Watershed Resources Education Program 2017-19
Evaluation Report

Project Overview

Project Summary

The Water Resources Education Program (WREP) is a program that engages students in introductory, foundation-laying, watershed experiences that enhance the local curriculum, increase water resources literacy and foster stewardship ethic in a team structure. As part of WREP, students researched and investigated a water resources issue and identified the need for action through learning about their surrounding community. The objectives of the program are as follows:

Student Objectives: Provide water resources education for a minimum 300 6th, 7th and 8th grade students from schools in Emmet, Cheboygan, Antrim and Charlevoix counties.

- Teach young students about their local watershed and how it is connected to the Great Lakes.
- Teach students how their own actions affect these water bodies and the organisms that live in them.
- Provide opportunities for students to connect with a natural watershed habitat by using the school grounds and community to conduct investigations and explore water resources in their environment.
- Engage students in place-based learning experiences both in and with their community.
- Engage students in stewardship "action projects" designed to teach students how they can become watershed stewards and environmental leaders/teachers in their communities.

Teacher Objectives: Provide informal professional development opportunities in the area of place-based education for up to 12 middle school teachers.

- Provide in-class modeling and curriculum resources so teachers are supported and confident in the future when teaching water resources science in their classrooms.
- Provide opportunities for teachers to learn about and experience place-based education throughout the school year and beyond.

Program Description

The Water Resources Education Program (WREP) includes five hour-long sessions at the school site. Students learn about local water resources and issues in their community. In addition, each class selects a water resource issue and plans and implements a project designed to improve water resources in their community. Students plan and implement the project with help from their teacher and support and resources from Watershed Council staff.

Teachers learn the programs alongside their students, attend planning meetings with Watershed Council instructors, and teach preparation and follow up activities from the WREP teacher guide. Each teacher receives WREP program curriculum binder and access to Watershed Council models, resources, and

tools to continue teaching the program. Watershed Council follows up with teachers in the year after their training to provide additional support.

Evaluation Goals

The Water Resources Education Program (WREP) evaluation process was both summative and formative. Data was collected from both teacher and student participants during the 2017-19 school years.

The evaluation data collected enabled Watershed Council staff to assess 1) the impact of the program on students and teachers and 2) the effectiveness of the program content and delivery to improve teaching methods and curricula for future programming. An added benefit to the evaluation process is being able to assess the effectiveness of the evaluation tools themselves in gathering the desired data from program participants. Information on the types of responses we received, the quality of the responses, and the amount of data we collected from each evaluation tool we administered in 2016-17 will allow us to improve the tools themselves as well as the overall evaluation plan.
Primary intended evaluation outcomes:

1) Increased academic knowledge of water resources science.
2) Growth of stewardship capabilities/intention expressed in everyday attitudes, behaviors, and capacity to work with others.

Key evaluation questions:
Program Effectiveness and Improvement

- Are we reaching our stated program goals and objectives for teacher and student participants?
- How can we improve WREP based on the feedback collected from teachers and the results of the evaluation process?

Student Participants

- What was the students' overall experience of the program?
- Was there any increase in student knowledge due to participation in the program?
- Were there any changes in students' attitudes, abilities, or behaviors due to participation in the program?

Teacher Participants

- What was the teachers' overall experience of the program?
- What suggestions do they have to improve the program content and delivery?
- Were there any increases in teachers' comfort level and perceived ability in place-based education?
    - Teaching environmental science concepts
    - Using the school yard as a learning resource
    - Facilitating a stewardship action project with their students

Methods

Quantitative and qualitative evaluation instruments were administered to teacher and student participants between September 2017 and January 2019. WREP teams participated in five in-class sessions, a team stewardship action project, regular meetings with teachers, and using the school grounds and community for field trips. Eight 6-8th grade classroom teachers and over 300 students participated in the WREP during the 2017-18 school year. During the 2018-19 school year, Watershed Council staff connected with teachers that participated in WREP in the previous year to offer support, resources, and materials to continue and further water resources education. The methodology behind each evaluation tool varies and is described separately for each tool below.

Student Pre- and Post-Program Surveys:

80 participating students completed a pre-survey before the first classroom session, and completed an identical survey within one month of the completion of the classroom sessions. This subset of students was selected as a representation of the total students' participant population because they were representative of the age group and knowledge level as the total student participant population. The five sessions developed for the program to introduce watershed education topics were the focus of the survey. Student opinions and feelings toward watershed conservation behaviors and attitudes was measured by a survey given at the beginning and the end of the course and the differences in their pre- and post- responses over this time period were compared.

Student pre- and post-surveys were administrated by the classroom teacher following a script. Students used identification numbers instead of their names to provide anonymity so students understood this was not a "test" that would be included in their school grades.

Student Reflection Survey:

At the end of the program, all students were asked to identify activities that were: (a) the most enjoyable and (b) they learned the most from during the class sessions. For each of these questions, students chose from five school based sessions and a sixth (other category) should they identify a WREP activity or event different from those provided. The other category was added to allow students to identify activities like the snowshoe field trip.

- Water Cycle and Watersheds
- Groundwater and School grounds
- Point & Non-point pollution
- Invasive Species in our community
- Stewardship Action Project Planning

An open-ended question asked students to write about "the most important thing" they learned about the watershed during the program.

Teacher Pre- and Post-Program Survey:

Six teacher participants (out of eight) completed a short pre-program survey in September-October 2017, before the program started. They completed a longer post-program survey that contained the same questions as the pre-program survey, plus additional reflection questions in June 2018.

The pre-post survey questions asked teachers about their comfort level in various areas such as leading an environmental field trip with their students and teaching environmental science concepts. Additional questions asked how the resources provided and program structure enabled them to teach the program themselves in the following school year.

Each teacher participant completed written evaluation forms that asked open-ended questions about their overall impressions of the program, program highlights, suggestions for program improvement, and how the program has impacted them, their students and the school community. The open-ended questions allowed teachers to be insightful in their responses and also allowed them to be detailed in their answers. Only the results of teachers that completed and turned in the overall written evaluation are included in this report. The surveyed teachers are representative of the entire teacher population, in that they all teach the same grades and the same information to their students. The two teachers that did not complete the evaluation teach at the same school as three teachers that did complete the evaluation. All five teachers from that school teach the same grade and lessons, so the three teachers that completed the survey are representative of the participating teachers from that school.

Data Analysis

Student Pre- and Post-Program Surveys:

The questions on the survey were separated into different answer categories to accurately assess the students prior and post knowledge regarding water resources topics and personal choices. Questions 1-13 on the survey were multiple choice with a correct answer based on what we felt it was important for the students to know and understand. Each student who completed the surveys was given a code to identify them. We then compiled the pre-program and post-program surveys for each student using their identification number and discarded any surveys that did not have both a pre- and post-survey. We then calculated the percentage of students that answered questions 1-13 correctly for the pre-survey and post-survey and compared the percentages to come up with the correct answer percent increase between the two surveys.

Questions 14-16 asked the students to respond to questions about their personal choices and feelings about water resources and taking steps to solve an environmental issue in their community. The possible answers for Questions 14-16 allowed the students to answer in ways that signified positive feelings or choices for their local water resources using standard Likert-scale response questions. We prioritized these positive answers and calculated the number of students that indicated positive feelings and choices. We then compared the percentage of positive answers between the two surveys to come up with the overall increase in positive feelings and choices regarding water resources and solving environmental issues.

The post-survey included two questions that asked the students to reflect on the WREP program and the skills that it helped them to develop. These questions were designed to gather feedback from the students regarding the program to improve future programming efforts of the Watershed Council. Question asked students to indicate which skills the WREP program helped them to develop. We recorded the skills listed by the students and determined the percentage of students that indicated skill

development. Question 16 asked students to suggest improvements for the WREP program. We reviewed responses and drew out categories that emerged. Once we completed the list of categories, we assigned code words to identify each category. The responses to each question were then coded and put into a table. As responses were put into the table, we took note of how often each type of response was made. The results for question 16 are displayed using this information.

Student Reflection Survey:

There were two types of questions on the student reflection survey. The first type of question asked the students to select the session that they enjoyed the most. We compiled the students' selections determined the popular sessions. The results are displayed in a bar graph.

The rest of the questions on the reflection survey were qualitative. We read all of the responses to questions 2-4 and drew out common themes and categories that emerged. As the responses were repeatedly reviewed, we merged some categories and created sub-categories as needed. Once we completed the list of categories, we assigned code words to identify each category. The responses were put into a table and we took note of how often each type of response was made.

Teacher Pre- and Post-Program Survey:

The teacher pre- and post-program surveys are in two parts. The first part asked teachers to share their comfort level with implementing and teaching water resources before and after participating in the WREP program. The pre-survey and post-survey responses from each surveyed teacher were put into a table and compared to see what, if any, changes occurred as a result of participation in WREP. The changes in responses were put into a separate table and then compiled into three percentage statements (i.e. no chance, decrease, or decrease) for each survey question. These are shown in the Results section. Results are shown for all WREP teacher participants that completed and turned in both pre- and post-program surveys. Six teachers completed both surveys, and two teachers completed just the pre-program survey.

The qualitative data we received from teachers' written evaluation forms was coded and quantified. We then read and re-read all of the responses to each of the questions, eventually drawing out common themes and categories that emerged from the responses. As the responses were repeatedly reviewed, we merged some categories and created sub-categories where needed. Once we completed the list of categories, we assigned code words to identify each category. The responses to each questions were then coded and put into a table. As responses were put into the table, we took note of how often each type of response was made. The results for the written evaluation forms are displayed using this information.

Results

Student Pre- and Post-Program Survey Results

Question 1-13 Results

Results Summary: Results of the multiple choice questions (1-13) indicate an overall increase in knowledge of the water resource issues that were covered in the WREP program. The average student scored 60% on the pretest and 82% on the posttest. Several questions saw a minor increase in percentage of correct answers or had a low before and after percentage.

Individual Question Results

Figure 1 compares the percentage of students answering each question correctly on the pretest versus the posttest.

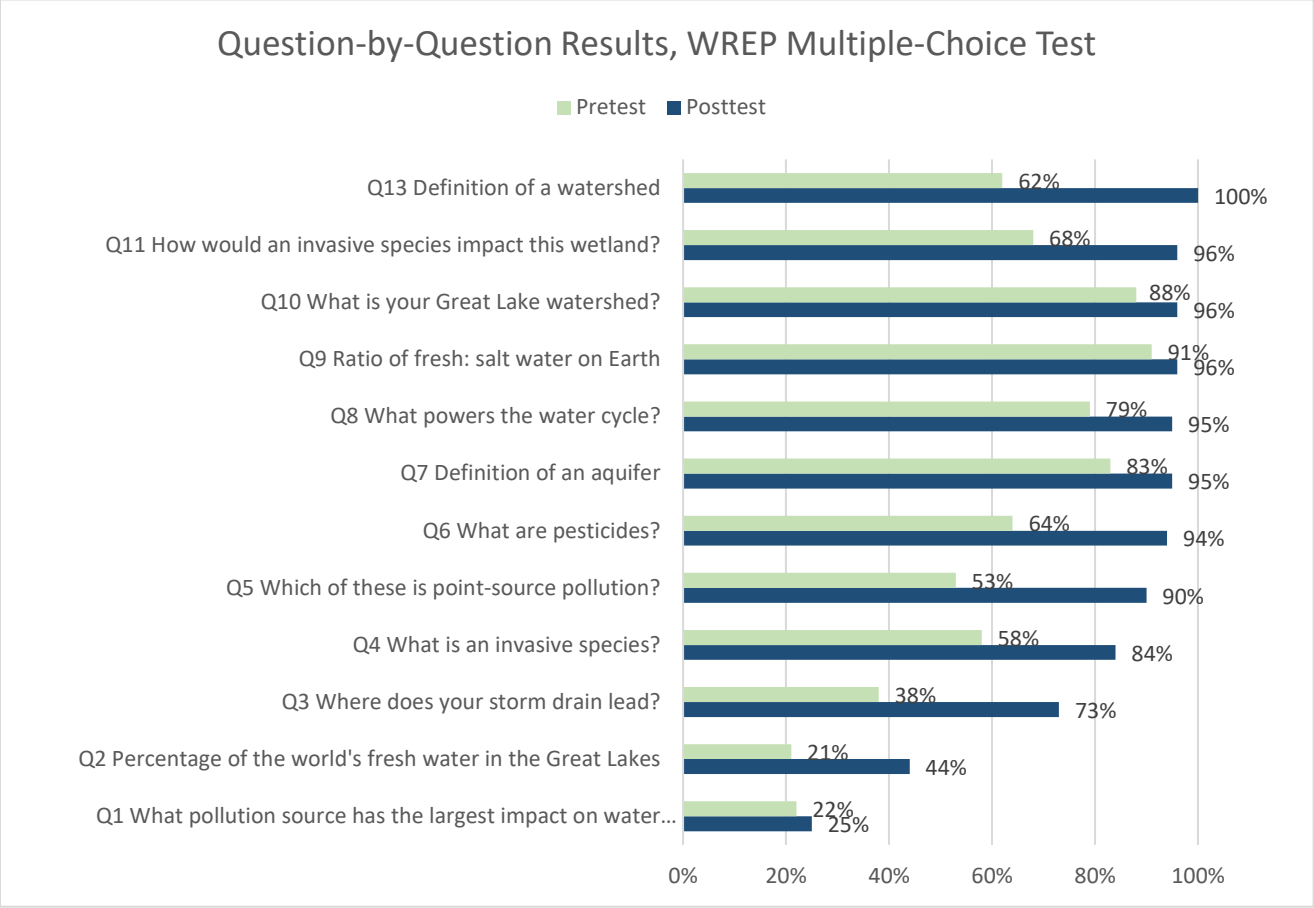


Figure 1

Some patterns in the responses are evident:

- Students made impressive gains on some questions, such as questions 3, 4, 5, 6, 11, and 13, focusing on invasive species, point-source pollution, pesticides, stormwater flows, and the definition of a watershed.
- Most students already knew they answers to questions 7-10, in which they were asked name the Great Lake that their local river drains to, select the correct definition of an aquifer, identify the ratio of fresh to salt water on Earth, and identify the power source for the water cycle.
- Students performed poorly on both pretest and posttest when asked to identify the percentage of the world's fresh water found in the Great Lakes, and to identify the type of pollution source that has the most impact on the Great Lakes.

A final multiple-choice question had technical issues and is not reported.

Question 14 asked students to list ways in which a healthy local watershed contributes to the health and well-being of local communities.
Results Summary: Results indicate that some students misunderstood the question and responded with answers that described ways to improve or care for watershed health, this indicates that in order to more accurately assess student understanding in the future, the question should be reworded. Of the students that responded with ways that a healthy watershed contributes to a healthy community, many indicated the positive relationship that exists between the two by listing things like:

- *A healthy watershed leads to clean drinking water*
- *Good crop growth*
- *Healthy local water bodies*
- *Increases biodiversity*
- *Stops erosion*
- *Increased natural beauty*

Stewardship measures
Students were presented with two sets of Likert-type question measuring aspects of stewardship. The first focused on responsible environmental behaviors of a general nature, including picking up litter, asking parents to recycle waste at home, not wasting water, not wasting energy by standing in front of an open refrigerator or leaving devices running, speaking with friends about ways to help the environment, and using refillable water bottles. Each item was framed as a statement about what the student does (e.g, "I have talked with my friends about ways to help the environment") with response options ranging from "very true" to "very false." These responses were converted into numeric scores ranging from 1 (least desirable answer) to 5 (most desirable answer), and a scale score constructed for each student representing the average response across the seven items.

The second battery of questions measured civic capacity, incorporating such abilities as gathering data and information about a local environmental problem, getting people to care about the problem, calling someone on the phone who you don't know for help with the problem, or writing an opinion letter to the newspaper. Students rated their ability to perform each item on a scale of 1 ("I definitely can't") to 5 ("I definitely can"), and each student's responses across the six items were averaged to produce a scale score.

Figure 2 shows comparisons of the mean scores across all students with matched pre- and post-program data for each of the stewardship indices.

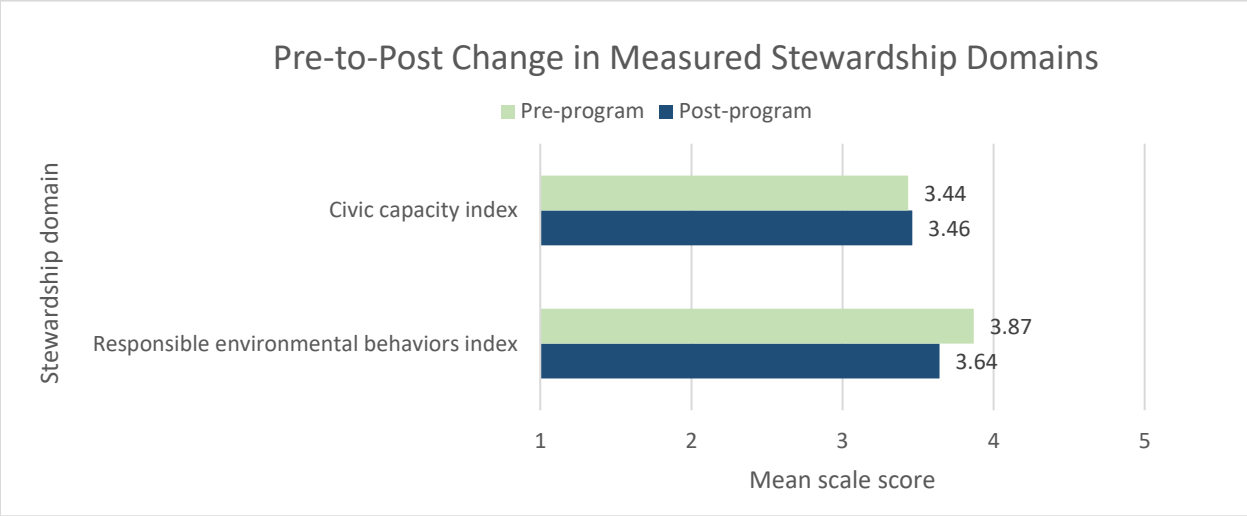


Figure 2

As shown in the figure, there was no change in students' self-reported civic capacity and a modest decline in their self-reported adherence to responsible environmental behaviors.

A review of the individual items related to environmental behaviors shows that a decline in self-reported pro-environmental behaviors was evident in several of the questions. There was a substantial decline in the students who reported that they have spoken with their friends about ways to help the environment (mean score of 3.05 pre-program and 2.64 post-program). There was a particularly sharp decline in students' reports that "If I see litter, I pick it up." The mean score was 4.24 on the pre-program survey, with 40% saying this was "very true" and 44% saying it was "mostly true." On the post-program survey, the mean scaled score was only 3.65, and only 11% of students rated it "very true" that "If I see litter, I pick it up," while 56% now rated it "mostly true." This pattern of responses can emerge in a variety of situations: it could be indicative of student frustration with the survey or resistance to perceived pro-environmental pressure, but it also occurs when students give a socially acceptable response on the pre-program survey and a more honest response on the post-program survey.

The civic index remained virtually unchanged from the pre-program to post-program surveys. Several items did show change, positive or negative, but these cancelled out over the array of items.

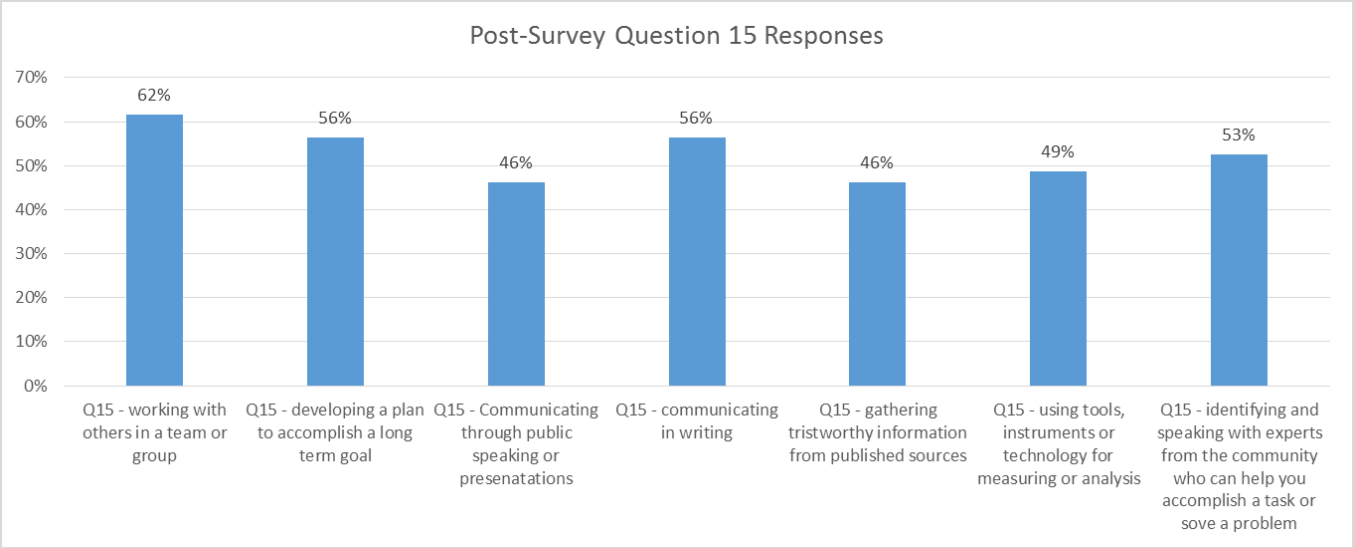
- Students had modestly more perceived ability after the program to speak in front of a group or contact someone they don't know on the phone to request help with an environmental problem (one teacher's comments on his or her teacher survey confirmed that students made such phone calls for their project).
- They had modestly less self-rated ability to get other people to care about the problem.

The overall pattern may indicate that while some students grew more confident talking about environmental issues with others, they also grew more aware of the challenges involved in persuading others. However, this is only one possible interpretation of the data.

Post-Survey Question Results

Post-Survey Question 15 asked students to select the skills that the WREP program helped them to develop.

Results Summary: The results indicate that the majority of students felt that participating in the WREP program helped them to develop one or more skills. We counted a 1 for every skill a student check and summed the numbers across the categories and the average student that answered the question selected 4-6 skills.



Post-Survey Question 16 asked students to list any ideas to improve the WREP program.

Results Summary: The results indicate that the majority of the students did not have suggested improvements for the WREP program. Several students suggested that instructors increase the amount of time spent on projects and presentations. Many students suggested increasing the amount of hands-on, visual, or outdoor learning activities. Several students suggested changing the projects, these suggestions are difficult to address as each WREP team chooses their project as a class.

Categories (Code Words)

1. Change timing of program/sessions/projects (Timing) N: 4
2. Change the amount of hands-on activities (Hands-On) N: 10
3. Increase the amount of fun activities/lessons (Enjoyment) N: 4
4. Increase relevancy, impact, or number of projects (Projects) N: 5
5. Spend more time outside (Outside) N:1

6. Increase the amount of models/visual aids (Visual Aids) N: 1
7. No suggestions for improvement (Nothing) N: 24

Student Responses

Of the 78 students that completed the post-survey, 29 did not record a response to question 16.

24 Students indicated that there was nothing that could be done to improve the program.

Code Word	**Student Responses**
Timing	"Slow down at presentation, start project earlier."
Timing	"Slow down the process, start project earlier."
Timing	"Have the meetings at younger ages and more often."
Timing	"Yes, people from the council could come in more often."
Hands-On	"Yes, they could make it so you have a more hand on experience and work with water more."
Hands-On	"For kids to help more in the garden because some kids did not get to help."
Hands-On	"Try to get more hands-on for the students."
Hands-On	"Try to get more hands-on for the students."
Hands-On	"More hands-on."
Hands-On	"Try to get more hands-on for more students."
Hands-On	"Have a more hands-on experience, I wish we got to work with water more."
Hands-On	"Students participate in the activities more."
Hands-On	"WREP should have projects and presentations."
Hands-On	"Do more hands-on activities."
Enjoyment	"Make jokes."
Enjoyment	"Making it fun."
Enjoyment	"Teach it to them in a fun and enjoyable way."
Enjoyment	"Listen to everyone's ideas and have fun."
Projects	"More flowers."
Projects	"Have the classes do different projects."
Projects	"To have every class do a different project."
Projects	"More projects, good amount of it."
Projects	"I was not there, but I think we should think deeper into what can and can't help the watershed."
Projects	"Addition to service."
Projects	"Make them try to help more about the pollutions."
Outside	"To go outside more."
Visual Aids	"Keep using visual aids that help us understand better."

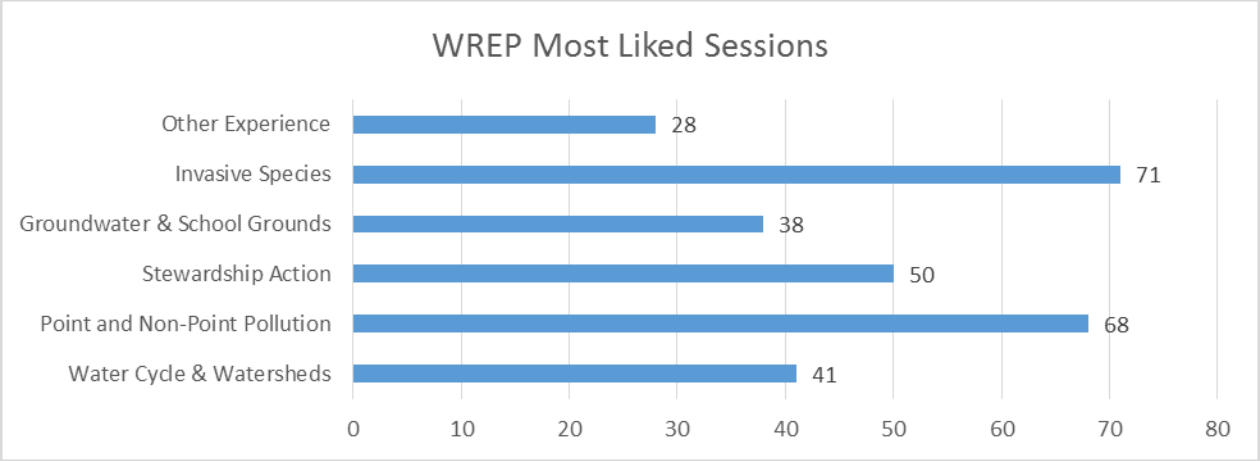
Student Reflection Survey

Individual Question Results

Question 1 asked students to select the sessions that they liked the most. The options available for selection were:

- Water Cycle and Watersheds
- Groundwater & School Grounds
- Point & Non-Point Pollution
- Invasive Species
- Stewardship Action Project
- Other Experience Not Listed

Results Summary: The results indicate that students enjoyed the invasive species and pollution sessions the most. At least 28 students enjoyed each session.



Question 2: What did you like most about these sessions? N: 140

Results Summary: The results indicate that the two things that students enjoyed most about the WREP sessions were 1) hands-on models and activities and 2) learning about local water resources and other water resource topics. Students also enjoyed taking action as part of the project or to help the environment. Going outside was also enjoyable for students.

Categories (Code Words)

1. Enjoyed taking action to improve local watershed (Action)
    a. Enjoyed working on the action project (Project)
    b. Enjoyed working to improve some aspect of the environment (Environment)
2. The activities were enjoyable/students had fun (Fun)
3. Students enjoyed learning (Learning)
    a. Students enjoyed learning about invasive species (Invasive)
    b. Students enjoyed learning about pollution (Pollution)
    c. Students enjoyed learning about their local ecosystem (Ecosystem)
4. Students enjoyed the hands-on activities (Hands-on)
5. Students enjoyed going outside (Outside)

Student Responses

Code Word	Number of Responses
Hands-On	44
Learning	26
Learning - Invasive	6
Learning – Pollution	1
Learning – Ecosystem	1
Action	5
Action – Project	2
Action – Environment	5
Outside	11

Question 3: Which activity helped you learn the most during your participation? Explain why. N: 140

Results Summary: The results indicate that the session from which the most students learned the most was the pollution model demonstration (Pollution model demonstration described in Program Documents attachment). The second highest was the invasive species activity, third was the action project, fourth was the watershed model demonstration, fifth was the groundwater model demonstration, and sixth was the soil test activity. Several students also indicated that they learned the most from the instructors. The most common indicated reason for student learning was increased awareness. Students also indicated they learned better from lessons that were interactive, relatable, and fun.

Categories (Code Words)

1. Students learned the most from the action project (Project)
    Sub-Categories
    a. Students learned because it was enjoyable (Fun)
    b. Students learned because it was interactive (Interactive)
    c. Students learned because it allowed them to apply their knowledge (Applied)
    d. Students learned because it made them more aware of that topic (Awareness)
    e. Students learned because it was relatable (Relatable)
2. Students learned the most from the watershed modeling activity (Watershed)
    a. Sub-Categories: (Fun) (Interactive) (Awareness)
3. Students learned the most from the soil testing activity (Soil Test)
    a. Sub-Categories: (Fun)
4. Students learned the most from the groundwater model demonstration (Groundwater)
    a. Sub-Categories: (Fun) (Interactive) (Awareness) (Relatable)
5. Students learned the most from the invasive species activity (Invasive)
    a. Sub-Categories: (Fun) (Interactive) (Awareness) (Relatable)
6. Students learned the most from the pollution model demonstration (Pollution)
    a. Sub-Categories: (Interactive) (Awareness)

7. Students learned the most from the instructors (Instructors)
    a. Sub-Categories: (Fun)

Learned Most from Project (Project) N: 23

Code Word	Number of Responses
Project	9
Fun	2
Interactive	5
Applied	5
Awareness	1
Relatable	1

Learned Most from Watershed Activity (Watershed) N: 22

Code Word	Number of Responses
Watershed	7
Fun	1
Interactive	6
Awareness	8

Learned Most from Soil Test Activity (Soil Test) N: 2

Code Word	Number of Responses
Soil Test	1
Fun	1

Learned Most from Groundwater Model (Groundwater) N: 12

Code Word	Number of Responses
Groundwater	2
Fun	1
Interactive	1
Awareness	4
Relatable	4

Learned Most from Invasive Species Activity (Invasive) N: 37

Code Word	Number of Responses
Invasive	10
Fun	1
Interactive	1
Awareness	20
Relatable	5

Learned Most from Pollution Model Demonstration (Pollution) N: 45

Code Word	Number of Responses
Pollution	16
Interactive	3
Awareness	26

Learned Most from the Instructors (Instructors) N: 3

Code Word	Number of Responses
Instructors	1
Fun	2

Question 4: Please write about "the most Important thing" you learned about your watershed this year.

Results Summary: The results indicate that the most important things learned had to do with stewardship of local water resources through action, pollution, watershed science, and the local ecosystem specifically the invasive species in the local ecosystem.

Categories (Code Words)

1. The most important thing that students learned was how to preserve and take care of their local watershed or environment (Stewardship)
    a. Students thought taking stewardship action of some sort was the most important thing (Action)
    b. Students thought working as a team to protect and preserve their watershed was the most important thing (Teamwork)
2. Students thought learning about their ecosystem was most important (Ecosystem)
    a. Students thought learning about their ecosystem's invasive species was most important (Invasive)
3. Students thought learning about pollution was most important (Pollution)
    a. Students thought learning about groundwater pollution was most important (Groundwater)
    b. Students thought learning about sediment or erosion pollution was most important (Erosion)
4. Students thought learning about watershed science was most important (Watershed)
    a. Students thought learning about their watershed's groundwater system was most important (Groundwater)

Stewardship was Most Important (Stewardship) N: 42

Code Word	Number of Responses
Stewardship	10
Action	31
Teamwork	1

Ecosystem was Most Important (Ecosystem) N: 22

Code Word	Number of Responses
Ecosystem	6
Invasive	16

Pollution was Most Important (Pollution) N: 40

Code Word	Number of Responses
Pollution	34
Groundwater	3
Erosion	3

Watershed Science was Most Important (Watershed) N: 35

Code Word	Number of Responses
Watershed	31
Groundwater	1

Teacher Pre- and Post-Program Surveys

Question 1: To what extent do you feel comfortable using the local watershed environment as a learning resource? N: 6

Results Summary: The majority of teachers felt more comfortable using the local watershed environment as a learning resource after participating in WREP. A considerable amount of teachers did not change their level of comfort in using the local watershed environment as a learning resource.

33% of teachers felt the same, no change, after participating in the WREP program.
17% of teachers felt less comfortable after participating in the WREP program.
50% of teachers felt more comfortable after participating in the WREP program.

Question 2: To what extent do you feel comfortable teaching environmental science concepts? N: 6

Results Summary: The majority of teachers did not change their level of comfort in teaching environmental science concepts after participating in the WREP program. A considerable amount of teachers felt more comfortable teaching environmental science concepts after participating in WREP.

50% of teachers felt the same, no change, after participating in the WREP program.
17% of teachers felt less comfortable after participating in the WREP program.
33% of teachers felt more comfortable after participating in the WREP program.

Question 3: To what extent do you feel comfortable leading an outdoor environmental field trip with your class? N: 6

Results Summary: None of the surveyed teachers changed their level of comfort in leading an outdoor environmental field trip with their class.

100% of teachers felt the same, no change, after participating in the WREP program.

Question 4: To what extent do you feel comfortable facilitating an environmental action project with your class? N: 6

Results Summary: The majority of teachers did not change their level of comfort in facilitating an environmental action project with their class after participating in WREP. A considerable amount of teachers felt less comfortable after participating in WREP.

50% of teachers felt the same, no change, after participating in the WREP program.
33% of teachers felt less comfortable after participating in the WREP program.
17% of teachers felt more comfortable after participating in the WREP program.

Question 5-6: Post Program Questions

Question 5: To what extent do you feel prepared to teach the Watershed Resources Education Program to you class next year? N: 6

Results Summary: All classroom teachers feel at least moderately prepared to teach the WREP program themselves after participating in the program, with half of the teachers feeling prepared 'to a considerable extent'.

To No Extent	To a Slight Extent	To a Moderate Extent	To a Considerable Extent	To a Great Extent
		3 50%	3 50%	

Question 6: To what extent do you feel the following resources we provide (curriculum resources, in-class modeling, equipment & materials) enable you to teach the program the following year? N: 6

Results Summary: All teachers felt that the provided resources will enable them to teach the program the following year, with the majority of teachers feeling that they enable them 'to a considerable extent'.

	To No Extent	To a Slight Extent	To a Moderate Extent	To a Considerable Extent	To a Great Extent
Curriculum Resources			1 17%	3 50%	2 33%
In-Class Modeling			1 17%	4 67%	1 17%
Equipment & Materials			2 33%	4 67%	

Teacher Overall Written Evaluation

Question 1: Please describe the overall experience of the team action project for you and your students. Do you feel that the team action project was successful? Why or why not?

Results Summary: The majority of teachers expressed overall satisfaction, enjoyment with the team action project. Teachers commented on how the action project helped the students to learn and apply the information that they were taught during the WREP sessions. Teachers also wrote positive comments about the classroom session content. 2 teachers indicated that they struggled finding enough time to implement the action project phase of the program.

Categories (Code Words)

1. The teacher felt that the project was successful (Yes)

a. The teachers felt that the students were engaged and interested (Engagement)
b. The teachers felt that the students learned ((Learning)
c. The teachers felt that the ability for students to choose their project was beneficial (Choice)

2. The teacher did not feel that the project was successful (No)
    a. The teacher felt that time management was an issue (Timing)

Successful Project (Yes) N: 5

Code Word	Teacher ID	Response from teacher participants
Yes	4	"8th Grade - Yes, it was simple enough to do in our short spring time frame."
Engagement	1	"I feel the project was very successful. The students were engaged, committed, and took pride in their work. The real life application was a wonderful way to bring it all together."
Learning	2	"Yes. Students learned about our watershed and did something to help it."
Learning	3	"Yes, the students had fun and learned a lot. The activities were interesting and informative."
Choice	5	"Yes, students had their choice of activities. All were able to relate their projects back to the watershed and see how the projects helped."

Unsuccessful Project (No) N: 2

Code Word	Teacher ID	Response from teacher participants
Timing	4	"6th grade - No, we didn't have time to devote to smaller groups doing different parts of it during the spring."
Timing	6	"Yes and No. I feel that our team had a quality action project but we did not have enough time to implement it. It may have to be completed in the fall when we have more time. Since I will have the same class next year, I will be able to complete the project."

Question 2: Please include any suggestions you might have to improve the action project component of the Water Resources Education Program.

Results Summary: One of the six teachers had no suggestions to improve the action project component. The majority of the remaining comments focused on improving the efficiency of the student survey process, and changing the timing of the program to improve student learning and retention as well as to allow more time for action project work.

Categories (Code Words)

1. No comment (NoImprove)
2. Improve ease and efficiency of program surveys and evaluations (Surveys)
3. Change timing of WREP program (Timing)

a. Shorten time between classroom sessions (Shorten)
b. Start program earlier in the year (Early)

Code Word	Teacher ID	Response from teacher participants
NoImprove	5	No comment
Surveys	1	"I would consolidate and streamline some of the questionnaires."
Shorten	2	"Come to our classes in consecutive days instead of sessions."
Shorten	3	"I think completing all the classes from Jan. to May might be better instead of lasting the entire school year. With the classes a month apart the students forget what happened the last class."
Early	4	"I think 6th grade would have benefitted from starting earlier in the year on the project (Good thing I will have them next year, we'll start on it in September)."
Early	6	"I think that the action project should be introduced and started at the beginning of the program. This will give teams more time to adjust and complete in time for the end of the year. Lancer Leap got in the way of Ellsworth students completing it on time."

Question 3: Please describe the overall experience of using the school grounds and local community for field trips for you and your students.

Results Summary: All responses about the use of the school grounds and local community for field trips were positive. Many teachers expressed that their students were able to relate what they learned in class to their community. Teachers also expressed that staying on the school grounds or within the local community allowed them to save time and the school to save money.

Categories (Code Words)

1. Beneficial for learning and applying skills (Skills)
2. Allows students to relate learning to local community (Relate)
3. Increased efficiency for schools and teachers (Efficiency)

Code Word	Teacher ID	Response from teacher participants
Skills	1	"I think it was a fantastic way to teach the students how the real world works. They had to ask for permission, plan, do research, find resources, and talk with community members."
Relate	2	"It was a positive experience to see how the school grounds are part of the watershed."
Relate	5	"Students enjoyed being outside and were able to see runoff and erosion in action."
Efficiency	3	"It was great. We could see everything we needed to see right here without having to use time travelling."
Efficiency	4	"We are lucky to have just a short walk to the water in our community. Wish the spring weather would have cooperated."
Efficiency	6	"We had a couple walking field trips, one on the school grounds and one to the Ellsworth River to measure for our project. I feel like local field trips are the most effective for students and the school. They get

		to identify issues that are right in their neighborhood and it is also more cost effective for schools."

Question 4: Describe one or two highlights from your school grounds field trip experience.

Results Summary: Many teachers described the high value of using the local community to improve the learning opportunities for their students as well as the impact that the field trips had on their students feelings regarding teamwork and personal stewardship.

Categories (Code Words)

1. Specific Activities Highlights (Activities)
    a. Observing the community water resources (Observing)
    b. Collecting data on community water resources (Data)
2. Increase in student pride in their work (Pride)
3. Increase in student enjoyment and enthusiasm (Enjoyment)

Code Word	Teacher ID	Response from teacher participants
Pride	1	"The students were proud of their work and I think it will leave a lasting impression."
Enjoyment	2	"Students have really ambitious ideas for their stewardship project. Keep it simple."
Observing	3	"Seeing how the water flowed around the school grounds and seeing erosion first hand."
Observing	4	"8th Grade - We went several times and saw the fluctuation in water level and temperature at [the park]. 6th Grade - Most were observant when they have a task for picking up trash."
Data	5	"Students really liked the soil sample trip. They wanted to complete more water testing and take more soil samples."
Data	6	"It was nice to take a walk down to Ellsworth River and have all the students work together on measuring for our plants that we wanted to grow along the river to help stop erosion."

Question 5: Please suggest any improvements to the field experience component of the Water Resources Education Program.

Results Summary: The majority of teachers did not have suggestions to improve the field experience and some teachers used this space to reiterate positive comments. One teacher mentioned that the weather was unfavorable, while another mentioned that they would like to spend more time during the program in the field or touring local water resources facilities.

Categories (Code Words)

1. No suggestions for improvement (NoImprove)
2. Positive Comments about field experience (Positive)
3. More field trips (FieldTrips)
4. Weather was unfavorable (Weather)

Code Word	Teacher ID	Response from teacher participants
Positive	1	"Nothing. It was great and worked well!"
Positive	2	"None, please continue what you are doing."
Positive	3	"Program ideas and teaching were great."
NoImprove	5	No Comment
FieldTrips	6	"I recommend more trips outside or to local areas of the community. We could investigate wastewater treatment facilities, erosion issues around town, invasive species, etc."
Weather	4	"I can't think of any, unless we can suddenly control the weather."

Question 6: How has the Water Resources Education Program helped you as a classroom teacher?

Results Summary: All of the teachers responded that the WREP program positively impacted them as classroom teachers. Two teachers commented that they appreciate the resources provided through the WREP program. The remaining feedback reflected a variety of ways that the WREP program has helped teachers.

Categories (Code Words)

1. Increased teacher and student understanding through real-world references and application (RealWorld)
2. Positive comments about Instructors (Intructors)
3. Positive comments about action project (Project)
4. Increased teacher knowledge of and access to resources (Resources)
5. Increased teacher ability to engage students in long-term projects (LongTerm)
6. Increased teacher ability to engage students using hands-on activities (HandsOn)
7. Increased teacher ability to connect lessons/activities to community resources (Community)

Code Word	Teacher ID	Response from teacher participants
RealWorld	1	"It enabled me to reference real world applications in the classroom when learning new material."
Instructors	2	"The Educators made all the difference as to whether or not the program was worthwhile. They were very patient and are very knowledgeable."
Project	3	"The program my class did (seed bombs) was inspired. I will use this program idea in the future."
Resources	3	"The booklets were a great resources and I hope to continue to use them in my room."
Resources	6	"The program has given me many ideas about how I can implement water resource experiences with my students."
LongTerm	4	"I was able to think more long term as to cleaning up our community. Not just one trip and done."
HandsOn	5	"It has helped me become more hands-on with my lessons."

Community	6	"I am also teaming up with the Antrim Conservation District for my high school and combined both groups are giving me numerous ideas about lessons to implement."

Question 7: Please share the impact that WREP has had on your students. Have you seen a significant change emerge through the work of the Water Resources Education Program in your classroom, school, or community?

Results Summary: Two of the six teachers did not respond to the question. Two teachers mentioned that participating in the WREP program allowed students to apply their knowledge regarding water resources and their community. One teacher mentioned an increase in student awareness of their watershed. The remaining feedback include comments on the increase of student pride in their work, improved school community, and general students enjoyment for the program.

Categories (Code Words)

1. Teacher did not respond to the question (NoResponse)
2. Teacher indicated students enjoyed the experience (Enjoy)
3. Increase in student awareness (Awareness)
4. Allowed students to apply knowledge (Apply)
5. Increased ownership and pride in project (Pride)
6. Project improved community (Community)

Code Word	Teacher ID	Response from teacher participants
NoResponse	3	No response
NoResponse	5	No response
Enjoy	6	"The students were enthusiastic about the program and were constantly asking me when the next lesson was. It is a good experience to have other instructors coming in to present to students as it gives them a new experience."
Awareness	4	"Some of my students (especially 8th grade) seemed more aware of their surroundings as we were outside. They noticed trash, wildlife, evidence of wildlife, water levels, insects… I felt they were more observant and realized the impact the watershed has on their lives and the community."
Apply	1	"The WREP program was a great addition to our science curriculum this year. The students were able to apply lessons learned throughout the year and create a stewardship masterpiece that made a difference in our small school community. They were given the support needed to be successful and enjoyed "running" the show. They were a little shocked that we were making them do the work. It was a fantastic lesson on how to function in society and the students felt success when they were able to procure the needed information."
Apply	6	"I think the program helps to give students an introduction to local issues involving something really important."
Pride	1	"It gave them a great sense of ownership, which lead to a great sense of pride at the completion of the project. One example of this sense of pride and ownership came from the phone calls and conversations the students had to initiate and complete themselves. At this age, an adult does most phone calls and conversations of this type for them. The students had to figure out who to call, what to say and then have the confidence to do so."
Community	2	"Our school grounds look great! Students really enjoyed working to improve the area between our halls."

Discussions and Conclusions

Overall, results indicate that the goals of the Water Resources Education Program (WREP) were achieved. The WREP program provided meaningful water resources experiences for middle school students, and also provided professional development to classroom teachers in environmental and place-based education.

The objectives for students participating in the WREP program included:

- Teach young students about their local watershed and how it is connected to the Great Lakes.
- Teach students how their own actions affect these water bodies and the organisms that live in them.
- Provide opportunities for students to connect with a natural watershed habitat by using the school grounds and community to conduct investigations and explore water resources in their environment.
- Engage students in place-based learning experiences both in and with their community.
- Engage students in stewardship "action projects" designed to teach students how they can become watershed stewards and environmental leaders/teachers in their communities.

Students showed an overall increase in knowledge of the program content through results from the pre- and post-program surveys. The individual question results reveal that students did learn about their local watershed and how it is connected to the Great Lakes. Many of the students had prior understanding of the distribution of water and the flow of their local water bodies, but there were increases in understanding regarding the impacts of human activity on their local watershed. The student survey could be improved by ensuring that the questions are easily understood and the answers are straightforward. It is also important that all questions are relevant to program information. This would allow students to more accurately show knowledge.

Both the student surveys and teacher evaluation forms show student comprehension of how their actions affect local water bodies and the organisms that live in them. Students increased their awareness about the storm drain system, the movement of invasive species, and the sources and types of pollution that can impact water resources. Teachers commented that their students are more aware of their actions. Pre-to-post comparisons of measures of responsible environmental behaviors and civic capacity did not show gains among student participants completing the surveys. However, these are general measures of stewardship attributes, not tied to water resources, and so may be a poor fit to this specific program. Students' written feedback indicated appreciation for the hands-on elements of WREP, including demonstrations and action projects; the lessons on pollution flow and invasive species were particularly well received.

The program provided opportunities for students to connect with a natural habitat by using the school grounds and the community to conduct investigations and explore water resources. In their written feedback teachers acknowledged that the field trip to local community impacted their students in many positive ways. Teachers cited a variety of hands-on activities as highlights of the field trip, and also expressed gratitude that their students were able to apply knowledge gained through participating in WREP in their own watershed and community. A few teachers wrote that the field experiences were valuable to themselves and their students and they would have liked to spend more time out of the classroom.

Many teachers also said that the field trips and the action project provided their students with new experiences and opportunities to engage in place-based education. Teachers went on to say that the program provided experiences their students would otherwise not have been able to participate in. Teachers also reported that students developed a greater pride and passion for acting as stewards for their community and their watershed.

The objectives for teachers participating in the WREP program included:

- Provide in-class modeling and curriculum resources so teachers are supported and confident in the future when teaching water resources science in their classrooms.
- Provide opportunities for teachers to learn about and experience place-based education throughout the school year and beyond.

Teacher survey and written evaluation form results indicate that the program provided professional development opportunities and the resources needed for teachers to feel comfortable teaching water resources in their classrooms in the future. Our direct in-class training model and the program equipment and resources proved to be most effective in preparing teachers to teach the program themselves. The program guide, with lesson plans, extensions, and other resources was also seen as a valuable tool for increasing teachers' confidence in teaching the program themselves. Several teachers mentioned that having the instructors from the Watershed Council in the classroom was very helpful for them to better understand different ways to teach water resources. Every teacher felt prepared to teach the program to future classes of students after participating in the first year of the program.

The program provided opportunities for teachers to learn about and experience place-based education. In their written feedback, teachers indicated that their experience participating in WREP allowed them to view place-based education at work. Several teachers mentioned the value of introducing students to community water resources and the process of planning a project in collaboration with community partners. Through the evaluation process, we learned that the program has provided teachers with place-based education related knowledge, resources, and opportunities that they otherwise would not have received or known about.

Recommendations

Although overall we received encouraging results as to the impact of the Water Resources Education Program on teachers and students, we do have a few recommendations to improve the content and delivery so the program more effectively meets its goals and objectives. We also have some recommendations to improve the program evaluation process itself, in order to strengthen and better assess whether we are achieving our objectives.

- Continue to provide hands-on, engaging water resources education to middle school students, both in the classroom and in the field. Continue to provide meaningful and relevant learning experiences, and opportunities for students to be engaged in learning about and caring for their local watershed
- Consider options to provide students with more time for hands-on work, and ensure that all students have equitable access to opportunities to handle tools and demonstration equipment.

- Continue to provide teachers with in-class water resources training, resources, program equipment, and support so teachers feel comfortable and confident in teaching water resources and engaging in place-based education in their classrooms.
- Work on ways to increase teachers' comfort level of participating in place-based education and facilitating an environmental action project with their students.
- Work with teachers to improve the planning and timing of program sessions and field trips. Use written feedback from teachers for insight as to ways to improve planning and timing. Earlier recruitment, summer planning sessions, etc. may be necessary in future WREP programs.
- Help teachers work with a partner in the building or at least network them in the region and have one face-to-face get together. Teachers struggle when they are all alone trying to do something new.
- Evaluate and continue to improve the program evaluation process. Revise questions on the student surveys to better reflect program information and improve student understanding.
    - Some items on the multiple-choice component of the test are misleading and should be updated or eliminated
    - Some items are too easy and should be eliminated or replaced with more challenging questions
    - Stewardship domains—responsible environmental behaviors and civic capacity—should be critically considered in terms of their fit for the program.
        - If a goal of WREP is to encourage pro-environmental behaviors among middle-schoolers, then these questions may be important to retain. Similarly, if WREP incorporates learning and skill-building relating to working with others and developing community partnerships to resolve issues, then the civic capacity index is a good fit. However, if either or both of these goals feel peripheral to the program, they should be eliminated, and potentially replaced with items better aligned to the program goals and activities.
        - If these indices are retained, Tip of the Mitt should consider a "retrospective pre/post" format in which students rate their environmental behaviors and civic capacity "now" and "before WREP," rating both periods on the post-program survey. The retrospective pre/post format is useful for situations where respondents may overestimate or overstate their capacity or commitment on a pretest because they don't know what they don't know, or haven't considered an issue closely.
    - It may be beneficial to reduce the scope of surveys and tests but administer them more broadly, with all students.

Appendices

Program Content and Activities Description
and
Evaluation Instruments

Appendix A. Water Resources Education Program Content and Activities Description

WREP Sessions Content and Activities

Session One: Water Cycle and Watersheds

Students learn the concept of a watershed and how the movement of water through the watershed is a part of the water cycle. Students will also learn about their local watershed and the geographical features that define their watershed. They will study their watershed map and locate their school neighborhood within their watershed.

Field Experience: Using the map as a reference, students will build a watershed model on school grounds for a visual and hands-on experience.

> ESS2-1 - Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process
> ESS2-4 - Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity

Teacher/Team Leader Activities: Location of homes on watershed map, Home Survey of Water Use

Session Two: Groundwater and School grounds

Students learn about the groundwater system, and the physical features of the system like aquifers, wells, etc. using a groundwater model. Students use this knowledge to discuss the impacts that human development can have on the system and the surrounding environment. Students will test school tap water – Chlorine, copper, hardness, nitrate, pH, phosphates, dissolved oxygen, temperature.

Field Experience: Students will use soil test kits and soil bores to test a variety of characteristics of the soil samples on school grounds. They will translate this knowledge to an assessment of the ground at their school property.

> ESS3-1 - Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes
> ESS3-4 - Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems

Teacher/Team Leader Activities: Student groundwater model lab, School Survey of Water Use

Session Three: Point & Non-point pollution

Students learn the difference between point source and non-point pollution and the impacts that humans can have on a watershed (fertilizer/pesticide pollution, chemicals, erosion, etc.) by using the watershed model.

Students then study a map of their local watershed and point out sites where human development may have an impact on the watershed. The map will be used as a reference when coming up with ideas for the stewardship project.

Appendix A.

Field Experience: Students will tour their school to see how rainwater runoff is handled on the grounds. A map of the school grounds will be used to document data from the tour and this data will then be used to help develop a stewardship project.

LS2-3 – Develop a model to describe phenomena

Teacher/Team Leader Activities: Locate businesses, development, land use on watershed map, Design a Filter Lab, Community Survey of Water Use

Session Four: Invasive Species

Students learn what an invasive species is as well as the impacts that invasive species can have on the environment that they are exposed to. Students learn to identify local invasive species with specimens provided by TOMWC staff.

Field Experience: Invasive Species Food Chain Scenario, search for invasive species in the school community

LS2-4 - Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect population

Teacher/Team Leader Activities: Further Invasive Species research in watershed and locate this data on the map (MISIN, I-naturalist)

Session Five: Stewardship Action Project

Students discuss the differences between a healthy watershed and an unhealthy watershed. They then discuss the health of their own watershed and what measures can be taken to make it healthier.

Students brainstorm projects to improve the health of the school community/watershed.

Students develop a stewardship/action to enact change in their watershed. Example stewardship projects include: native planting, informational posters, invasive species removal, rain barrel installation.

ESS3-3 - Apply scientific principles to design a method for monitoring and minimizing the impact on the environment

LS2-5 - Evaluate competing design solutions for maintaining biodiversity and ecosystem services

Teacher/Team Leader Activities: Team Planning/Decision Making Guide, Stewardship Action Project Progress Check(s), Stewardship Action Project Communication (poster, video, PPT, etc.), RIPPLE Summit

Appendix B. Teacher Pre-Program Survey

Water Resources Education Program

Teacher Pre-Survey

Teacher _____ School_____

Date _____ Grade_____

Please respond to the questions below. Add comments or clarifications if needed.

1. To what extent do you feel comfortable using the local watershed environment as a learning resource?

_____ To no extent

_____ To a slight extent

_____ To a moderate extent

_____ To a considerable extent

_____ To a great extent

2. Last school year, to what extent did you use LOCAL natural resources in your teaching?

_____ In a very limited way, if at all

_____ In a significant but contained unit

_____ As a major part of my curriculum

_____ As the core organizing structure of my teaching

3. To what extent do you feel comfortable teaching environmental science concepts?

_____ To no extent

_____ To a slight extent

_____ To a moderate extent

_____ To a considerable extent

_____ To a great extent

Appendix B.

4. To what extent do you feel comfortable leading an outdoor and/or school yard experience with your class?

_____ To no extent

_____ To a slight extent

_____ To a moderate extent

_____ To a considerable extent

_____ To a great extent

5. To what extent do you feel comfortable facilitating a stewardship action project with your class?

_____ To no extent

_____ To a slight extent

_____ To a moderate extent

_____ To a considerable extent

_____ To a great extent

6. What do you understand the term "stewardship action project" to mean or include? *Please write your response in some detail.*

Appendix C. Teacher Overall Evaluation Form and Post-program Survey

Teacher Overall Evaluation Form and Post-Program Survey

Water Resources Education Program

School: Date:

Teacher's Name:

Stewardship Action Project:

Stewardship Action Project Evaluation - Please describe the overall experience of the team action project for you and your students.

1. Do you feel that the team action project was successful? Why or why not?

2. Please include any suggestions you might have to improve the action project component of the Water Resources Education Program.

Field Experience Evaluation:

1. Please describe the overall experience of using the school grounds and local community for field trips for you and your students.

2. Describe one or two highlights from your school grounds field trip experience.

3. Please suggest any improvements to the field experience component of the Water Resources Education Program.

Appendix C.

Overall Program Evaluation

1. How has the Water Resources Education Program helped you as a classroom teacher?

2. Please share the impact that the WREP has had on your students.

Have you seen a **significant or meaningful change** emerge through the work of the Water Resources Education Program in your classroom, school or community?

Please focus on things you have witnessed or experienced directly, understanding that change is significant if it feels important to you, and may focus on one person, a whole community or anything in between. Please tell you story of change in as much detail as you can.

Appendix C.

Post-Program Survey

1. To what extent do you feel comfortable using the local watershed environment as a learning resource?

_____To no extent

_____To a slight extent

_____To a moderate extent

_____To a considerable extent

_____To a great extent

2. To what extent do you feel comfortable teaching environmental science concepts?

_____To no extent

_____To a slight extent

_____To a moderate extent

_____To a considerable extent

_____To a great extent

3. To what extent do you feel comfortable leading an outdoor environmental field trip with your class?

_____To no extent

_____To a slight extent

_____To a moderate extent

_____To a considerable extent

_____To a great extent

4. To what extent do you feel comfortable facilitating an environmental action project with your class?

_____To no extent

_____To a slight extent

_____To a moderate extent

_____To a considerable extent

_____To a great extent

5. To what extent do you feel prepared to <u>teach the Watershed Action Program to your class next year?</u>

_____To no extent

_____To a slight extent

_____To a moderate extent

_____To a considerable extent

_____To a great extent

6. To what extent do you feel the following resources we provide **enable you to teach the program the following school year?**

Curriculum Resources	In-Class Modeling	Equipment & Materials
____To no extent	____To no extent	___To no extent
____To a slight extent	____To a slight extent	___To a slight extent
____To a moderate extent	____To a moderate extent	___To a moderate extent
____To a considerable extent	____To a considerable extent	___To a considerable extent
____To a great extent	____To a great extent	___To a great extent

**Please add any additional comments or suggestions that would help to improve the Water Resources Education Program. If you produced any curriculum documents or additional activities you would like to share for grant reporting purposes, we would be most appreciative! We will make sure you receive credit for all work submitted.

Appendix D. Student Pre-Program Survey

Water Resources Education Programs

Participant Survey

Student Number _____ Date _____

School _____Teacher_____

1. Which of these statements best describes a watershed?

A. Any area that is always wet or that floods regularly.

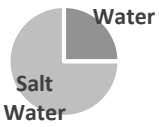
B. The land area that drains water into a river or other body of water.

C. The land along the bank of a river or stream.

D. The area where a river flows into the ocean and the waters mix.

2. Which graph represents the amount of fresh water in the world?

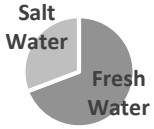
A.



B.

C.

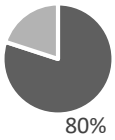
D.



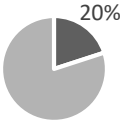
3. What percentage of all freshwater on the Earth is contained in the Great Lakes? (freshwater shown in dark grey)

A.

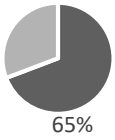
B.



C.



D.



4. What is the name of the Great Lake your local river flows into?

A. Lake Huron

B. Lake Erie

C. Lake Michigan

D. Lake Superior

Appendix D.

5. What is an aquifer?

A. an underground storage and flow of water

B. an irrigation ditch filled with water

C. an artificial channel for conveying water

D. a river system

6. Storm drains around your school connect directly to?

A. Ocean

B. River

C. Sewer

D. Lake

7. What is the major source of energy that powers the water cycle?

A. Wind

B. Gravity

C. Sun

D. Rain

8. What is an invasive species?

A. a non-native species

B. a living species that is on the verge of extinction

C. a non-native species causing environmental or economic harm

D. a species that signifies a healthy environment

9. What are pesticides?

A. Small animals the live in the water

B. Insects that eat people's gardens

C. A type of mineral

D. Chemicals that people use to kill "pests"

Appendix D.

10. Which the following is an example of point source pollution?

A. Storm water runoff

B. Waste flowing out of a factory outlet pipe

C. Animal owners not cleaning up pet waste

D. Fertilizer running off of shorelines into a lake

11. Which of the following types of pollution has the largest impact on streams, rivers, and lakes?

A. Dumping of garbage by cities

B. Trash washed into the lake from beaches

C. Waste from factories

D. Surface water running off yards, city streets, paved lots, and farm fields

12. How can pollution in a local lake or river harm humans? (circle all that apply)

A. Through drinking water from the sink

B. Through the sewer system

C. Through the food chain, by eating fish caught in a local waterbody

D. Through the storm drain system

13. An *invasive pond lily species* is introduced to a Michigan lake containing a large variety of native plants and animals. What will most likely happen to the lake over a period of time?

A. The pond lily species will not have an effect on the lake. It will grow side by side with other species in the lake.

B. The pond lily species will spread throughout the lake, becoming the dominant species in the area, while many of the native plants and animals will decrease or disappear altogether.

C. The native species will kill off the invasive pond lily species so that it will no longer be present in the lake.

D. The animals in the lake will eat the new pond lily species and keep it from growing in the area.

Appendix D.

14. What are some ways in which a healthy local watershed contributes to the health and well-being of local communities? *List three*. If you can't list three, list as many as you can.

1. _____

2. _____

3. _____

How true or false are these statements to you?

15. Please select one answer for each row.

	Very true	Mostly true	Not sure	Mostly false	Very false
(a) To save energy, I turn off lights, televisions, and other electronic devices at home when they are not in use.	○	○	○	○	○
(b) I do not let a water faucet run when it is not necessary. For example, I turn off the faucet while I brush my teeth.	○	○	○	○	○
(c) I have talked with my friends about ways to help the environment.	○	○	○	○	○
(d) I have asked my parents to recycle some of the things we use.	○	○	○	○	○
(e) I leave the refrigerator open while I decide what to get out.	○	○	○	○	○
(f) When I need to carry drinking water with me, I use a refillable bottle that I fill with water from the tap.	○	○	○	○	○
(g) If I see litter, I pick it up.	○	○	○	○	○

Appendix D.

What could you do?
If you found out about an environmental situation in your school or community that you wanted to do something about, for example, running buses are creating too much exhaust in the school parking lot, or a local beach has been closed for swimming due to water quality problems, how well do you think you would be able to do each of the following?

16. Please select the one answer that best matches your answer.

	I definitely can't	I probably can't	Maybe	I probably can	I definitely can
(a) Gather data and information to describe the nature and extent of the problem.	○	○	○	○	○
(b) Get other people to care about the problem.	○	○	○	○	○
(c) Express your views in front of a group of people.	○	○	○	○	○
(d) Identify individuals or groups who could help you with the problem.	○	○	○	○	○
(e) Write an opinion letter to a local newspaper.	○	○	○	○	○
(f) Call someone on the phone that you had never met before to get their help with the problem.	○	○	○	○	○

Appendix E. Student Post-Program Survey

Water Resources Education Programs

Participant Post Survey

*************Use the Answer Sheet to record your responses to the questions. Thank You!!!!!!**

1. Which of these statements best describes a watershed?

A. Any area that is always wet or that floods regularly.

B. The land area that drains water into a river or other body of water.

C. The land along the bank of a river or stream.

D. The area where a river flows into the ocean and the waters mix.

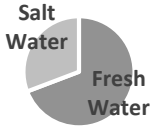
2. Which graph represents the amount of fresh water in the world?

A.

B.

C.

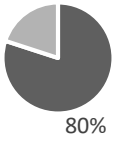
D.



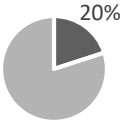
3. What percentage of all freshwater on the Earth is contained in the Great Lakes? (freshwater shown in dark grey)

A.

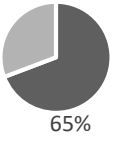
B.



C.



D.



4. What is the name of the Great Lake your local river flows into?

A. Lake Huron

B. Lake Erie

C. Lake Michigan

D. Lake Superior

Appendix E.

5. What is an aquifer?

A. an underground storage and flow of water

B. an irrigation ditch filled with water

C. an artificial channel for conveying water

D. a river system

6. Storm drains around your school connect directly to?

A. Ocean

B. River

C. Sewer

D. Lake

7. What is the major source of energy that powers the water cycle?

A. Wind

B. Gravity

C. Sun

D. Rain

8. What is an invasive species?

A. a non-native species

B. a living species that is on the verge of extinction

C. a non-native species causing environmental or economic harm

D. a species that signifies a healthy environment

9. What are pesticides?

A. Small animals the live in the water

B. Insects that eat people's gardens

C. A type of mineral

D. Chemicals that people use to kill "pests"

Appendix E.

10. Which the following is an example of point source pollution?

A. Storm water runoff

B. Waste flowing out of a factory outlet pipe

C. Animal owners not cleaning up pet waste

D. Fertilizer running off of shorelines into a lake

11. Which of the following types of pollution has the largest impact on streams, rivers, and lakes?

A. Dumping of garbage by cities

B. Trash washed into the lake from beaches

C. Waste from factories

D. Surface water running off yards, city streets, paved lots, and farm fields

12. How can pollution in a local lake or river harm humans? (circle all that apply)

A. Through drinking water from the sink

B. Through the sewer system

C. Through the food chain, by eating fish caught in a local waterbody

D. Through the storm drain system

13. An *invasive pond lily species* is introduced to a Michigan lake containing a large variety of native plants and animals. What will most likely happen to the lake over a period of time?

A. The pond lily species will not have an effect on the lake. It will grow side by side with other species in the lake.

B. The pond lily species will spread throughout the lake, becoming the dominant species in the area, while many of the native plants and animals will decrease or disappear altogether.

C. The native species will kill off the invasive pond lily species so that it will no longer be present in the lake.

D. The animals in the lake will eat the new pond lily species and keep it from growing in the area.

Appendix F. Student Post-Program Answer Sheet

Water Resources Education Programs
Participant Survey Answer Sheet

Student Number _____ Date _____

School _____Teacher_____

Please write your responses next to the question number below.

1. _____	5. _____	9. _____	13. _____
2. _____	6. _____	10._____	
3. _____	7. _____	11. _____	
4. _____	8. _____	12._____	

14. What are some ways in which a healthy local watershed contributes to the health and well-being of local communities? *List three*. If you can't list three, list as many as you can.

15. Did your work through the Water Resources Education Program (WREP) this year help you develop any of the following skills? *Please check all that apply.*

- ☐ Working with others in a team or group
- ☐ Developing a plan to accomplish a long term goal
- ☐ Communicating through public speaking or presentations
- ☐ Communicating in writing
- ☐ Gathering trustworthy information from published sources
- ☐ Using tools, instruments, or technology for measuring or analysis
- ☐ Identifying and speaking with experts from the community who can help you accomplish a task or solve a problem

17. Do you have any ideas to make the WREP program better or enjoyable for students like you?

17. How true or false are these statements to you after participating in WREP?

Please select one answer for each row.	Very true	Mostly true	Not sure	Mostly false	Very false
(a) To save energy, I turn off lights, televisions, and other electronic devices at home when they are not in use.	○	○	○	○	○
(b) I do not let a water faucet run when it is not necessary. For example, I turn off the faucet while I brush my teeth.	○	○	○	○	○
(c) I have talked with my friends about ways to help the environment.	○	○	○	○	○
(d) I have asked my parents to recycle some of the things we use.	○	○	○	○	○
(e) I leave the refrigerator open while I decide what to get out.	○	○	○	○	○
(f) When I need to carry drinking water with me, I use a refillable bottle that I fill with water from the tap.	○	○	○	○	○
(g) If I see litter, I pick it up.	○	○	○	○	○

18. After participating in WREP, if an environmental situation happened at your school, how well do you think you would be able to do each of the following?

Please select the one answer that best matches your answer.	I definitely can't	I probably can't	Maybe	I probably can	I definitely can
(a) Gather data and information to describe the nature and extent of the problem.	○	○	○	○	○
(b) Get other people to care about the problem.	○	○	○	○	○
(c) Express your views in front of a group of people.	○	○	○	○	○
(d) Identify individuals or groups who could help you with the problem.	○	○	○	○	○
(e) Write an opinion letter to a local newspaper.	○	○	○	○	○
(f) Call someone on the phone that you had never met before to get their help with the problem.	○	○	○	○	○

Appendix G. Teacher Directions for Post-Survey

Teacher Directions for Student Post-Program Survey

Dear Teacher,

Thank you for helping us with our program evaluation by administering this survey to your team of students. Please read over the directions and carefully follow each direction when administering the survey to your class.

Directions

Before the Survey:

Your students will need to use the same unique identification numbers they used on their pre-program surveys. Please have these ID #'s ready so students can enter them onto their post-program surveys.

When Administering the Survey:

1) Say: "The Watershed Council wants to find out what you have learned through their program." (Show them the survey.) "This survey is the same one you completed before the program started. The survey is like a test, but you won't be graded on your answers. The Watershed Council is asking us to fill this out because they want to find out what you've learned."

2) **Say:** "I will pass out the survey, and we will complete part of it together. Do not start on the questions yet."

3) **Pass out** the survey and with your students complete the following sections on the top of each page: student ID #, date, teacher's name, and school.

4) **Say:** "I will read each question out loud, and give you time to complete your answer. I will repeat the question if you need me to."

5) **Say:** "You might not know how to answer some of these questions. It is okay if you don't know the answer to a question. Just do your best. If you don't know an answer, make your best guess."

6) **Read** each question out loud, and then give students time to write their answer. Repeat the question if they need it read out loud again. Try not to influence students' answers at any point during the survey.

7) When students are finished, make sure students have their names and other information filled out on each page, collect all of the surveys, and put them in the envelope provided. Give the envelope to your Watershed Education staff during the next session.

Thank you again for helping us to improve our programs!