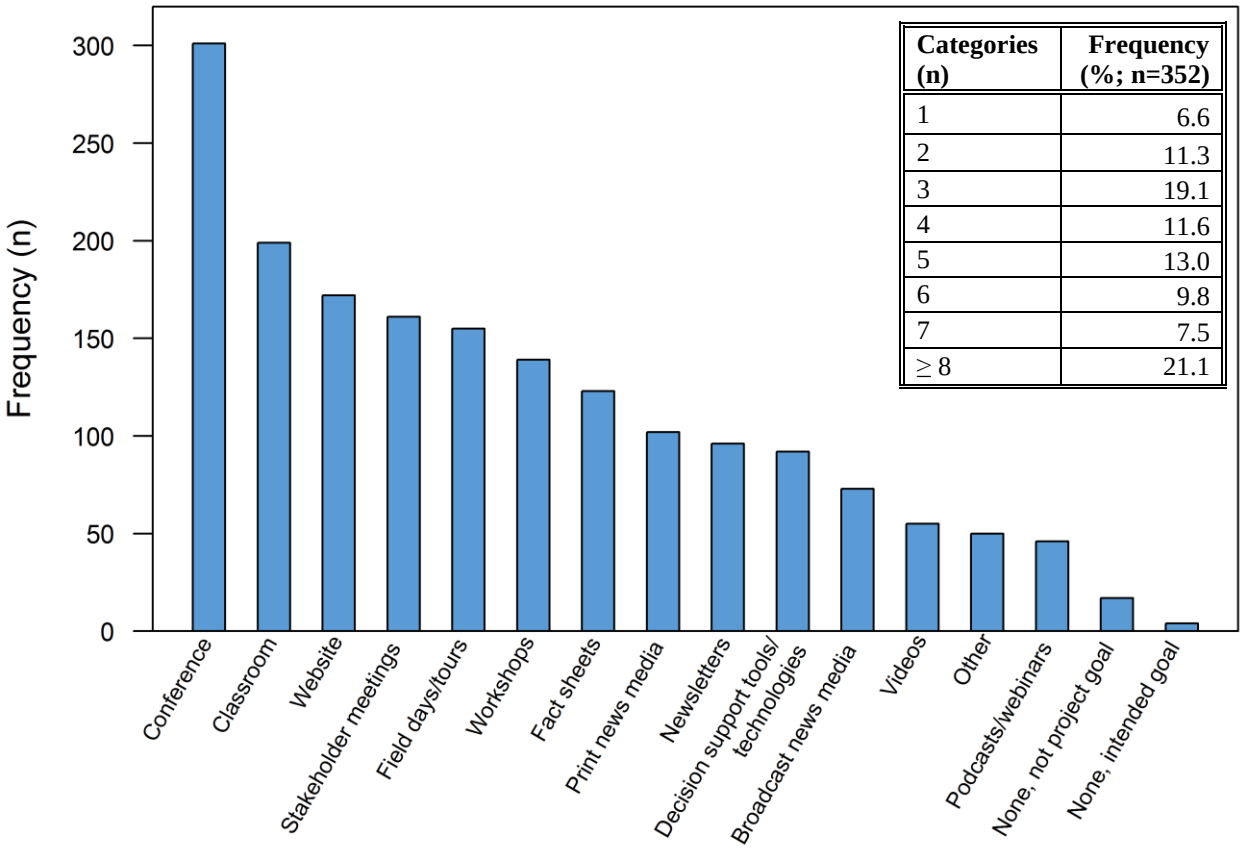
Categories (n)	Frequency (%; n=363)
1	5.2
2	9.1
3	11.0
4	18.5
5	16.3
6	14.0
7	9.4
≥ 8	16.6

Figure 5. Outcomes that resulted in project success.
Corresponds to closed Q18: "Please indicate which of the following outcomes made this project a success (check all that apply)." Table indicates the frequency of PDs to select ≥ 1 category.

Table 10. Publication types.
Corresponds to closed Q11: **"**Please enter the number of the following publication types that emerged from this NIFA project."

Type	Frequency (%)	Number of Publications (mean ± sd)
Journal articles	39.8	6.7 ± 17.7
Theses/dissertations	33.2	2.5 ± 3.6
Extension	27.0	8.3 ± 28.8

Respondents (n=341) could check more than one publication type.

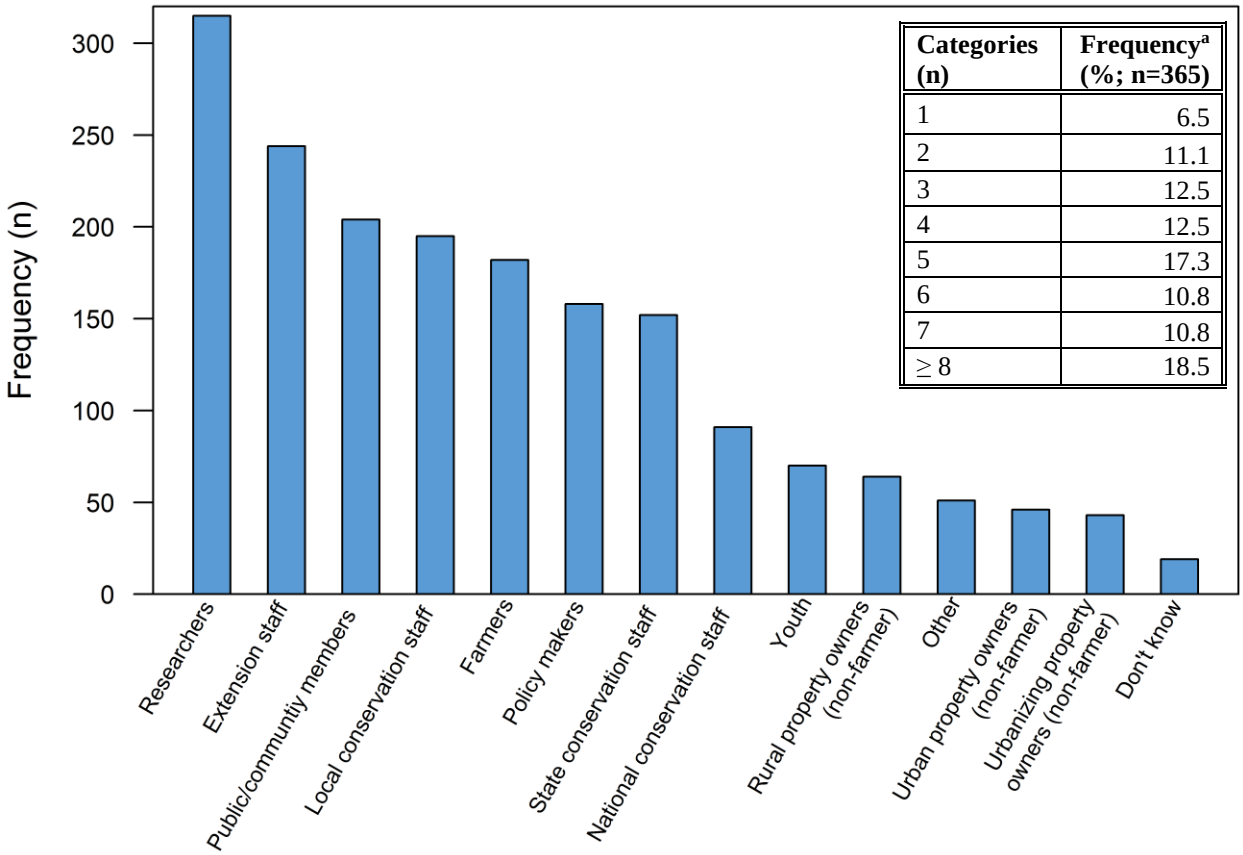


Categories (n)	Frequency (%; n=352)
1	6.6
2	11.3
3	19.1
4	11.6
5	13.0
6	9.8
7	7.5
≥ 8	21.1

Figure 6. Project knowledge dissemination methods.
Corresponds to closed Q13: "The project team disseminated project knowledge through the following means (check all that apply)." Table indicates the frequency of PDs to select ≥ 1 category. "None" responses were not included the table.

Table 11. Website status.
Corresponds to closed Q14: "Please tell us about the website you developed for this project."

Publicly available/accessible		Still being updated		Other	Frequency (%; n=172)
Yes	No	Yes	No		
X					29.1
X		X			23.3
X			X		8.1
X		X		X	2.9
X			X	X	2.3
				X	3.5
			X		8.7
		X			3.5
		X		X	0.6
				X	5.2
	X				9.3
	X		X		2.3
	X			X	0.6
	X		X	X	0.6



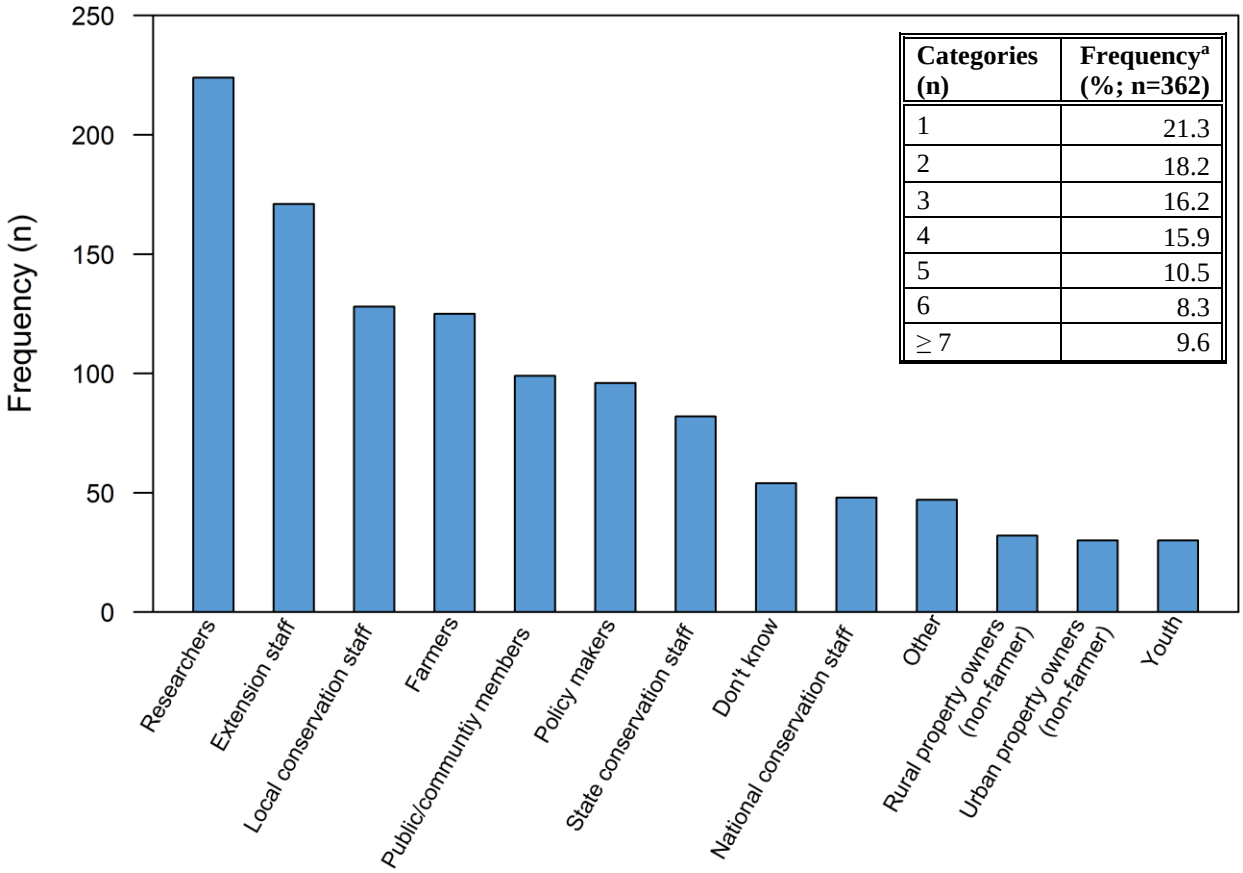
Categories (n)	Frequency[a] (%; n=365)
1	6.5
2	11.1
3	12.5
4	12.5
5	17.3
6	10.8
7	10.8
≥ 8	18.5

Figure 7. Stakeholder groups that learned about project results.
Corresponds to closed Q12: "To the best of your knowledge, the following stakeholder groups learned about the results of this project (check all that apply)." Table indicates the frequency of PDs to select ≥ 1 category.
[a] n is total Q12 response; however, frequency percentage calculated without "Don't know" responses (n=19).

Table 12. Stakeholder groups that learned about project results "Other" codes.
Corresponds to open portion of Q12: "To the best of your knowledge, the following stakeholder groups learned about the results of this project."

Code	Frequency (n)
Commodity organization	2
Educators	6
Environmental organization/group (non-government specific)	5
Government agency/organization	14
Industry/business	12
Students	8
Tribe member(s)/professional(s)	1
Miscellaneous[a]	8
Ongoing[b]	2
Not coded[c]	4

[a] Generalized due to level of specificity.
[b] Respondents indicated that it was too early in the project to have an inclusive list.
[c] Response either unclear, irrelevant, or already included in closed category(-ies).



Categories (n)	Frequency[a] (%; n=362)
1	21.3
2	18.2
3	16.2
4	15.9
5	10.5
6	8.3
≥ 7	9.6

Figure 8. Stakeholder groups to use project outcomes.
Corresponds to closed Q15: "To the best of my knowledge, the outcomes of this project have been used by the following stakeholder groups (check all that apply)." Table indicates the frequency of PDs to select ≥ 1 category. "Other" open responses coded (Table 13); respondents may have indicated more than one "Other" group. [a] n is total Q15 responses; however, frequency percentage calculated without "Don't know" (n=54).

Table 13. Stakeholder groups to use project outcomes "Other" codes.
Corresponds to open portion of Q15: "To the best of my knowledge, the outcomes of this project have been used by the following stakeholder groups:"

Code	Frequency (n)
Commodity organization	2
Educators	6
Environmental organization/group (non-government specific)	1
Government agency/organization	10
Industry/business	7
Students	5
Tribe member(s)/professional(s)	1
Urbanizing property owners (non-farmer)	1
Miscellaneous[a]	8
Ongoing[b]	11
Not coded[c]	4

[a] Generalized due to level of specificity given in the response.
[b] Respondents indicated that it was too early in the project to have an inclusive list.
[c] Response either unclear, irrelevant, or already included in closed category(-ies).

3.4 Funds

Funds from outside of NIFA seeded more than half (53.7%) of the projects and the majority (46.2%) of PDs indicated that their project led to funding for additional project(s) (Table 14). The majority (54.0%) of projects did not interact with NIFA-funded Regional Water Quality (Section 406) or multi-state HATCH projects (Figure 9); however, 21 projects interacted with both types of projects (n=365).

Table 14. Funding avenues.
Corresponds to closed Q20: "Were other funds used to seed this project?" and Q21: "Did this project help lead to funding for (an) additional project(s)."

Source	Seed Funding Frequency (%; n=367)	Lead to Funding Frequency (%; n=366)
Yes; NIFA	12.8	18.0
Yes; non-NIFA	53.7	46.2
No	31.6	30.1
Don't know	1.9	5.7

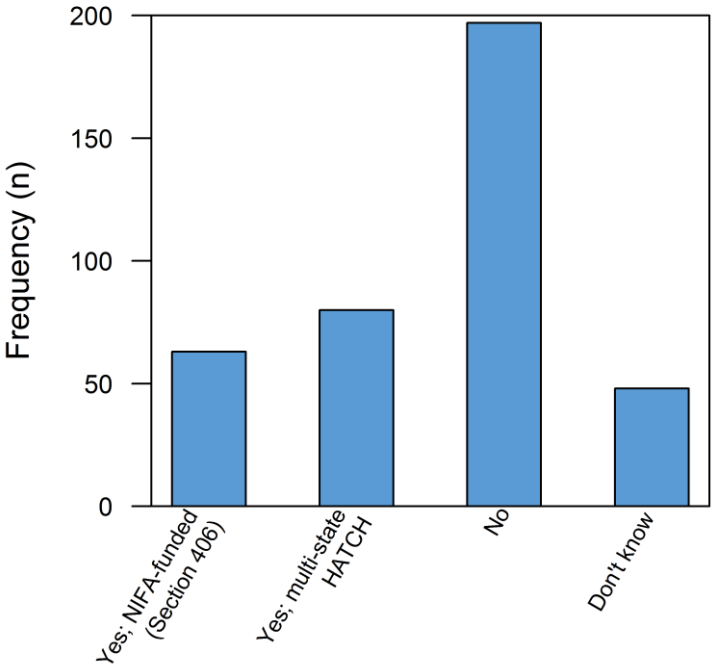


Figure 9. Interaction with NIFA-funded Regional Water Quality Projects or multi-state HATCH projects.
Corresponds to closed Q22, "Did this project interact with any NIFA-funded Regional Water Quality Projects (Section 406) or multi-state HATCH projects?"

3.5 Perceptions of success

The PDs were asked to indicate how their project was successful. Their responses were distributed into a total of 10 codes. The majority (82.8%) of PD responses were allocated within one or two codes (48.4% or 34.4%, respectively). The majority of respondents (65.3%) indicated that their project success was related to meeting project objectives (Table 15). There was a large decline (37.6%) between the most frequent code of "met objectives" and the next most common code "stakeholder engagement." Whereas project success had a majority code present, when asked what could have made their projects more successful the modal response was only 28.7%, which was regarding an increase of, more stable, full, and/or longer-term funding (Table 16).

The PDs were then asked to rate the project's success in eleven specific areas. Overall, the projects were deemed either successful or very successful with a mean Likert score range of 3.8-4.5 (Figure 10). Highest (Likert mean 4.5) ranked project areas were training students and generating research results; however, only 15% of respondents remarked on how "Students" lead to their project's success in open Q9 (Figure 10; Table 15). Next highest (Likert mean 4.3) area was developing new relationships/synergies with other organizations (Figure 10); overall, synergies resulted in an increase in stakeholder adoption, leveraging of additional funds, and improved water outcomes (Figure 11).

This page intentionally left blank.

Table 15. Codes to describe how projects were successful.
Corresponds to open Q9: "Please tell us, in your opinion, how this project was successful?" Codes ordered by frequency (n=343).

Code	Frequency (n)	Description	Examples
Met objectives	224	Project developed knowledge, methods, or tools. Knowledge gained or goals accomplished	*"Achieved project objectives. . ."* *"All objectives were accomplished, expected deliverables delivered, and new knowledge regarding the environmental fate of target pathogens created."* *"Determined the soil type and vegetation conditions best suited for reducing microbial pathogen overland transport."*
Stakeholder engagement	95	Project engagement with stakeholders and/or extension focusing on K-12	*"It provided educational training for high school students about the use of GIS relative to water issues. They learned how to use this valuable tool and how it is used around the world in various ways."* *"It reached a large number of rural underserved people and educated them about protecting their drinking water source."* *"The knowledge gained through this research had an immediate positive impact on the industry."*
Collaboration	59	Beneficial partnerships, relationships, or interactions established/developed	*"A partnership (municipal, industrial, other interested parties) coming together to develop water management strategies to address critical issues in a politically complex international watershed."* *"Connections and partnerships between federal, state and local agencies and Extension were developed, most notably in animal manure management and watershed management with considerable influence on regulations and developing efficient means of compliance."* *"The project was successful because of the excellent collaborative efforts among lead scientists and support from the administration, extension personnel, and student workers."*
Students	52	Undergraduate/graduate students and/or postdoctoral researchers were involved and/or funded. Educational curriculum developed	*"1. Train 7 PhD and 1 MS student in plant physiology and plant breeding. 2. Trained students now work for Monsanto (2), Syngenta (1), International maize and wheat research center (CIMMYT)(2), University of Virginia (1), Assistant Professor, University of Arkansas (1), one is interviewing."* *"It brought together students to learn about the ecology/natural resources in their backyard and the importance of conservation/protection of native species."* *"It created several courses and modules for use in community college education, and strengthened several degree programs and workforce development pipelines. It provided facilities for education and training that are in use today many years after the grant has ended."*
Publications	50	Project led to research publications	*"Multiple papers published that have been well-cited; 3 MS theses."* *"Published research papers in leading journals, and present at conference."* *"The project resulted in two successful dissertations (2 PhD students were trained as part of this grant). In addition, 6 data chapters were published in peer-reviewed journals."*

Code	Frequency (n)	Description	Examples
Sustained outcomes	49	Project led to increased awareness, commercially available product, change in behavior	*"Developing regional based irrigation technology and management that has been adopted beyond the range of Kansas."* *"A variable rate center pivot irrigation system was tested in multiple states, the benefits were quantified, and the system is now commercially available. Farmer tests have shown significant improvements in yield along with reductions in total irrigation water applied."* *"This project was successful as all outputs have been produced and are being used by clientele to save water."*
Funding	28	Additional funding received	*". . . it was successful in starting a number of projects that have been ongoing and have been continued with other support."* *"This project developed and applied a land use change simulation model that was subsequently used in an NSF research project and in several research proposals."* *"This project was a SEED grant. With this project and smaller follow-up grants, I successfully graduated two graduate students, involved several undergraduates in research, and published 2 peer-reviewed publications on this topic."*
Ongoing	23	Project ongoing and respondents indicated too early to judge project success	*"So far yes, but we are only in year 2 of 5."* *"The project is entering the second year and we can't tell yet."* *"The project is in its second year. It is too soon to evaluate success or failure. We have encountered technical problems and overcome most of them."*
Policy change	16	Project led to a policy change	*"It has led the state to develop a pilot project in water quality trading."* *"Exceptionally successful. This project has formed the basis for multiple grower initiatives, establishment of water district guidelines and state wide policy. A large number of practices have changed as a consequence of this work."* *"Used in policy decisions about climate change mitigation and adaptation."*
Miscellaneous	13	Miscellaneous project specific activities and/or interactions	*"1890s extension agents come from a variety of backgrounds."* *"We had regularly meetings of the research group to evaluate progress."* *"The project was successful in providing services to underserved communities."*

Table 16. Codes to describe how projects could have been more successful.
Corresponds to open Q10: "Please tell us, in your opinion, how this project could have been more successful." Codes ordered by frequency (n=289).

Code	Frequency (n)	Description	Examples
Funding	83	Increase of, more stable, full, and/or longer-term funding	*"An opportunity for follow on funding to refine and explore new evolving concepts."* *"As this was a special grants project, the money available was not large and tended to decline slightly from year to year. However, we leveraged it quite well as best we could."* *"I wish we had the opportunity and funding to monitor the effectiveness of the demonstration projects."* *"If there was enough travel funds for County agents to attend the face-to-face workshops."* *"We only received a partial award (about 1/4 original budget). This restricted some portions of the multidisciplinary aspects."*
Expansion	54	Increased/broadened project to include or expand project element (e.g. outreach, scale, tools used, scope, participants, project team personnel, and/or evaluation)	*"An inclusion of an analytical chemist."* *"Expanding the collaborators beyond the agricultural school to include other schools at the land grant universities. Also by expanding Extension activities in the urban areas to engage a broader audience."* *"If I had to re-write the grant I would include more travel funds for the co-PI and I to attend seminars/workshops on aquaculture and hydroponics and to visit aquaculture/hydroponics facilities outside our district."* *"Involving active participation of USGS and NGOs."* *"While it attempted to examine many genes, a larger number of genes would be valuable."*
Project management	50	Increased and/or improved project management, study design, and/or preparation	*"Better advanced training of all project personnel engaged in field studies."* *"In the proposal phase, if we had realized we were capable of expanding the area of the project, then our project planning would have been more straightforward."* *"It proved extremely challenging, logistically, to gather all the data…needed within the constraints of working within a national park."* *"Better project management."* *"This project could have been more successful had I had a better transition plan when my post-doc received a full-time job in another region. The final analyses and publications remain incomplete because of this poor transition."*

Code	Frequency (n)	Description	Examples
Time	36	Additional time	*"Although all projected deliverables were exceeded, it would have been nice to have the time/funding to conduct even more extensive training, working with the NIFA Regional Water Programs, most of whom were very interested in the training. We capture great examples of projects created as a result of this training, but a more thorough follow-up evaluation would have been valuable for both us and NIFA."* *"Increased time for networking and engaging with tribal colleges."* *"Simply more time and focus to expand the tools developed would have been helpful. While we did reach out to practicing conservation agents, more effort in that realm later in the project may have helped to increase the impact."*
NIFA constraints	31	Programmatic/funding agency barriers/limitations/ restrictions	*"Better integration with other special research grants."* *"There were two distinct project combined into a single grant, making reporting very difficult."* *"Uncertainty of year to year funding would not allow us to thoroughly plan for future."* *"Although this development effort was initiated by federal agencies (USDA and USDI), neither agency had procurement of best management practices policies that enabled full deployment of the successful results at operational scale."*
Barriers	23	Unforeseen barriers related to conducting research such as politics, natural phenomenon, mandated work, etc.	*"At the time of this project, the state . . . was sending detectives on . . . [neighboring state] farms (sometimes illegally) to see what they were doing. All part of the lawsuit between the two states. This of course made the farmers very skeptical of us and it took some time for them to accept that we were not there picking sides but to do real research and extend real science based info. We lost a good amount of time in gaining trust that would not have been necessary if the lawsuit was not happening."* *"The project had political opposition locally and nationally. If we did not have that political opposition, we could have worked more efficiently with local officials and been able to do tests more thoroughly."* *"We encountered several problems with some sensors installed in the field, and as a result, we lost some data."* *"Weather turned out to be a very limiting factor in gully monitoring. A dry 2012 year and wet 2014 created continuous problems with data collection."*
Miscellaneous	20	Miscellaneous project specific constraints	*"This project was funded by USEPA though an interagency agreement with NIFA. These types of collaborations could be of great benefit to water resource management if challenges in communicating between agency financial systems were reduced."* *"The difficulty is finding students interested in the program. Once we get them here, our retention is high, but irrigation and natural resources are hard sells to 18-year-olds."* *"If more 1890 institutions participated."*

Code	Frequency (n)	Description	Examples
More training and outreach	17	Additional training and outreach	*"It would have been useful to have more follow-on activities, although these would have required volunteers."* *"This project would have been more successful if more resources had been dedicated to training clientele."* *". . . we would have expanded the number of sites for research and demonstration, and performed additional community outreach."*
Unexpected personnel change	15	Project team member died, fell sick, or transferred jobs causing setbacks to project goals and outcomes	*". . . we lost some very talented research and extension people to the private sector, and their knowledge, enthusiasm and creativity have been tough to replace."* *"One of the co-PIs passed away soon after the project ended, and it was difficult emotionally to move forward with certain aspects of the project without him."* *"Three co-PIs changed institutions during the project's timeline which created a variety of logistical issues."*
More impact	14	Broader impact and adoption of project results/outcomes	*"After it was proven that management practices could be successful in keeping nutrient and soil on the land with an improvement in the downstream lake system, there was not significant follow up by local agencies (US Soil and Water, NYDEC) in providing funds to develop a strategy or plan for the entire watershed."* *"As with any project, if more people would have adopted the more efficient practices that would have improved the project's success. However, it takes a lot to change people's attitudes and behaviors so outreach and education is a continuing need in any project."* *"Would have like to have been able to better document impact."*
Support	12	Increased support from scientists, extension, stakeholders, industry	*"Better support by faculty."* *"Teacher support in the classroom could be improved so that . . . [monitoring] activities could be incorporated throughout the year instead of just spring and fall monitoring."* *"More cooperation with seed companies who have likely done significant research in this area would have been helpful."*
Collaboration	11	Improved partnerships, relationships or interactions with others in the project team	*"I as principal PI should have made time in my schedule to visit the lead PIs and other collaborators at their research sites during the growing season. I think this would have fostered a little more sense of unity and purpose, a better visit for the overall project."* *"I wish the group had functioned better - it was a challenge to move the project forward."* *"The PI should have served as a committee member for all graduate students even at other universities to help 'track' research progress."*

Code	Frequency (n)	Description	Examples
Continue collaboration	11	Continuation of project team collaboration after project completion	*"More effective cooperating among participants after the project ended."* *"Better continued cooperation among the disciplines after the project ended."* *"Continued strong collaboration among the disciplines."*
More publications	10	Increase in publications	*"It is challenging to accomplish a participatory approach and publish peer-reviewed papers at the same time. Our hope is that in the next year, our several papers in preparation can become part of the peer-reviewed documentation of our successes and our unique observations."* *"The project's economic and social science component findings were not published."* *"While the project resulted in detailed agency reports, we are still working on publishing the results in peer-reviewed journals. We have draft publications composed, but have not yet made the time to push them through the publication process. This process has taken longer than usual for this particular project."*
Ongoing	9	Project ongoing and success cannot yet be judged	*"The project is in its second year. It is too soon to evaluate success or failure."* *"We are still in early stages of the educational outreach component of the project, but engaging stakeholder groups earlier on, even in the planning stages of the project, might have been helpful."* *"Currently in progress."*
Extension	6	Extension was ineffective	*"Extension was the weak link."* *"Legacy of water quality coordinators, selected by Extension Directors limited access to other faculty."* *"With increased involvement and support of Extension Educators across the state we could have expanded the program more widely."*
Staff	5	Additional staff (not extension)	*"If we had been able to hire one more person to work on written materials - that would have improved our output."* *"We always needed more creative talent - especially graduate students and post-docs."* *"We needed to have an administrative assistant or a similar person that could take care of the administrative details of the project."*

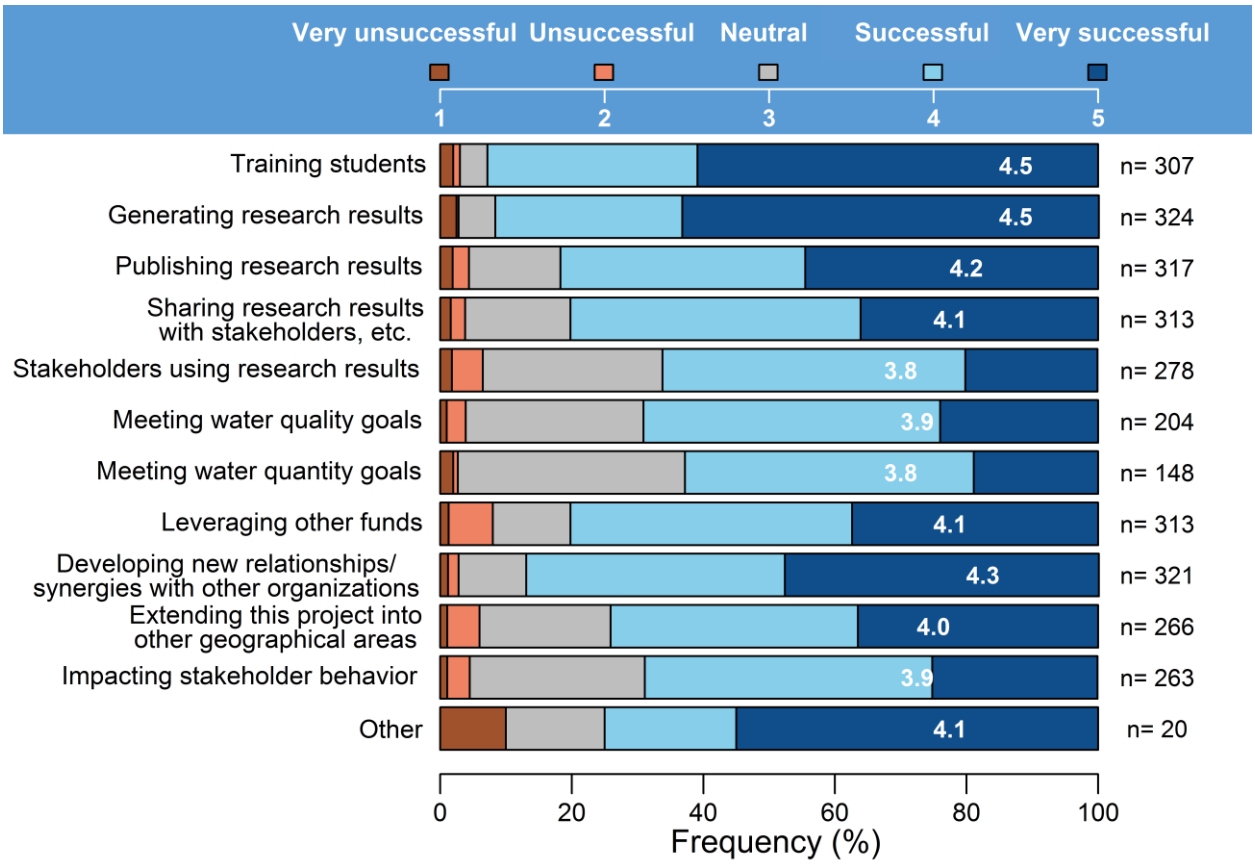


Figure 10. Project success areas.
Corresponds to Likert-style Q16: "In your opinion, how successful was your project in the following areas?" Mean in white text.

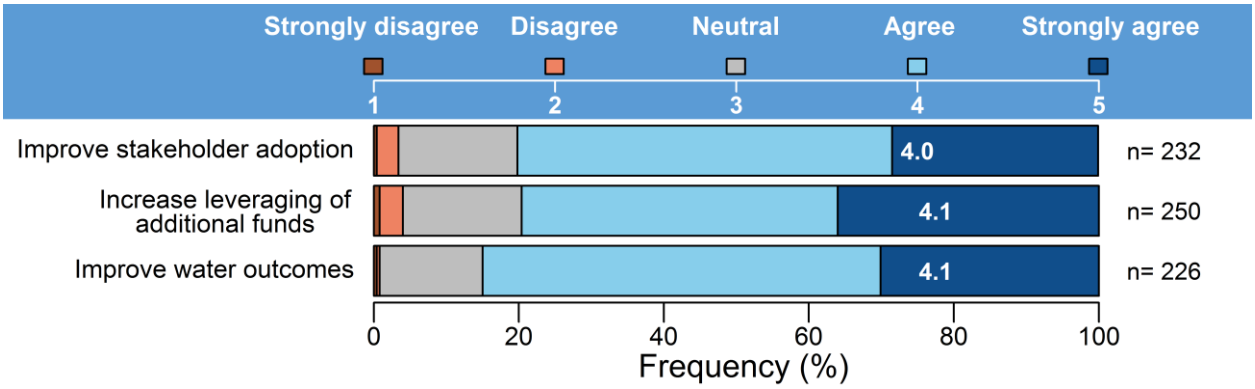


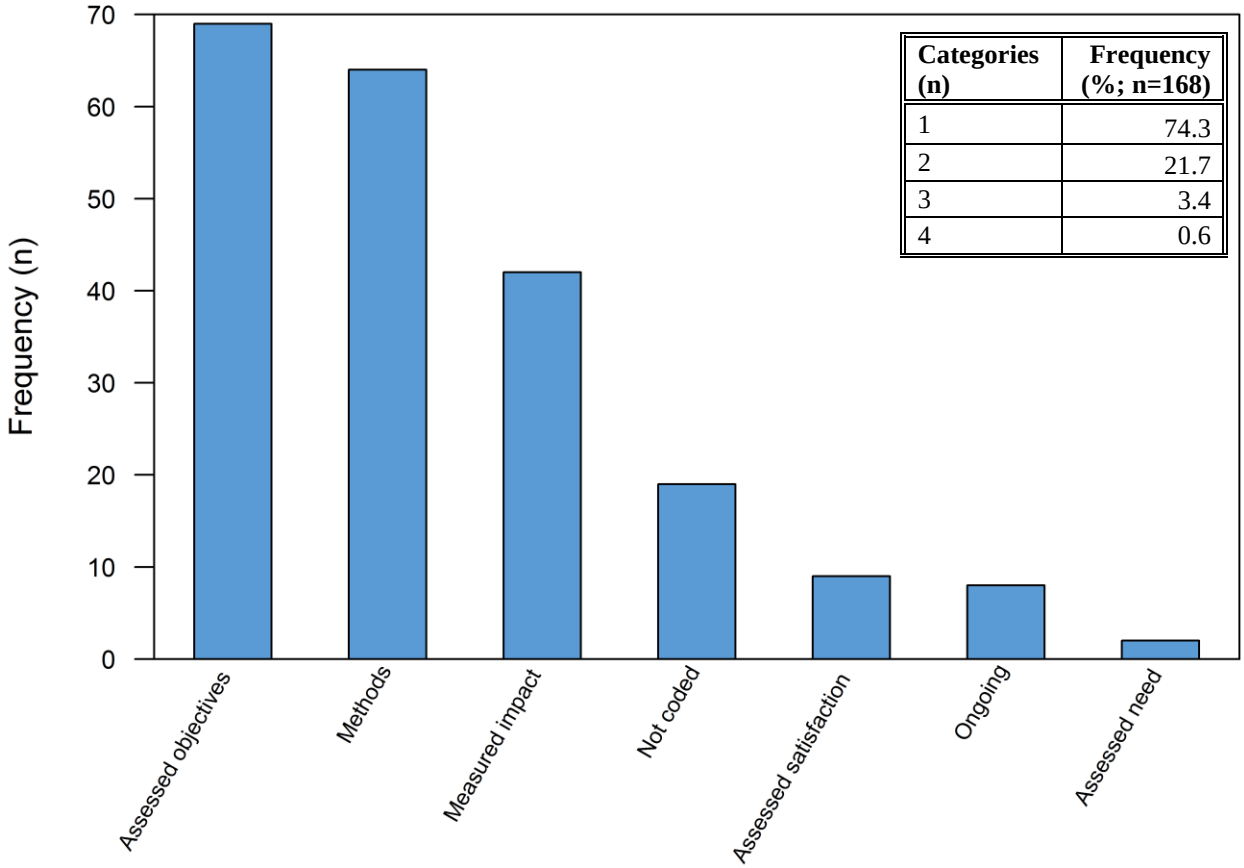
Figure 11. Success through synergies.
Corresponds to Likert-style Q17: "New synergies/relationships developed through this project helped in the following areas:" Mean in white text.

3.6 Project evaluation, focus of future NIFA funding, and additional comments

Half (50.6%) of the PDs evaluated project success (Q19); those respondents were asked what they did. Their responses were arranged into codes and subcodes (Figure 12 and Table 17). If a response contained multiple subcodes within the same code the code was only tallied once; therefore, subcodes (Table 17) will not tally up to the total number of codes (Figure 12). Not all codes have subcodes. The most frequent code present was evaluating the project relative to the project objectives (Figure 12). Methods varied (Table 17) and no prevalent quantitative evaluation measurement emerged from the responses.

Future NIFA funding (Q23), identified by PDs, should be focused on water quality and scarcity (53.6% and 46.4%, respectively; Figure 13). Their responses were arranged into codes and subcodes (Figure 13 and Table 18). If a response contained multiple subcodes within the same code the code was only tallied once; therefore, subcodes (Table 18) will not tally up to the total number of codes (Figure 13). Not all codes have subcodes. Water quality had a total of 21 subcodes; the majority (n=38) of these respondents indicated the focus should specifically be nutrients (i.e. fertilizers) entering waterways (Table 18).

The final question of the survey requested any additional comments (Q28). Two main themes were developed from their responses regarding NIFA projects and funding, which were comments about NIFA, the USDA, or the funding programs and suggestions to NIFA (Table 19).



Categories (n)	Frequency (%; n=168)
1	74.3
2	21.7
3	3.4
4	0.6

Figure 12. Project evaluation codes.
Corresponds to open portion of Q19: "Did you evaluate project success?" Table indicates the frequency of PDs to select ≥ 1 category. Detailed description of codes in Table 17.

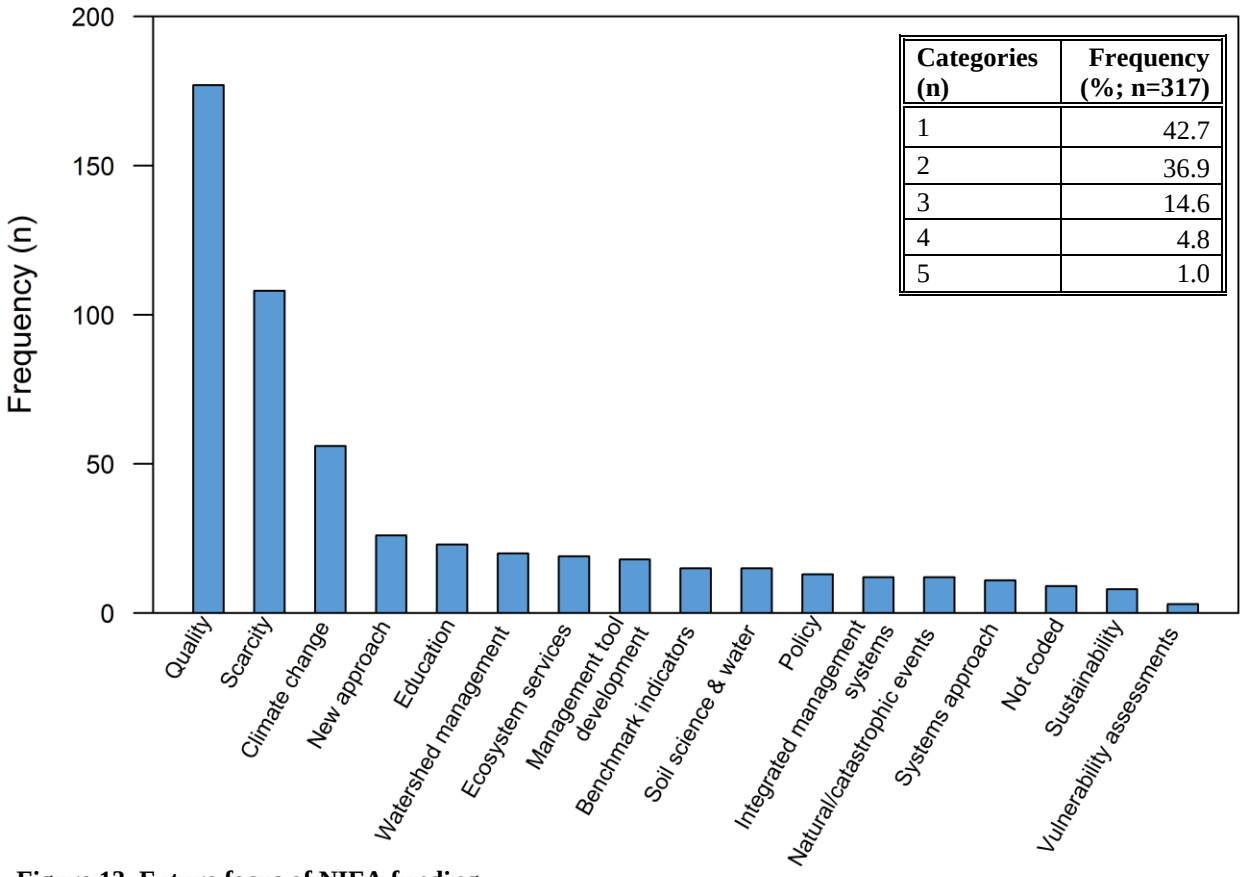
Table 17. Project evaluation codes.
Corresponds to open portion of Q19: "Did you evaluate project success?" Ordered by frequency of codes (bolded) then subcodes.

Subcode	Frequency (n)	Description	Examples
Assessed objectives			
Research/ proposal objectives accomplished	37	Compared objectives with project accomplishments, if knowledge was gained, assessed production	*"Compared results and accomplishments of project against the goals stated in the application and work plan, and determined these were met."* *"Reviewed outcomes against stated project objectives to assure attainment."* *"Noted that all project goals were achieved."*
Publications	17	Number of publications	*"By the number of publications produced."* *"Assessed numbers of publications and citations."* *"Published all papers."*
Leveraging	14	Project outcomes used towards new funds and/or research, relationships developed	*"Success was stated to be leveraged additional research."* *"Tracked leveraged resources."* *"Successes were explained in research funding proposals."*
Student involvement	13	Number of students trained/involved and/or exposed	*"Success was based on number of students exposed to science of Aquaculture and Natural Resources."* *"Number of undergraduate and graduate students trained. Knowledge gained by the students."* *"Student understanding, learned skills, and their involvement with continuation with related degrees and opportunities."*
Final/annual/ progress report(s)	9	Final/annual/progress report(s) conducted but detail of reports not included	*"We wrote summary reports and met with all involved to access our outcomes."* *"End of year reports and in proposals for new funding. But quantitative evaluations were not done."* *"The success of the project was summarized in the final project report."*
Presentations	4	Number of presentations	*"Presentation and posters at Professional Conferences."*
Results shared	4	Results/knowledge disseminated/ communicated	*"Communication of results!"*

Subcode	Frequency (n)	Description	Examples
Methods			
Miscellaneous	23	Vague how method was conducted or only one PD used method	*"Through farmer advisory committee."* *"Internal evaluation was performed."* *"Social network analysis."*
Survey(s)	22	Survey(s) were conducted	*"We surveyed organizations at beginning and near end of the project."* *"Student/Teacher surveys."* *"Participants were surveyed by another researcher about their attitudinal and behavioral changes."*
Assessment(s)	18	Evaluation conducted but specifics vague	*"New volunteers are evaluated about their training."* *"Workshop and conference evaluations."* *"We distributed an evaluation form to project participants and others involved in the project to determine the project's success."*
Team Meeting(s)	6	Internal meetings conducted	*"We could have done this better, but project co-PIs and graduate students had conversations regularly to assess progress and deliverables."* *"Annual PI meetings."*
Interview(s)	5	Interviews conducted	*"Follow up interviews with communities that participated."* *"Follow-up phone interviews to determine how/if the project recommendations are being adopted by stakeholders."*
Observation(s)	5	Observed a behavior or use of project results	*"Tracked use of website."* *"I am at an outlying experiment station and I see firsthand the adoption of practices based on the success of this project."*
External evaluator	2	Used external evaluator	*"External evaluator matched goals with outcomes."*
Measured impact			
Results/ knowledge adopted	22	Project results/ knowledge used	*"We did evaluate to determine if participants adopted suggested practices."* *"We evaluated how many people we served and how many wells were tested and cleaned up."* *"Determining the extent to which the project findings and disseminations have impacted their opinion of sustainable agriculture and considering herbs as alternative crops in Mississippi."*

Subcode	Frequency (n)	Description	Examples
Behavior changed	7	Project results/ knowledge modified behavior	*"Management changes of land use."* *"Evaluation were done pre and post wise to access changes in behavior and knowledge."*
Student productivity	3	Resulted in productive students	*"Evaluated student productivity."*
Not applicable (NA)	2	Evaluated impact broadly	*"Estimated economical impact."* *"Only via indirect impacts."*
Not coded			
NA	19	Response vague or unclear	*"This is a research project. We are not building widgets. I work on the project every day."* *"I believe we evaluated public meetings."* *"Yes this project has been one of the most successful projects that I have conducted."*
Assessed satisfaction			
NA	9	Evaluated satisfaction broadly	*"Only generally and in terms of our client farmers' satisfaction."* *"Not formally, but there was feedback from stakeholders on the project success."*
Ongoing			
NA	8	Project not finished and cannot be evaluated	*"Success of project cannot be evaluated until it is finished."* *"Not yet because project is not completed but will do so at the end (e.g., compare objectives with project outcomes)."*
Assessed need			
NA	2	Evaluated need broadly	*"Follow up needs assessment."* *"Asking what thematic areas in water quality will they need for them to perform their duties efficiently to stakeholders."*

This page intentionally left blank.



Categories (n)	Frequency (%; n=317)
1	42.7
2	36.9
3	14.6
4	4.8
5	1.0

Figure 13. Future focus of NIFA funding.
Corresponds to open Q23: "In your opinion, what water related science questions should NIFA funding be focused upon in the future?" Table indicates the frequency of PDs to select ≥ 1 category. Detailed description of codes in Table 18.

This page intentionally left blank.

Table 18. Future focus of NIFA funding codes.
Corresponds to open Q23: "In your opinion, what water related science questions should NIFA funding be focused upon in the future?" Ordered by frequency of codes (bolded) then subcodes.

Subcode	Frequency (n)	Description	Examples
Quality			
Nutrients	38	Fertilizers entering waterways, leaching	*"Industrial fertilizer application and runoff."* *"Reducing nitrogen, phosphorus and sediment runoff from ag[riculture] in large watersheds."* *"Nutrient management within controlled environments and at nurseries."*
NA	28	Broad water quality issues	*"Improving and protecting water quality."* *"Core water quality and agriculture projects."* *"Understanding regional differences in water quality outcomes of agricultural."*
Safe water	27	Drinking water and general microbiological safety	*"Microbiological safety of water."* *"Effect of agriculturally-derived, water-borne 'emerging contaminants' on ecological and human health"* *"The potential impact of urban farming on urban health."*
BMP development	16	Developing methods for management practices	*"BMPs for nutrient retention to minimize eutrophication."* *"Organic farming as a water quality approach."* *"What realistically can be done to solve the water quality problems with our current form of agriculture?"*
Land use effects	16	Investigating land use effects	*"Local land use decision making - the key to everything. Well, many things."* *"Somehow urban water quality needs to be included."* *"Water quality as related to projected land use."*
BMP adoption	15	Adoption methods for management practices	*"On the ground water projects to increase implementation of water quality and quantity protecting practices. Adoption of science-based practices is needed to make improvements. In order to gain adoption, land owners often need to be directly engaged in projects over a sustained period of time (this cannot be achieved only with webinars and webpages)."* *"I think our greatest challenge is adoption and finding options that are easily adopted by landowners under a 'productive conservation' framework. This is more social science research but needs to be integrated with the biophysical sciences as well as financial research."* *"Practice adoption. We have much of the science we need, but must support local applied research/demonstration to facilitate adoption by stakeholders at all levels."*

Subcode	Frequency (n)	Description	Examples
Microbiological/ organic	13	Microbiological and/or organic contamination (including impact use mitigation)	*"Speciation of organic compounds in water and interactions with suspended solids."* *"First, there needs to be more work on correctly identifying the source of pathogenic organisms in water sources. Then there is the need to identify the pathogen shedding patterns in different livestock species."* *"Cyanobacteria issues in surface water."*
BMP relative effectiveness	12	Investigating relative effectiveness between management practices	*"Understanding effectiveness of conservation practices in watersheds relative to upland versus in-stream and near-stream practices"* *"Influence of green infrastructure on water quality and ground water recharge."* *"An examination of innovative BMPs to improve water quality through the reduction of nutrients so that areas such as the Chesapeake Bay as well as elsewhere (e.g. Lake Erie) can substantially reduce N, P in their waters."*
Agrochemicals	10	Herbicides and/or pesticides entering water and their effect on ecological and human health	*"Water quality, how agrochemical pollution affects water quality and biodiversity, and how agrochemicals affect waterborne pathogens which can threaten human health."* *"Water pollution from pesticides and pesticide mixtures."* *"How do agricultural fields contribute to harmful algal blooms (HAB) in water bodies."*
BMP policy effectiveness/ development	9	Effectiveness of management practices	*"Evaluate the level of success of current policy initiatives for promoting the use of water quality improvement practices in agricultural lands. Evaluate potential success of alternative policy initiatives."* *"Continue evaluating the role of agricultural activities on water quality and management activities to reduce impact."* *"How to develop programs that effectively incentivize water conservation and nutrient reduction by agriculture. This would include full cost accounting of implications of excess nutrient loading. How to make BMP cost share programs more transparent and better assess public direct payment vs. indirect cost share programs to implement BMPs."*
Livestock	9	Livestock effects	*"Effects of animal waste on water quality."* *"Role of grazing cattle in cutbank erosion; Use of shade distribution to control the contribution of grazing cattle to NPS."*
Monitoring	9	Data collection and/or tools	*"Good data on relative demand for water resources, across all users."* *"Soil moisture sensing systems coupled to wireless communication and control systems. . ."*

Subcode	Frequency (n)	Description	Examples
Erosion/ sediment	8	Erosion and sediment impacts	*"Understanding sources of sediment in a watershed; Addressing reservoir sedimentation issues."* *"There still is a great need to design engineered erosion control materials to reduce soil movement on sloped lands and delivery of sediment to streams and lakes."*
Wastewater management	8	Management of wastewater including stormwater (non-agricultural land)	*"Quantitative mitigation for stormwater."* *"Stormwater management practices and technologies."*
Economics/cost effective	6	Investigating the economics of improving water quality	*"Low cost treatment technology for agricultural water."* *"How to improve water quality cost-effectively?"*
Invasive species	4	Impact of invasive species	*"Water quality relationships with native vs invasive plants (e.g., erosion control, runoff), especially in riparian corridors."* *"Invasive species, poor ecological diversity and its impacts on water quality"*
Septic systems	4	Septic system impacts	*"Septic system recharge to groundwater."* *"The contribution of pathogens and nutrients from septic systems to surface- and ground-waters in rural and urbanizing watersheds and associated implications for food safety."*
Sustainable water decontamination treatments	4	Use of treatments for sustainable water decontamination	*"Use of biochar filtration systems to capture microbes and chemicals from agricultural wastestreams."* *". . . .for development of inexpensive pathogen removal filters for non-point source contamination, e.g., renewable sand/clay filters, etc."*
Droughts	3	Drought impacts	*"Impacts of drought on hydrology and water quality."*
Pharmaceuticals	2	Pharmaceutical impacts	*"Antibiotic pathways and environmental impacts."*
Salinity management	2	Techniques to manage salinity	*". . . desalination and water treatment."*
Fracking	1	Hydraulic fracturing impacts	*". . . fracking, . . ."*
Scarcity			
Protection and conservation	22	Protection and conservation methods of limited water resources	*"Water science as it applies to water rights issues and water supply for both human and ecological consumption."* *"How can we better manage our current water resources and reduce use or use water more efficiently to ensure enough good-quality water for the growing population?"* *"Water Conservation and Management. New engineering designs to increase water delivery efficiency."*

Subcode	Frequency (n)	Description	Examples
Irrigation	21	Irrigation efficiency, use, and impact	*"Probably projects that help to address fresh water scarcity including reduction in irrigation."* *"Efficient use of water in irrigated perennial crops."* *"Basic physiology of water uptake and transport processes that can provide insights into precision irrigation management tailored to the specific physiology of a given crop/rootstock/genotype growing in a specific location."*
Use	21	Efficiency and management	*"Best use of water by agricultural producers during times of drought."* *"Water Use Efficiency."* *"Efficient use and management of water resources for agricultural land."*
NA	21	Broad water quantity/scarcity issues	*"Drought and drought response."* *"Water scarcity for agriculture."* *"Water quantity is increasingly more important, regionally, nationally and internationally."*
Reuse/alternative sources	19	Investigating water reuse and alternative sources	*"Irrigation and precipitation runoff as an alternative water resource."* *"Issues related to water reuse for agricultural purposes."* *"Wise use of alternative water 'types' e.g. purple (reclaimed) water for food production/irrigation, development of grey water recycling at the homeowner level for metropolitan communities."*
Crop production	15	Impact of water scarcity on crop production and mitigation strategies	*"Crop responses to water deficit."* *"The primary areas are agricultural production with limited water (less water available than in the past), and this emphasis should include potential changes in common local and regional crop species."* *"There are many issues, but a key under-funded area is whole-plant and crop physiology of water relations. There are many critical issues in understanding water use efficiency (crop structure, leaf form, stomatal regulation, hydraulic conductivity, crop management etc.) that cannot be understood at any lower level of hierarchy. Dependence on molecular approaches is extremely naive as has been shown over the last 30 years. Complex problems like this and climate change requires good integrated funding across all levels of hierarchy."*
Allocation	8	Demand between different users	*"The conflict of water usage between agriculture and other industry."* *"Movement and transport of water from one region to another within the U.S. Some areas have insufficient water sources (e.g., Texas and California) while other areas have excess water (e.g., Michigan). Water cannot be a local or state issue because that results in "stealing" water from nearby areas and lots of politics. We need a national approach to water."*

Subcode	Frequency (n)	Description	Examples
Quality	7	Water quality issues due to scarcity	*"Water quality issues in arid and semi-arid areas."* *"Dealing with quantity and quality issues at the same time."*
Land use change effects	5	Impact of land use change	*"How land cover change is affecting water quality and quantity."* *". . .agricultural land use change . . ."*
Climate change			
Water quality/ quantity	42	Climate change impacts on water quality and/or quantity	*"Issues related to water quantity/quality relative to climate change."* *"Understanding the potential impacts of climate change on water supplies to farms and ranches."* *"Climate change as mediated by changes in temperature, precipitation/runoff, and how this affects aquatic ecosystems. Also, the interactions of climate change with other stressors, such as climate-eutrophication interactions."*
Water adaptation	15	Adaptation methods	*"What buffers watershed response to climate change in intensively managed regions?"* *"Climate adaptation related to water conservation, crop production and stormwater management."* *"Climate adaptation for key land grant/extension stakeholder groups."*
NA	3	Broad climate change impacts	*"Changing precipitation trends, peaks and timing."*
Economics	1	Cost estimates and strategies	*"How to connect economic estimates to both climate/drought impacts? How to determine the economic benefits of planning, adaptation/mitigation strategies for drought, extreme events, and climate change?"*
New approach			
NA	26	Basic/fundamental or topical areas	*"Problems related to coupled-human natural systems."* *"Water-related questions should we focus on? Where do we start? The current level of NIFA funding and focus on water-related science is ABYSMAL, considering the multiple challenges we face across the nation, not only in terms of water quantity (both surface and groundwater resources), but also water quality. Considering the importance of water to our national and food security, I would expect a coordinated inter-agency approach is the only way we will be able to make any progress on water-related issues in the next 10-20 years. IT IS TIME FOR CONGRESS, USDA-NIFA, USDA-NRCS, USGS, DOE, EPA TO WAKE UP!!"* *"Supply side water investigations continue to be important but the demand side is not well understood or studied at all. This should be a focus in the future."* *"Optical effects nearby a liquid air interface."* *"Regional water resource co-ordination project."*

Subcode	Frequency (n)	Description	Examples
Education			
Extension	9	Extension programming and/or education	*"County Agents education in water resources."* *"Extension programming to stakeholders both ag[riculture] and urban to keep the conversation active for water quality/quantity."*
End users/ stakeholders implementation	6	Implementation/ adoption by stakeholders/end users	*"Better implementation of project results through federal, state and county agencies."* *"We need to find ways to change water users' behavior so the results of past research can be more fully implemented."*
Next generation	4	Engaging with next generation	*"Funding to keep public breeding research programs active so that universities have resources to continue training future generations of plant breeders."* *"A qualified workforce is very important. We are a community college in the heart of [state] agricultural region and are ideally situated for training our future decision makers, but much of the funding is focused on very specific research. This makes the funding unrealistic for our institution. We were writing grants for water projects in [state] several years before the crisis hit CNN, but if projects are too proactive they don't score well in the grant process. This causes a lag in the innovation coming from government funded institutions."*
Collaboration	3	Interaction between groups	*"Improved dialog and cooperation between groups of researchers and extension specialists."* *"Educating researchers and 'environmentalists' about how to learn from community and other stakeholders."*
Stakeholder co-creation/ production	2	Co-creation with stakeholders/end users	*"Need to research the process of co-creation with end users and operationalizing the results so they continue to inform decisions and planning."*
Training	1	Training of technical staff	*". . . This will take better training of technical people. For example, we developed [name] models that ably predict outcomes for management practice. However, a large percentage of the people in the agencies at the field level have absolutely no idea how to use them properly."*
NA	1	Broad water problems education	*"Enhancing international research & education on water problems and challenges."*
Watershed management			
NA	20	Management across watersheds including all land use types, surface/groundwater	*"Watershed studies (nutrient loading, erosion, animal waste, septic tanks in rural watershed)"* *"Shared benefits of managing water across landscapes - urban, ag[riculture], forest."* *"I think that NIFA's current focus is appropriate, especially the focus on watershed management and efforts to reduce agriculture's impact on water quality. More efforts are needed to enhance integrated and interdisciplinary research projects."*

Subcode	Frequency (n)	Description	Examples
Ecosystem services			
NA	19	Ecosystem services role in water quality/quantity	*"Measuring water-related ecosystem services on family forests."* *"We need better molecular-scale understanding of the ecosystem processes involved in water science questions."* *"The role of non-ag[riculture] areas such as wetlands and forests in capturing N, P, and sediment from agricultural areas. It is an ecosystem service (capture of ag[riculture] N, P, sediment) provided by adjacent non-ag[riculture] areas that appears to be maximal at about 50% agricultural land use in rural areas without significant urban land use (<5%)."*
Management tool development			
NA	18	Developing management tools/ technology	*"Technology to better obtain spatial-temporal measurements of water."* "V*ery accurate weather forecast systems, phenotyping for water use efficiency."* *"Improved targeting of hotspots of pollution and improved targeting of hotspots of pollution removal."*
Benchmark indicators			
NA	15	Developing benchmark indicators for models	*"Linking impacts to physical indicators."* *"Current reliance on water quality models, without empirical field data, seems risky."* *"Support innovative new methods especially iterative experiments and predictive modeling."*
Soil science and water			
NA	15	Soil and water interactions	*"Root zone solute transport and transformation."* *"Traditional crop system to a bioenergy crop system may affect the soil-water system?"* *"Soil as an ecological filter for clean water."*
Policy			
NA	13	Policy effectiveness/ development on water quality and quantity issues	*"There should be more support for studies looking at the influences of water use and water policy on regional economic development."* *"Local land use planning."* *"How to improve the delivery of conservation to achieve needed outcomes within budget constraints."*

Subcode	Frequency (n)	Description	Examples
Integrated management systems			
NA	12	Integrating water management systems including energy/food/water nexus	*"Water in relation to food, human and environmental health, and energy."* *"Water resources needed for renewable bio-energy industry both during feedstock production and refinery operations."* *"Water science as related to the water, food, and energy security nexus."*
Systems approach			
NA	12	Systems approach to water/soil management	*"Water exchange between surface water and groundwater."* *"Understanding interactions, feedbacks, and non-linearities between water cycle and carbon and other nutrient cycling in soils."* *"Interactions between surface water, groundwater, communities, and ecosystems"*
Natural/catastrophic events			
NA	11	Natural/catastrophic events effects on water/agriculture/ hydrology	*"As storms become more intense, such as Hurricane Sandy and Tropical Storm Irene, urbanizing and urban areas need to be prepared to be prepared for extreme storm events."* *"Extreme weather effects - droughts, floods, seasonal extremes."* *"Disaster-related water quality issues."*
Not coded			
NA	9	Response vague or unclear	*"I am no longer working on issues of water quality."* *"This was a great project -- our goals were clear: education and extension programing about pathogens. We did this and more!!"*
Sustainability			
NA	8	Sustainable water and agriculture	*"Sustainable food production in production environments."* *"Sustainability metric development for animal agriculture."*
Vulnerability assessments			
NA	3	Analyzing water resource vulnerabilities	*"What are the basic contaminants in underserved communities' drinking water resources?"* *"How to do vulnerability assessments and tie adaptation planning to these assessments?"*

Table 19. Additional comments related to NIFA projects or funding.
Corresponds to open Q28: "Please use the space below for any additional comments about this survey or NIFA projects and funding."

Code	Frequency (n)	Examples
NIFA/program comment	24	*"NIFA was very instrumental in address the biosolids topic as it is a very politically charged topic."* *"These funds though never large were very important through leveraging with other funds to provide us with sustained momentum in water quantity research in time when water quality was predominate."* *"Most NIFA projects are 3 years, 4 with a no-cost extension. It is really hard to get the necessary work done in this time, much less have that information have an impact. I think the time frame of these projects is too short to realistically expect change."* *"The work/research the funding this survey addresses is without doubt some of the best our organization has ever performed. The freedom to design the research locally being key. Issues addressed in real time by people interested in the topic not just funding for survival sake is the right formula for sound research."* *"This project was a great opportunity to work with colleagues in other states and deliver the project materials to extension clientele in rural, suburban and urban communities."* *"NIFA support for basic research studies in the small-medium level range ($0.5M-$1.5M) is making significant contributions (with low risk) to our understanding and management of water resources & climate change issues."* *"This Special Research Grant funding was extremely efficient since it was leveraged successfully across many disciplines and with many collaborators to directly address producer identified issues across the Southern Great Plains: it didn't have to 'fit' predetermined criteria diluting the effectiveness of the proposed questions. Dollar for dollar it was extremely effective, and could have been much more effective if funding had been continued!"* *"It is a travesty that past (very successful) water programs were gutted by the last NIFA Director. All that critical mass is now lost, and we are reaping the (lack of) benefits from his lack of leadership and misguided, misdirected efforts."* *"NIFA now appears to have preference for large, integrated projects, which emphasizes more on team building and organization and proportionally less on basic science research and technology development."* *"The project created a fundamental opportunity for developing several strong research programs that were impactful for stakeholders. Very disheartening that foundation funding eliminated in favor of large-scale CAP projects. This eliminated the funding stream for our project in spite of its success because it is too small scale and multi-state proposals were not funded."* *"Our National Water Program project has been a highlight of my career in its relevance, opportunity and impact. I continue to work on disseminating and utilizing the results."*

Code	Frequency (n)	Examples
Suggestions for NIFA	27	*"I was surprised by the lack of reporting requirements from NIFA. Except for CRIS reports and participation in annual investigator meetings, no one at NIFA seemed to want to hear of project results in any kind of detail. I realize that almost all the funded researchers are academics and publication in peer-reviewed journals is both expected and rewarded, but this is not true for consultants. Although we expended a lot of effort to produce a comprehensive final report, we received no acknowledgment or interest from NIFA in the report and as we are not particularly rewarded for journal publications, had no incentive (or time) to publish in that venue. I believe that NIFA needs to impose greater reporting requirements on funded investigators (similar to what other agencies like USEPA do) and to track project results more closely. Perhaps surveys like this would be less necessary to assess program effectiveness."* *"We need to keep creating pathways for high school and undergraduate students (especially minorities and women) to explore science related fields and jobs within these fields and make science accessible to all stakeholders."* *"More medium size projects. The current mega size projects encourage collaboration, but not good for junior faculty."* *"NIFA is fantastic. NIFA would improve if it could be more consistent year to year in its release of RFA, program deadlines, and requests or non-request of letter of intent. At present NIFA does something different every year."* *"Funds must be allocated to minority serving institutions (1890s) that are working in water related issues as they are currently not receiving sufficient support to make sustainable impacts in their communities."* *"I was hoping to have more interactions with the folks related to USAWaterquality.org. I also enjoyed conferences organized by NIFA. I miss those and I hope they are brought back."* *"The focus should be on projects with clear practical outcomes."* *"This project helped to establish my lab early in my academic career, and enabled a chemical engineer to invest in a research agenda related to soils, agriculture, climate & sustainability. Please keep investing in NIFA SEED projects, and continue encouraging reviewers to take a chance on innovative new directions."* *"It is important to recognize and value the role that trained educators and leaders can play in ensuring NIFA funding has significant impact on water quality and quantity. People with expertise in education, leadership, civic engagement, communication, and public policy are critical to fulfilling NIFA's integrated mission."* *"More funds for smaller (e.g., two PI) efforts are needed."* *"This project was funded through the International Science & Education (ISE) program. This was a very successful and promising program which was unfortunately terminated by the USDA. Please bring back this program - it did a whole lot of good for a little amount of money!"*

4 References

Gold, A.J, D. Parker, R.M. Waskom, J. Dobrowolski, M. O'Neill, P.M. Groffman, K. Addy, M. Barber, S. Batie, B. Benham, M. Bianchi, T. Blewett, C. Evenson, K. Farrell-Poe, C. Gardner, W. Graham, J. Harrison, T. Harter, J. Kushner, R. Lowrance, J. Lund, R. Mahler, M. McClaran, M. McFarland, D. Osmond, J. Pritchett, L. Prokopy, C. Rock, A. Shober, M. Silitonga, D. Swackhamer, J. Thurston, D. Todey, R. Turco, G. Vellidis, and L. Wright Morton, 2013. Advancing water resource management in agricultural, rural, and urbanizing watersheds: Why land-grant universities matter, Journal of Soil and Water Conservation, v. 68, p. 337-348.

IBM Corporation, 2013. IBM Statistical Package for the Social Science (SPSS) Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.

National Research Council (NRC), 2004. Confronting the Nation's Water Problems: The Role of Research, National Academies Press, Washington, DC.

Qualtrics software, Version April - November 2015 of Qualtrics. Copyright © 2015 Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. http://www.qualtrics.com.

R Core Team, 2015. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria, https://www.R-project.org/.

Research, Education, and Economics Information System (REEIS) database (http://www.reeis.usda.gov/). Accessed December, 2014.

United Stated Department of Agriculture Research, Education, and Economics (USDA REE), 2012. Research, Education, and Economics Action Plan, https://www.ree.usda.gov/.

This page intentionally left blank.

Appendix A

A.1 NIFA Water Portfolio Project Director Survey

Question 1 (Q1). Is this an ongoing project?
- ❍ Yes
- ❍ No

Skip: "Yes" text provided below. "No" continue to Q2.

We are interested in evaluating the current status of projects, whether ongoing or complete. When completing this survey, please reflect upon what has actually occurred with your project since it began (rather than what you plan for the future).

Q2. Was this project:
- ❍ Extension only?
- ❍ Research only?
- ❍ Extension and education?
- ❍ Research and extension?
- ❍ Research and education?
- ❍ Research, extension and education?

Q3. What was the geographical scope of this project?
- ❑ Single watershed
- ❑ Regional within one state (specify region and state using two letter abbreviation)_____
- ❑ Statewide (specify state using two letter abbreviation) _____
- ❑ Multi-state (specify states using two letter abbreviations or region) _____
- ❑ National
- ❑ Other (please specify) _____

Q4. This project focused on (check all that apply):
- ❑ Agricultural land
- ❑ Arid land
- ❑ Coastal land
- ❑ Drinking water and health
- ❑ Natural resources land (forested, prairie, wetlands, etc.)
- ❑ Prairie/grassland
- ❑ Riparian areas
- ❑ River/stream/creek restoration
- ❑ Rural areas
- ❑ Stormwater management
- ❑ Urbanizing areas
- ❑ Urban areas
- ❑ Watershed management
- ❑ Youth education
- ❑ Other working land (other than agriculture) [please indicate type of working land] _____
- ❑ Other: _____

Q5. The following types of individuals were included on this project (check all that apply):

- ❑ Agricultural & Biological Engineers
- ❑ Agronomists
- ❑ Chemists
- ❑ Climatologist
- ❑ Ecologist
- ❑ Economists
- ❑ Geologists
- ❑ Geospatial Scientist
- ❑ Hydrologists
- ❑ Plant Scientists
- ❑ Soil Scientists
- ❑ Social Scientists (non-economists)
- ❑ Non-science professionals (please specify) _____
- ❑ Other: _____

Q6. Please indicate what type of project this was: Was this a single university or multi-university project?

- ❍ Single university
- ❍ Multi-university
- ❍ Public/private collaboration (please specify)
- ❍ Other (please specify)

Skip: If "Multi-university" selected, answer Q7. All other categories continue to Q8.

Q7. Were any of the co-PIs from a Minority Serving Institution such as a Historically Black College or University (HBCU) or a Hispanic Serving Institution (HSI)?

- ❍ Yes
- ❍ No
- ❍ I do not remember/do not know

Q8. How many co-Project Directors were involved in this project? (please include yourself in this number)

Q9. Please tell us, in your opinion, how this project was successful:

Q10. Please tell us, in your opinion, how this project could have been more successful:

Q11. Please enter the number of the following publication types that emerged from this NIFA project (if you do not specifically remember, please enter your best guess).

- ❑ Journal articles (specify number)_____
- ❑ Theses/dissertations (specify number) _____
- ❑ Extension publications (specify number)_____

Q12. To the best of your knowledge, the following stakeholder groups learned about the results of this project (check all that apply):

- ❑ Don't know
- ❑ Community members/the public
- ❑ Extension staff
- ❑ Farmers
- ❑ Local conservation staff
- ❑ National conservation staff
- ❑ Policy makers
- ❑ Researchers
- ❑ Rural property owners (non-farmer)
- ❑ State conservation staff
- ❑ Urban property owners (non-farmer)
- ❑ Urbanizing property owners (non-farmer)
- ❑ Youth
- ❑ Other_____

Q13. The project team disseminated project knowledge through the following means (check all that apply): [Please include details for each box checked, including intended audience] For example, You could check the "Stakeholder meetings" box below and include, we presented our project results at a meeting with farmers and a separate meeting with local elected officials.

- ❑ Did not disseminate project knowledge; not an intended outcome of this project
- ❑ Did not disseminate project knowledge; but it was an intended outcome of project
- ❑ Audio podcasts/webinars_____
- ❑ Broadcast news media_____
- ❑ Classroom_____
- ❑ Conference_____
- ❑ Decision support tools/technologies_____
- ❑ Fact Sheets_____
- ❑ Field days/tours_____
- ❑ Newsletters_____
- ❑ Print news media_____
- ❑ Stakeholder meetings_____
- ❑ Videos_____
- ❑ Website_____
- ❑ Workshops_____
- ❑ Other (please indicate)_____

Skip: If "Website" selected, answer Q14. All other categories continue to Q15.

Q14. Please tell us about the website you developed for this project.

- ❑ This website is still available/accessible to the public
- ❑ This website is still being updated
- ❑ This website is no longer available/accessible to the public
- ❑ This website is no longer updated
- ❑ Other (please indicate)_____

Q15. To the best of my knowledge, the outcomes of this project have been used by the following stakeholder groups (check all that apply):

- ❑ Don't know
- ❑ Community members/the public
- ❑ Extension staff
- ❑ Farmers
- ❑ Local conservation staff
- ❑ National conservation staff
- ❑ Policy makers
- ❑ Researchers
- ❑ Rural property owners (non-farmer)
- ❑ State conservation staff
- ❑ Urban property owners (non-farmer)
- ❑ Youth
- ❑ Other (please indicate)_____

Q16. In your opinion, how successful was your project in the following areas?

	Very unsuccessful	Unsuccessful	Neutral	Successful	Very successful	Don't know	Not a goal of project
Developing new relationships/synergies with other organizations	❍	❍	❍	❍	❍	❍	❍
Extending this project into other geographical areas	❍	❍	❍	❍	❍	❍	❍
Generating research results	❍	❍	❍	❍	❍	❍	❍
Impacting stakeholder behavior	❍	❍	❍	❍	❍	❍	❍
Leveraging other funds	❍	❍	❍	❍	❍	❍	❍
Meeting water quality goals	❍	❍	❍	❍	❍	❍	❍
Meeting water quantity goals	❍	❍	❍	❍	❍	❍	❍
Publishing research results	❍	❍	❍	❍	❍	❍	❍
Sharing research results with stakeholders, etc.	❍	❍	❍	❍	❍	❍	❍
Stakeholders using research results	❍	❍	❍	❍	❍	❍	❍
Training students	❍	❍	❍	❍	❍	❍	❍
Other (please indicate)	❍	❍	❍	❍	❍	❍	❍

Skip: If "Developing new relationships/synergies with other organizations" selected, answer Q17. All other categories continue to Q18.

Q17. New synergies/relationships developed through this project helped in the following areas:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Don't know
Improve water outcomes	❍	❍	❍	❍	❍	❍
Improve stakeholder adoption of project results	❍	❍	❍	❍	❍	❍
Increase leveraging of additional funds	❍	❍	❍	❍	❍	❍

Q18. Please indicate which of the following outcomes made this project a success (check all that apply):

- ❑ Not applicable
- ❑ Educational curricula developed
- ❑ Extension programs developed
- ❑ Number of publications
- ❑ Number of students working on the project
- ❑ Policy changed
- ❑ Project goals were achieved
- ❑ Relationship building with stakeholders
- ❑ Relationship building with partner institutions
- ❑ Stakeholders adopted recommendations
- ❑ There was increased conversation about project goals/outcomes with stakeholders
- ❑ Water issues were solved
- ❑ Other (please indicate) _____
- ❑ If you have additional thoughts on the success of this project, please share them here: _____

Q19. Did you evaluate project success?

- ❍ No
- ❍ Yes (please explain what you did):_____

Q20. Were other funds used to seed this project?

- ❍ Yes; other NIFA funds
- ❍ Yes; other non-NIFA funds
- ❍ No
- ❍ Don't know

Q21. Did this project help lead to funding for (an) additional project(s).

- ❍ Yes - additional NIFA funds
- ❍ Yes - additional non-NIFA funds
- ❍ No
- ❍ Don't know

Q22. Did this project interact with any NIFA-funded Regional Water Quality Projects (Section 406) or multi-state HATCH projects?

- ❑ Yes - NIFA-funded Regional Water Quality project (Section 406)
- ❑ Yes - multi-state HATCH project
- ❑ No
- ❑ Don't know

General Information:

Q23. In your opinion, what water related science questions should NIFA funding be focused upon in the future?

Q24. What year were you born?

Q25. What is your gender?

Q26. What was your job title when this project was funded?

- ❍ Assistant Professor
- ❍ Associate Professor
- ❍ Full Professor
- ❍ Extension Educator
- ❍ Research Staff
- ❍ Other_____

Q27. What type of scientist are you?

- ❑ Agricultural & Biological Engineer
- ❑ Agronomist
- ❑ Chemist
- ❑ Climatologist
- ❑ Ecologist
- ❑ Economist
- ❑ Geologist
- ❑ Geospatial Scientist
- ❑ Hydrologist
- ❑ Plant Scientist
- ❑ Soil Scientist
- ❑ Social Scientist (non-economists)
- ❑ Other:_____

Q28. Please use the space below for any additional comments about this survey or NIFA projects and funding.

Thank you for completing this survey and providing your feedback to the assessment of the NIFA Water Portfolio. Once you click the >> button to submit your responses, you will be redirected to a summary of your responses that you can convert to pdf for your records, if interested. We may contact you in the future for additional input and information.