



Marcellus Matters EASE: Marcellus Citizen Science Network

Summative Evaluation Report

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Background

Marcellus Matters: EASE

Marcellus Matters: Engaging Adults in Science and Energy (EASE) was a program of Penn State University's Marcellus Center for Outreach and Research (MCOR), in collaboration with other experts across the university. The first year of program activities took place in 2012, and the project continued through September 2016. EASE was a multidisciplinary initiative that provided adults in rural Pennsylvania with opportunities to increase their knowledge of science and energy systems and engage in scientific inquiry and investigation through the lens of natural gas development.

The present report addresses one of the four program activities, the Marcellus Citizen Science Network (MCSN).

Marcellus Citizen Science Network

An outgrowth of the Community Science Volunteers (CSV) course, the Marcellus Citizen Science Network (MCSN) was a program developed to immerse adult learners in the processes of scientific research. By teaching participants to locate and report orphan and abandoned wells (OAW), the program involved people in data collection that could help mitigate against potential hazards in their communities.

MCSN was structured to include both a workshop element (in which participants learned how to identify potential well locations) and a fieldwork element (in which participants actually attempted to locate wells based on preliminary research). The stated goals of the MCSN program were to engage people in the processes of scientific inquiry, to increase participants' interest in science and energy, to increase participants' knowledge about the science and technology involved in locating OAW, and to support participants in contributing to scientific knowledge in their communities.

In the context of the larger project goal of fostering civil dialogue and involvement in community deliberations about energy, evaluation sought to answer two overarching questions:

- To what extent did the Marcellus Citizen Science Network build participant awareness of science and energy and participant understanding of scientific processes?
- To what extent did the Marcellus Citizen Science Network foster or enhance individual participation in community science efforts?

Methods

The evaluation of MCSN was a census study of all participants at each program event, and it consisted of a post-program questionnaire designed to measure the success of MCSN at developing specific content knowledge and skill sets. The instrument included self-reported retrospective pre- and post-levels of understanding related to energy development, self-reported retrospective pre- and post- scores of related to new skills and knowledge, and a few interest- and experience-related questions to inform the continual development of the program. The questionnaire was distributed as a paper-pencil form, then collected by EASE program staff; completed questionnaires were then forwarded to the evaluation team for analysis.

Open-ended responses were coded using emergent categories; where applicable, these coded items were analyzed alongside parallel quantitative items using SPSS. De-identified individual responses to items were analyzed in aggregate by session-type (i.e., workshops and fieldwork experiences). The creation of separate instruments for workshops and fieldwork meant that each response could be tied to the specific experience of participating in a workshop or in fieldwork; however, as a result, some individual respondents in the workshop participant group were represented in the fieldwork participant group.

Limitations

When interpreting results to this study, it is important to note the limitations, which by design included self-reported change in response to the program. While self-reported assessment is inherently biased by the perspective of that individual, this approach is appropriate to the central questions of this evaluation, which pertain to individuals' perceptions of and reactions to the program and invite primarily qualitative data. . The retrospective pre/post design of the evaluation is also useful in this regard because it allows participants to provide a reflection of the degree of perceived change in any particular area by reflecting on both the pre- and post-conditions side-by-side, and it can control in issues such as "response shift bias."¹ It can therefore allow for easier comparison in light of changes to the program and variability across participant groups. In addition, while the very high response rate to the data collection means that the data almost fully represents the population of participants, the small number of individuals involved presents some limits to what can statistically be said about quantifiable data, especially with regard to variation between counties. Therefore, analysis of quantitative data has been limited to nonparametric statistical tests and descriptive statistics for central tendency.

Results

In total, 51 participants attended an MCSN workshop, and 71 participants attended an MCSN fieldwork experience (with about 25 participants attending both). From this overall pool of participants, 43 individuals responded to an experience questionnaire. Among these, 14 were respondents to a first-phase formative questionnaire administered by the team at the combined workshop and fieldwork experiences. The evaluation data described here includes comparable data from those initial measures, as well as data from 29 respondents who responded to an experience-specific summative questionnaire (i.e., a workshop-related and/or a fieldwork-related instrument) at each subsequent event. For the purposes of analysis, participants in the full-day experiences that took place in phase one were considered to have participated in both a workshop and a fieldwork experience. Of the 29 participants in phase two of the program, five participants attended both a workshop and a fieldwork experience, two participated in a workshop only, and 22 participated in fieldwork only.

Phase One: Outreach and Program Development

In its first iteration, MCSN began with a series of local informational sessions that were intended to introduce past participants in the Community Science Volunteers (CSV) course to the history of oil

¹ For more on response shift bias, see Rohs, F.R. (1999). Response shift bias: A problem in evaluating leadership development with self-report pretest-post measures. *Journal of Agricultural Education*, 40(4): 28-37.

and gas development, the distribution of OAW in Pennsylvania, and the associated environmental and societal concerns. In an effort to accommodate the needs of individual communities, participants were also asked to identify local interest areas and logistical considerations for the structure of the MCSN program. From these outreach efforts, the MCSN program team began to identify factors that could affect participation, as well as what seemed to drive community interest. In general, participants shared that they were interested in environmental and safety concerns, as well as opportunities to contribute to a collective effort, apply science skills, and enjoy the outdoors. The informational sessions were also an important contact for identifying key participants, or “local champions,” in individual communities who could support recruitment through local organizations and affinity groups.

Recruitment for the MCSN program primarily focused on groups and interests that already held traction in the target communities. For example, in Clearfield County, several participants were already active regularly in testing water quality in multiple creeks, lakes, and reservoirs through the work of a local watershed organization; some were also members of Sierra Club. In addition to recruiting those already active in environmental efforts, MCSN sought to engage outdoorspeople (i.e., hunting and fishing enthusiasts) in order to support them in understanding and reporting on well data if they encountered OAW in the course of their sporting activities. Meanwhile, those with deep knowledge of community history, such as town elders and county planners, were invited to participate, especially in the process of researching potential locations of undocumented OAW. The specific local history and current conditions of shale gas development also influenced focus areas for each community: while the extensive oil and coal extraction histories in Clearfield and Indiana Counties translated to concern about methane emissions, fault lines, and potential communication between coal mines, old wells, and aquifers, interest in Sullivan County was more closely linked to recent oil and gas development.

In the first phase of MCSN, program opportunities were intended to complement the informational sessions by guiding participants first through the process of locating areas of historic oil and gas development, then through the process of engaging safely in fieldwork. Participants were encouraged to apply the concepts and explore the resources presented during the informational sessions by engaging in two complementary indoor activities. In the first activity, participants used United States Geological Survey (USGS) geologic and topographic maps, Works Progress Administration (WPA) mining maps, and Penn Pilot aerial photography to identify visual indicators of potential historic oil and gas development. The second activity introduced participants to the use of historic documents such as maps, USGS progress reports, well records, well logs, and well plats to identify the precise locations of an OAW. Throughout these exercises, participants were introduced to the types of observations that are important to document in the field. Following a brief fieldwork health and safety presentation, participants were then encouraged to explore a field site, to locate a known OAW, and to record essential field observations (site location, site condition, casing status, etc.).

Phase Two: Program Refinement and Sustainability

While in the first developmental phase of the program the research workshop and fieldwork elements were combined into a single day-long experience, participant feedback indicated that separating document-based research from fieldwork would allow attendees to focus more deeply on their interest areas and create fewer barriers related to scheduling. Therefore, the second phase of MCSN presented several discrete opportunities for participants: workshop experiences, demonstration-based fieldwork experiences (in which a facilitator took participants to a known

well site and went to practice documenting it), and exploratory fieldwork experiences (in which a facilitator and participants identified a likely well site and went to investigate it). In a few cases, additional field trip opportunities were added (e.g., a visit to the Drake Well Museum). Across these experiences, there was a greater emphasis on hands-on experience, discovery, and exploration for participants, particularly with respect to background research and the experience of uncertainty in locating wells (as opposed to simply going to a known site.) In addition to these in-person experiences, the program also included the development of online resources which participants could use to document and report OAW to state agencies.

Connections to Other Project Elements

Because the MCSN program began after the other project elements, participants were asked whether they had taken part in any other EASE programs. Among their responses, some participants did indicate that they had attended previous public events related to the Community Conversations (a performance and community dialogue program) and/or MarcellusByDesign (a community planning workshop experience). The most common past interaction with Marcellus EASE was through Community Science Volunteers, an 8-to-10 week course designed to build critical science literacy through exploration of topics related to shale gas development. This finding is unsurprising in light of the general trend toward increased general buy-in for the EASE project among those who had participated in the longer-term experience of Community Science Volunteers, as well as the fact that in several counties, participants had been directly invited to participate in MCSN.

Table 1. MCSN participants' reported participation in other EASE programs

	Attended Community Science Volunteers	Attended Community Conversations	Attended MarcellusByDesign
Fieldwork Participants (n=41)	17 (42%)	6 (15%)	4 (10%)
Workshop Participants (n=21)	15 (71%)	4 (19%)	4 (19%)

Participant Knowledge and Understanding

After each type of program experience, participants were asked to rate (on a scale where 1 meant “Not well at all” and 7 meant “Very well”) their knowledge and ability related to science skills before their participation and after it. For both workshop experiences and fieldwork experiences, participants reported significant, positive change on every skill and knowledge item. Following both the research workshops and the fieldwork experiences, the areas in which respondents felt most confident were understanding methods for collecting data and knowing where to find state and local data on OAW; notably, scores showed stronger agreement after fieldwork.

Table 2. Workshop participants' self-reported understanding scores (retrospective pre-and post-ratings); results of comparison of paired pre/post scores*

Item	BEFORE Mean	AFTER Mean	p-value
Understand methods for collecting data (n=20)	3.25	5.52	.000
Know where to find state and local data on abandoned and orphan wells (n=20)	2.20	5.52	.000
Understand perceptions of risk and reward in natural gas development (n=20)	3.50	5.33	.001
Know how to use resources available to research historic oil and gas development (n=20)	2.45	5.33	.000
Understand how science is conducted (n=20)	3.90	5.10	.002
Interpret scientific data or findings (n=19)	3.58	5.05	.001

*Wilcoxon Signed Rank test for significance

Table 3. Fieldwork participants' self-reported scores of knowledge and skills gained (retrospective pre-and post-ratings); results of comparison of paired pre/post scores*

Item	BEFORE Mean	AFTER Mean	p-value
Understand methods for collecting data (n=41)	3.49	5.83	.000
Know how to report abandoned and orphan wells (n=41)	2.78	5.68	.000
Know how to document field observations (n=41)	3.46	5.61	.000
Know how to describe technical details about wells (i.e., presence or absence of casing, type of casing, etc.) (n=41)	3.22	5.54	.000
Know how to record GPS data (n=20)	3.45	4.85	.007

*Wilcoxon Signed Rank test for significance

The item with the least reported change related to how to record GPS data, which likely reflects participants' existing experience; among those who had participated in fieldwork, nearly all (20 of 23 respondents) reported that they had used a GPS device before participating in the program.

Participant Learning Roles

Because both the workshop and fieldwork experiences included participants recruited through existing community groups, the evaluation team also sought to understand how participants saw their roles in the learning experiences of others. While a very strong majority of participants in both workshops and fieldwork reported that other participants had influenced their individual learning, far fewer saw themselves as having contributed to the learning of others (Table 4s and 5). Even so, more fieldwork participants than workshop participants reported that they had influenced others,

particularly in relation to sharing scientific information and making plans to continue their participation.

Table 4. Workshop participants' (n=19) identification of learning roles

Item	I influenced others	Other participants influenced me	Not applicable
Learning how to read or interpret background documents or scientific data	1	17	1
Planning to do more background research on my own or with a group	1	13	5

Table 5. Fieldwork participants' (n=39) identification of learning roles

Item	I influenced others	Other participants influenced me	Not applicable
Learning new scientific information	5	28	6
Learning how to gather and record scientific data	1	27	11
Planning to do more fieldwork on my own or with a group	3	24	12

Participant Confidence and Intention

All participants were also invited to rate their agreement (on a scale where 1 meant “Strongly Disagree” and 5 meant “Strongly Agree”) with statements related to their beliefs about community involvement and their levels of confidence about and interest in continuing to contribute to the reporting of OAW. The strongest agreement from participants in both experiences related to the idea that citizens can contribute in important ways to the scientific process of locating OAW (Tables 6 and 7). Despite this, agreement was moderate but less strongly reported for participants’ enthusiasm about and confidence in their own personal involvement.

Table 6. Workshop participants’ agreement ratings of experience and intention

Item	Mean	Median	Mode
I think citizens have an important role to play in gathering scientific data about orphan and abandoned wells (n=20)	4.5	5	5
I would like to continue locating and reporting orphan and abandoned wells (n=20)	4	4	4
I feel prepared to locate orphan and abandoned wells outside this program (n=20)	4	4	4
I am personally committed to helping my community take action related to orphan and abandoned wells (n=20)	4	4	4
I feel prepared to report orphan and abandoned wells using the Orphan Well Scout and Map Forum (n=20)	3.8	4	4

Table 7. Fieldwork participants' agreement ratings of experience and intention

Item	Mean	Median	Mode
I think citizens have an important role to play in gathering scientific data about orphan and abandoned wells (n=39)	4.7	5	5
I feel prepared to use a GPS device on my own (n=5)*	4.2	5	5
I feel prepared to locate orphan and abandoned wells outside this program (n=39)	4	4	4
I enjoyed the process of gathering these data (n=38)	4	4	4
I am personally committed to helping my community take action related to orphan and abandoned wells (n=39)	3.9	4	3
I feel prepared to report orphan and abandoned wells using the Orphan Well Scout and Map Forum (n=18)	3.8	4	4
I would like to continue locating and reporting orphan and abandoned wells (n=39)	3.8	4	3

**In several MCSN fieldwork programs, participants did not use GPS devices; in these instances, they did not respond to this item.*

When asked if they had plans to continue the activities they had participated in as part of MCSN, about half of respondents (13 of 21) described some intention to do additional fieldwork. For most who described their plans, the activities they listed mapped directly to places they already went or organizations they were already part of; this suggests that although the number of people at individual program opportunities was sometimes small, the outreach strategy of engaging those who already had some active interest in environmental health and/or existing presence in places likely to have OAW did reach target audiences. For example, a respondent wrote “I would do [more fieldwork] on my friends’ farm, where I know the lay out of the land” (Summative Fieldwork Questionnaire). Respondents also framed opportunities as being connected to their existing community efforts: “We have an established group that is interested in creating a database for our county in Ohio. This will require citizens work in the field” (Summative Fieldwork Questionnaire).

Although responses from workshops were limited, four respondents did offer similar intentions related to the background geographical and historical research involved in locating potential well sites. These included comments like “Look at computer research for areas that I hike and fish near” and “research the state game lands located in the NE part of the country” (Summative Workshop Questionnaire). Notably, one respondent did identify a potential leadership role in continued OAW activities, reported that they were “also interested in educating others on this info and the online tools” (Summative Workshop Questionnaire).

Program Sustainability

Both to provide opportunities for iterative refinement and to inform conversations about the sustaining OAW citizen science initiatives beyond the funded grant, participants in MCSN were asked to rate their interest in attending future events (on a scale where 1 meant “Very uninterested” and 5 meant “Very interested”) and to provide feedback about their experiences, as well as potential organizational contacts for outreach. For both experience types, respondents reported moderately strong interest in continuing their participation, with workshop participants (n=6) giving a mean rating of 4.7 (Median: 5; Mode: 5) and fieldwork participants (n=25) giving a mean rating of 4.2 (Median: 4; Mode: 5).

In describing what they felt was most helpful about the MCSN workshop experiences, respondents primarily mentioned visual examples of wells themselves and the process of accurately and thoroughly creating well reports. Areas that they felt could be improved related to logistical details, such as projection equipment, the temperature of the room, and timing. Meanwhile, participants primarily identified the most helpful elements of the fieldwork experience as opportunities to see wells in person and learning experiences related to describing the characteristics and details of wells. Among the aspects of the fieldwork that they felt could be improved, participants focused primarily on the desire for more hands-on practice and the desire for longer experiences. To support deliberation about future program opportunities, a complete list of raw responses is included in Appendix B.

Among the organizations that participants suggested MCSN contact, Sierra Club was listed most frequently (5 respondents), followed by Pennsylvania Senior Environmental Corps groups (3 respondents) and the League of Women Voters (2 respondents). Other suggested contacts included the Indiana County Conservation District, DEP/DCNR, Penn State Geosciences Club, Ohio River Citizens Alliance, and Friends for Environmental Justice.

Team Reflections

In a final group debrief, the EASE project team as a whole was asked to outline what they felt participants had gained through the program, what they themselves would identify as major takeaways or lessons learned, and what they identified as the legacy of the program (Figure 1).

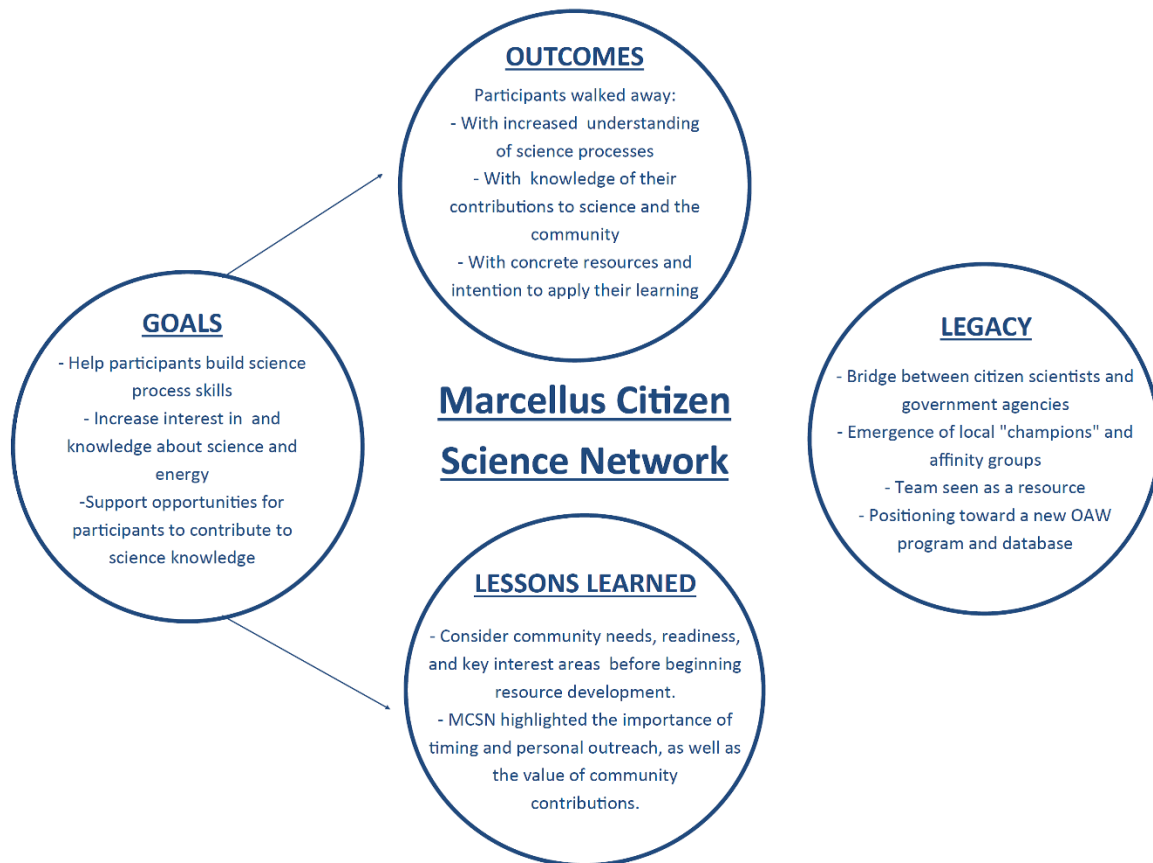


Figure 1. Team reflections on the Marcellus Citizen Science Network

In this discussion, project team members observed that participants in MCSN not only appeared to gain an increased awareness of scientific processes, but also described increased awareness of their own potential to contribute to both scientific knowledge their local communities; in some cases, participants also indicated that they intended to continue reporting OAW data, as well.

In considering their own takeaways, the project team indicated that MCSN illustrated the value of community contributions to knowledge about local history and environmental conditions. As was true for several other aspects of the overall project, team members also described MCSN as illustrating the need to understand the concerns of individual communities and stakeholder groups, as well as the important of personal outreach, relationship-building, and sustained contact.

As with other EASE programs, the legacy associated with MCSN included publications and presentations by team members, along with ongoing use of program materials and resources among participants. In addition, through strategic partnerships and agency support, the MCSN team is positioned to continue programming that will help communities in rural Pennsylvania locate and document OAW beyond the EASE grant period. New collaborations are furthering sustainability: for example, Penn State's Earth and Environmental Systems Institute and the Center for Environmental Informatics have agreed to continue to house and maintain the program's OAW database after the end of the project. Other organizations which are now connected to the MCSN program include local Sierra Club chapters, the Department of Environmental Protection, Indiana University of Pennsylvania, PULS, Save Our Streams PA, The Enviroeneers, Mansfield University, and the Keystone Trails Association. Finally, the program team held a capstone conference in September 2016 to debrief about MCSN and consider productive next steps. This convening of major stakeholders in the documentation of OAW resulted in consensus that collaboration was needed between agencies, community members, and researchers, as well as an action plan for assembling a regional working group on OAW. The agenda from that meeting is included in Appendix C.

Conclusions

Overall, the development and implementation of the Marcellus Citizen Science Network demonstrated efficacy at supporting community learning related to science process skills, as well as increasing skill and intention in relation to locating and documenting orphan and abandoned wells. Comments related to the program suggest that in general, those who attended MCSN events responded positively and could identify applicable takeaways from their participation. More specifically, community members enjoyed participating in scientific processes, and they felt that the program had prepared them to locate OAW. Meanwhile, audience data demonstrate that both the workshop and fieldwork components contributed to significant, positive gains in skills and knowledge. Workshops were most effective at helping participants understand the processes of conducting historical research on OAW and understanding well data, whereas fieldwork experiences helped participants improve technical skills, such as documenting their observations, describing OAW, recording GPS data, and reporting OAW.

Importantly, participants agreed that citizens have a meaningful role to play in gathering scientific data about OAW, and participants' individual learning and increased confidence suggested that they were well-positioned to begin filling that role. Despite this, their personal commitment to taking action tended to be in the neutral ranges: their individual motivation to participate in efforts around OAW was not as strong as the general sense that locating and documenting well sites was a worthy goal. Even so, participants in both workshops and fieldwork experiences agreed that they would be interested in participating in additional program sessions in the future. This interest, combined with participants' indications that they primarily saw themselves as learners, rather than in positions to support others' learning, triangulates against findings from other elements of the larger EASE project.

Because the Community Science Volunteers (CSV) course had a strongly didactic orientation *and* that program was the most visible element of EASE for many participants, expectations about the structure and purpose of both MCSN and MarcellusByDesign appeared to have been somewhat influenced by the course. In some ways, this was very supportive: the buy-in that was generated through sustained contact with CSV participants seems to have contributed positively to outreach efforts for MCSN. In approaching MCSN, however, many participants appear to have primarily considered their enthusiasm about hands-on fieldwork experience and increased confidence and skills of within the frame of individual learning, rather than community action. Still, by the end of the EASE project, MCSN program data indicated that workshop and fieldwork experiences were met with enthusiasm, were supportive to community members' skills and knowledge of science processes, and for some, encouraged participants to apply what they had learned.

Meanwhile, an important takeaway for the program team was that MCSN illustrated the value of community contributions to local scientific knowledge. Additionally, the outreach necessary to building MCSN strongly demonstrated the importance of understanding and foregrounding the concerns of individual communities and stakeholder groups, as well as the importance of sustained, relationship-driven communications with participants. As was also true for other EASE programs, the legacy associated with MCSN included publications and presentations by team members, along with documented community intention to continue the use of program resources. Finally, the development of strategic partnerships and sustainability planning for OAW together have positioned MCSN programming as an important precursor to new opportunities for citizens to engage in the process of locating and reporting OAW that will beyond the EASE grant period.

Appendix A: Summative Evaluation Questionnaires

Phase 2 Workshop Questionnaire

Thank you so much for participating in the Marcellus Matters Orphan and Abandoned Well workshop! Your feedback will help us learn about this program and improve these activities in the future.

Using a scale from 1 to 7, please respond the following statements about your knowledge and skills **BEFORE** today's workshop and **AFTER** today's workshop. Circle one number for **BEFORE** and one number for **AFTER**. 1 means "Not well at all" and 7 means "Very well."

BEFORE Today's workshop							How well did you...	AFTER Today's workshop						
Not well at all						Very well		Not well at all						
1	2	3	4	5	6	7	Understand how science is conducted?	1	2	3	4	5	6	7
1	2	3	4	5	6	7	Understand methods for collecting data?	1	2	3	4	5	6	7
1	2	3	4	5	6	7	Interpret scientific data or findings?	1	2	3	4	5	6	7
1	2	3	4	5	6	7	Understand perceptions of risk and reward in natural gas development?	1	2	3	4	5	6	7
1	2	3	4	5	6	7	Know how to use resources available to research historic oil and gas development?	1	2	3	4	5	6	7
1	2	3	4	5	6	7	Know where to find state and local data on abandoned and orphan wells?	1	2	3	4	5	6	7
1	2	3	4	5	6	7	Know how to report abandoned and orphan wells?	1	2	3	4	5	6	7
1	2	3	4	5	6	7	Understand the environmental impacts of abandoned and orphan wells?	1	2	3	4	5	6	7

Have you ever attended any of the following events? (Check all that apply)

- Marcellus Matters: Community Science Volunteers** (10-week class on the science of energy development)
- Marcellus Matters: Community Conversations** (public event with theater and dialogue segments)
- MarcellusByDesign** (public event about landscape architecture and community planning)
- Marcellus Citizen Science events** (Penn State convening, information sessions, workshop experiences, or fieldwork experiences besides today's)

In what ways did your interactions with other participants today affect each of the following aspects of the workshop? (Circle the choices that best apply.)	I Influenced Others	Other Participants Influenced Me	Not Applicable
Learning how to read or interpret background documents or scientific data	x	x	x
Planning to do more background research on my own or with a group	x	x	x

How much do you agree with each of the following statements? (Circle the choice that best applies.)	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I would like to continue locating and reporting orphan and abandoned wells.	1	2	3	4	5
I feel prepared to locate orphan and abandoned wells outside this program.	1	2	3	4	5
I feel prepared to report orphan and abandoned wells using the Orphan Well Scout and Map Forum.	1	2	3	4	5
I think citizens have an important role to play in gathering scientific data about orphan and abandoned wells.	1	2	3	4	5
I am personally committed to helping my community take action related to orphan and abandoned wells.	1	2	3	4	5

Do you have any specific plans to do more research about orphan and abandoned wells? If so, please describe them below.

What was most helpful to you about today's workshop?

What could be improved about today's workshop?

How interested would you be in attending a workshop that included hands-on experience with online resources like Google Earth and the PA DEP Well page?

(Circle the choice that best applies.)

Very uninterested		Neither interested nor uninterested		Very interested
1	2	3	4	5

Please list any groups you are connected to who might be interested in a workshop like this one.

Are you attending today's afternoon field trip? (circle one) Yes No

If you selected "No," which reason best describes why? (circle one) Busy Not Interested Physical Ability Other -please describe

Phase 2 Field Trip Questionnaire

Thank you so much for participating in the Marcellus Matters Orphan and Abandoned Well fieldwork trip! Your feedback will help us learn about this program and improve these activities in the future.

Using a scale from 1 to 7, please respond the following statements about your knowledge and skills **BEFORE** today's workshop and **AFTER** today's fieldwork. Circle one number for **BEFORE** and one number for **AFTER**. 1 means "Not well at all" and 7 means "Very well."

BEFORE Today's fieldwork								AFTER Today's fieldwork															
Not well at all							Very well			How well did you...							Not well at all			Very well			
1	2	3	4	5	6	7		Understand methods for collecting data?	1	2	3	4	5	6	7								
1	2	3	4	5	6	7		Know how to document field observations?	1	2	3	4	5	6	7								
1	2	3	4	5	6	7		Know how to record GPS data?	1	2	3	4	5	6	7								
1	2	3	4	5	6	7		Know how to describe technical details about wells (i.e., presence or absence of casing, type of casing, etc.)?	1	2	3	4	5	6	7								
1	2	3	4	5	6	7		Know how to report abandoned and orphan wells?	1	2	3	4	5	6	7								

Have you ever attended any of the following events? (Check all that apply)

- Marcellus Matters: Community Science Volunteers** (10-week class on the science of energy development)
- Marcellus Matters: Community Conversations** (public event with theater and dialogue segments)
- MarcellusByDesign** (public event about landscape architecture and community planning)
- Marcellus Citizen Science events** (Penn State convening, information sessions, workshop experiences, or fieldwork experiences besides today's)

In what ways did your interactions with other participants today affect each of the following aspects of fieldwork? (Circle the choices that best apply.)	I Influenced Others	Other Participants Influenced Me	Not Applicable
Learning new scientific information	x	x	x
Learning how to gather and record scientific data	x	x	x
Planning to do more fieldwork on my own or with a group	x	x	x

How much do you agree with each of the following statements? (Circle the choice that best applies.)	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I enjoyed the process of gathering these data.	1	2	3	4	5
I would like to continue locating and reporting orphan and abandoned wells.	1	2	3	4	5
I feel prepared to locate orphan and abandoned wells outside this program.	1	2	3	4	5
I feel prepared to use a GPS device on my own.	1	2	3	4	5
I feel prepared to report orphan and abandoned wells using the Orphan Well Scout and Map Forum.	1	2	3	4	5
I think citizens have an important role to play in gathering scientific data about orphan and abandoned wells.	1	2	3	4	5
I am personally committed to helping my community take action related to orphan and abandoned wells.	1	2	3	4	5

Do you have any specific plans to do more fieldwork? If so, please describe them below.

Had you ever used a GPS device before today's fieldwork experience? (circle one) Yes No

What was most helpful to you about today's fieldwork experience?

What could be improved about today's fieldwork experience?

How interested would you be in participating in future field trips?

(Circle the choice that best applies.)

Very uninterested		Neither interested nor uninterested		Very interested
1	2	3	4	5

Please list any groups you are connected to who might be interested in a fieldwork experience like this one.

Did you attend this morning's workshop? (circle one) Yes No

If you selected "No," which reason best describes why? (circle one) Busy Not Interested Other (please describe below)

If you selected "Yes," what element of the workshop was most helpful to you during the afternoon fieldwork?

Appendix B: Raw Participant Feedback

Summative Workshop Data

What was most helpful to you about today's workshop?

General information

Learning what to look for in well sites, what data to record, and how to report it.

Presentation of data, examples, & (probably) visiting actual sites

Nooreen's presentation and showing her well report to DEP

Photographs of abandoned wells, forms, etc

What could be improved about today's workshop?

A warmer room

Time management (only slightly)

Facility was not very amenable-- COLD. Lighting and projection screen not good at all.

Just a little more on everything

?

Summative Fieldwork Data

What was most helpful to you about today's fieldwork experience?

seeing the sites, smelling the H₂S, methane & oil slicks

Seeing the wells

Seeing the instrument used.

To see actual plugged well

Actually see a plugged well and identify the state of repair

seeing what to look for

Getting out in the field to see an actual abandoned well

Learning characteristics of communication indicators where a well may be leaking into a waterway/surface.

Having the well described.

general knowledge about gas issues

The description of the casings

Description and visual of plugged well

Identify is a well leaking

Learning to ID wells. Measuring flows.

Technical information explained by DEP inspector

Seeing the FLIR camera & different meters for measuring methane, knowing details is very helpful

The importance of the abandoned wells and the cost of capping them

Better understanding the purpose of Marcellus Matters

understanding objectives of PA DEP & NSF projects with respect to abandoned wells

Big picture talks

Learning about organized efforts to locate & report abandoned wells

What could be improved about today's fieldwork experience?

take along some pH paper and possibly dissolved solids meter

explaining initials used IE LEL OGI etc

more time?

Additional pictures to show the standard configuration

See actual orphan well

Much more detailed experience

Hands on measurements. Overall great trip. :)

Historical handout

Hands on experience

More sites

Visit sites that have not been plugged, see the signs

Need to schedule more time to go over data collection, & perform some data collection, & use the various tools & meters

Brief intro of people and their agency, who they rep & why they are interested in attending

Understand the general backgrounds of your audience & address material accordingly. Some folks have science background and others do not

Needed more time

It was excellent as is. Could be a little longer.

Ideally, we could have visited on orphan or abandoned well

Appendix C: Agenda from the OAW Capstone Meeting

2016 Orphan Wells Conference

21 September 2016, EES Building, Penn State University



Indiana University of Pennsylvania

Dr. Steve Hovan
Bob Wilson

Mansfield University

Cecil Cooper
James Tice

Marcellus Matters Citizen Science Volunteers

Marianne Atkinson
Richard Atkinson

PA Department of Environmental Protection

Seth Pelepko
Richard Swank

Penn State University, Marcellus Matters

Nooreen Meghani –Conference Organizer
Terry Noll

Save Our Streams PA

Laurie Barr

AGENDA

- | | |
|-------------|--|
| 10:00 | Introductions
Coffee and pastries |
| 10:15-12:30 | Organization presentations (informal) In ~20 minutes increments:
What are your organization's goals? What have you found? What do you need to accomplish your goals? |
| 12:30-12:40 | Break |
| 12:40-1:30 | Lunch
Orphan Well Scout tool, MU OAW Mapping tool, IMAPS? |
| 1:30-3:00 | Discussion of overlapping goals. How can we help each other?
Next steps |
| 3:00-4:30 | Additional agenda items? |