**Welcome!** to the Regional Science Consortium’s NOAA B-WET teacher training sessions “The Great Lakes W.I.S.E. Program - *Developing environmental leaders through* ***W****atershed* ***I****mmersive* ***S****tewardship* ***E****xperiences”*. During these three days, we will set sail on the Lettie G. Howard to collect samples, analyze water for bacteria, dig through sediment for macroinvertebrates, restore wetlands, experience the geology and erosion impacts on the Presque Isle State Park shoreline, understand the water cycle, investigate the impacts of weather and climate, explore the flora and fauna (native and invasive species), learn the history of Port Erie, and understand the importance and our interaction with the Great Lakes. This project was supported by a NOAA B-WET (Bay Watershed Education Training) grant. The National Oceanic and Atmospheric Administration (NOAA) is an agency in the Department of Commerce with the mission: “To understand and predict changes in climate, weather, oceans, and coasts, to share that knowledge and information with others, and to conserve and manage coastal and marine ecosystems and resources.” One of the Office of Education’s programs is the NOAA Bay Watershed Education and Training (B-WET) program. Established by Congress in 2002, the B-WET program is an environmental education program that promotes locally relevant, authentic experiential STEM learning for K-12 audiences. B-WET fosters the growth of new, innovative programs and encourages capacity-building and environmental education partnerships. Funded projects advance ocean, climate, and other environmental literacy principles. (<https://www.noaa.gov/office-education/bwet/comm_toolkit/background-info>)

**Great Lakes Literacy Principles**:

1. The Great Lakes, bodies of fresh water with many features, are connected to each other and to the world ocean. (A-I.)
2. Natural forces formed the Great Lakes; the lakes continue to shape the features of their watershed. (A-E.)
3. The Great Lakes influence local and regional weather and climate. (A-E.)
4. Water makes Earth habitable; fresh water sustains life on land. (A-B.)
5. The Great Lakes support a broad diversity of life and ecosystems. (A-I.)
6. The Great Lakes and humans in their watershed are inextricable interconnected. (A-F.)
7. Much remains to be learned about the Great Lakes. (A-F.)
8. The Great Lakes are socially, economically, and environmentally significant to their region, the nation, and the planet. (A-F.)

**Presentation Schedule:**

 **June 29, 2021**

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| --- | --- | --- | --- |
| **Time** | **Activity** | **Speaker** | **Location** |
| 8:30-9:00 | Welcome! Overview of Current Project – GLL Principles, previous BWET experience, student feedback, impacts of COVID | Jeanette | Microscope Lab |
| 9:00-11:00 | Tour of PISP | Brian Gula | TREC |
| 11:00-11:20 | Intro to NOAA online resources  | Sarah | Microscope Lab |
| 11:20-11:50 | Lake Erie Watershed – water quality, lake levels, Lake Erie functions | Amber |
| 11:50-12:10 | Fish Fight! | Sarah | Outside TREC |
| 12:10-12:40 | Lunch |  | Education Pavilion @ TREC |
| 12:40-1:00 | Travel to Dobbins Landing |  |  |
| 1:00–2:30 | Sailing on Howard G. Lettie & sample collection | Sarah & Jeanette | Dobbins Landing |
| 2:30-2:50 | Travel to TREC |  |  |
| 2:50-3:30 | Demo Lettie G Howard Sample Processing | Sarah, Jeanette, Amber, Sean | Education Pavilion @ TREC |
| 3:30-4:00 | RSC Staff Lightning Talks on Current Projects – approx. 5 min each | Jeanette, Jen, Amber, Sean, Sarah | Microscope Lab |
| 4:00-4 :30 | Icebreaker: Great Lakes Trivia | Sarah |

**July 21, 2021**

|  |  |  |  |
| --- | --- | --- | --- |
| **Time** | **Activity** | **Staff** | **Location** |
| 8:30-8:45 | Wetland Restoration Overview | Jeanette | Microscope Lab |
| 8:45-9:00 | Wetland Restoration: Natives & Invasives | Jen |
| 9:00-9:15 | Wetland Restoration: Macros and Mussels | Amber |
| 9:15-9:30 | Wetland Restoration: Fish and Amphibians | Sean |
| 9:30-9:45 | Demo of Frog call software & quiz | Sean |
| 9:45-10:00 | Break |  | Research Wing |
| 10:00-10:20 | Demo of GIS drone imagery | Sean | Microscope Lab |
| 10:20-10:35 | MWEE-Lake Erie Rocks! GIS drone overlay for erosion activity | Sean |
| 10:35-11:00 | Rocks and Minerals Activity | Sean |
| 11:00-11:30 | Lunch |  | Education Pavilion @ TREC |
| 11:30-11:50 | Transport to Leo’s Landing |  |  |
| 11:50-12:15 | Deploy froglogger | Sean | Leo’s Landing |
| 12:15-12:45 | Macroinvertebrate Sampling | Amber |
| 12:45-1:30 | Macroinvertebrate Identification & Biotic Index | Amber |
| 1:30-2:30 | Fish Collection & Identification | Sean, Amber & Sarah |
| 2:30-3:45 | Native/Invasive Identification & native planting | Jen |
| 3:45-4:10 | Herbarium Demo | Sarah |
| 4:10-4:30 | Transport back to TREC |  |  |

**July 28, 2021**

|  |  |  |  |
| --- | --- | --- | --- |
| **Time** | **Activity** | **Staff** | **Location** |
| 8:30-9:30 | MWEE Osmosis: dialysis tubing & potatoes | Sarah | Microscope Lab |
| 9:30-10:00 | Demo plant lab | Sarah |
| 10:00-10:15 | Break |  | RSC Wing |
| 10:15-10:40 | Storm Drain Survey | Sarah | TREC Parking Lot |
| 10:40-11:00 | Transport to Beach 2 |  |  |
| 11:00-11:20 | Monitoring Environmental Parameters | Jeanette | Beach 2 Tower |
| 11:20-11:30 | Transport to Rotary Pavilion |  |  |
| 11:30-12:00 | Recreation at PISP and impacts | Ray | Rotary Pavilion |
| 12:00-12:30 | Lunch |  |
| 12:30-1:00 | Smart Great Lakes: using buoy data to graph parameter over time and observe changes | Sarah |
| 1:00-1:30 | Identification of Native American names in region and activity | Amber |
| 1:30-1:50 | MWEE-Lake Erie Rocks! Tour of PA Shoreline to observe sediment movement with drone demo | Sean | Beach 7 |
| 1:50-2:00 | Beach Cleanup | Sarah |
| 2:00-2:15 | Break |  | Rotary Pavilion |
| 2:15-2:45 | Microplastics in Sand | Sean |
| 2:45-3:15 | Filter Engineering Challenge | Sarah |
| 3:15-4:00 | Microplastics in Fish Stomachs | Amber |
| 4:00-4:30 | Transport back to TREC |  |  |

**Presentations:**

**June 29, 2021**

* **Welcome! Overview of Current Project**

(Jeanette Schnars, Ph.D., Executive Director, Regional Science Consortium) – Review of the Great Lakes Literacy principles, previous B-Wet experience including student feedback, and the impacts of COVID-19.

* **Tour of Presque Isle State Park**

(Brian Gula, Environmental Educator, PA DCNR) – Guided car tour of Presque Isle State Park.

* **Introduction to NOAA Online Resources**

(Sarah Magyan, Education and Outreach Coordinator, Regional Science Consortium) – Teachers will be introduced to the numerous NOAA education assets available online at (<http://www.noaa.gov/office-education/grants/noaa-assets#education>) and associated website links.

* **Lake Erie Watershed**

(Amber Stilwell, M.S., Research Coordinator, Regional Science Consortium) – Training on the boundary of the Lake Erie Watershed and how impacts to the land directly impact the health and quality of the water, which includes its tributaries, wetlands, bays, and the Lake; thorough review of the water cycle and record high Lake levels; Lake Erie functions – including water currents, stratification, ice covers, seasonal turnovers, and the ‘dead zone’.

* **RSC Staff Lightning Talks on Current Projects**

(Jeanette Schnars, Jen Salem, Amber Stilwell, Sean Dalton, and Sarah Magyan) – Highlight of the many research projects being conducted at the RSC and what questions still remain unanswered.

* **MWEEs** – demonstration of available Meaningful Watershed Educational Experiences (MWEEs) to include in the field trip to the RSC during the school year.
	+ Fish Fight!
	+ Sailing on the Howard G. Lettie and sample processing
	+ Great Lakes Trivia

**July 21, 2021**

* **Wetland Restoration Overview**

(Jeanette Schnars, Ph.D., Executive Director, Regional Science Consortium) – The RSC has been working for nearly a decade on the restoration and monitoring of the National Priority Wetlands at Presque Isle State Park; this training will include the function of a wetland and how it protects the Lake from nutrients, pollutants, and the impacts of storm events.

* **Wetland Restoration: Natives and Invasives**

(Jen Salem, Horticultural Specialist, Regional Science Consortium) – An introduction to native and invasive plants as well as their roles in the PISP environment.

* **Wetland Restoration: Macroinvertebrates and Mussels**

(Amber Stilwell, M.S., Research Coordinator, Regional Science Consortium) – An introduction to the macroinvertebrates and native mussels found at PISP and their ecosystem roles.

* **Wetland Restoration: Fish and Amphibians**

(Sean Dalton, Lab and Field Coordinator and GIS Specialist, Regional Science Consortium) – An introduction to fish and amphibians present at PISP and their role in the environment.

* **MWEEs** – demonstration of available Meaningful Watershed Educational Experiences (MWEEs) to include in the field trip to the RSC during the school year.
	+ Lake Erie Rocks!
	+ Wetlands and Lake Erie

**July 28, 2021**

* **Monitoring Environmental Parameters**

(Jeanette Schnars, Ph.D., Executive Director, Regional Science Consortium) – The RSC operates and maintains 2 weather stations and 4 buoys on Lake Erie, all reporting real-time data that is passed on to the RSC, GLOS, and NOAA-National Buoy Data Center.

* **Recreation at Presque Isle State Park and it’s Impacts**

(Ray Bierbower, Environmental Educator, PA DCNR) – Discussion of the numerous types of recreation at Presque Isle State Park, which attracts over 4 million visitors annually. Managed by PA DCNR, PISP experiences a >20% increase in attendance during the summer of 2020 due to the public seeking outdoor activities that adhered to social distancing. What were the impacts of this increased visitation?

* **MWEEs** – demonstration of available Meaningful Watershed Educational Experiences (MWEEs) to include in the field trip to the RSC during the school year.
	+ Water, Water Everywhere *– but not all is a drop to drink!*
	+ Smart Great Lakes (Great Lakes Oberving System (GLOS) Initative)
	+ Lake Erie Rocks!
	+ Marine Debris, Microplastics, and Beach Cleanup – *How to be a Good Environmental Steward!*

**Online Training Materials**

A total of 6 hours of online training materials must be completed in addition to the in-person training dates. Materials can be accessed at [www.regsciconsort.com/bwet](http://www.regsciconsort.com/bwet) with the password “**BWET**”.

* **Understanding Erosion on the Lake Erie shoreline - *Sand Nourishment, Breakwaters, Ice Dunes, and Sand Transport***

(Sean Dalton, Lab and Field Coordinator and GIS Specialist, Regional Science Consortium) – Erosion is a continual process along the Lake Erie shoreline. Many features, such as the elaborate series of breakwalls along the Presque Isle State Park shoreline are in place to reduce the rate of erosion, however annual sand nourishment is still required. The RSC is studying the transport of sand in the formation of tombolos to better understand the processes occurring locally.

* **Our Maritime Roots**

(Jerry Skrypzak, President, SONS of Lake Erie) – The Port of Erie was an important to Erie’s Maritime history. This working waterfront provided great economic revenue during its time, and also saw many ships lost. Some of those ships still exist today as wreck sites on the bottom of Lake Erie.

* **Citizen Science CoCoRaHS and Great Lakes Storms**

(Sarah Jamison, Senior Service Hydrologist, NOAA-National Weather Service, Cleveland) – The Great Lakes, especially Lake Erie, have experienced some impressive storms over the last hundred years. Modern weather forecasting relies on multiple data sources providing reliable weather information, which is a contrast to weather reports a century ago.

* **100-Year Storm**

(NOAA-National Weather Service) – Discussion of “The White Hurricane” and the historical development of the National Weather Bureau.

* **Weather Stations and Weather Watchers**

(Jeanette Schnars, Ph.D., Executive Director, Regional Science Consortium) – Discussion on how teachers can use their weather stations (provided in a previous B-Wet grant) to monitor weather.

* **Native American History**

(Amber Stilwell, M.S., Research Coordinator, Regional Science Consortium) – The historical settlement and development along the Great Lakes, and the reference to Native American and immigrant origins. As a Researcher and Marine Archaeologist, specific research projects discovering, and surveying submerged cultural sites will be highlighted.

* **RSC Online Education Initiative Lessons**

(Regional Science Consortium) - The Regional Science Consortium has developed and implemented an entirely new online education initiative. Each lesson includes a narrated presentation, video, introduction, activity instructions, student worksheet, teacher guide. The following lessons have been selected as part of the NOAA B-Wet program.

* + Buoys and Weather
	+ Erosion
	+ Macroinvertebrates
	+ Microplastics
	+ Rocks and Minerals
	+ Stormwater Runoff

We recommend completing the follow online training materials by their listed training session to better understand the activities planned for that training session.

* By July 21st :
	+ Erosion Online Education Initiative Lesson
	+ Macroinvertebrates Online Education Initiative Lesson
	+ Rocks and Minerals Online Education Initiative Lesson
	+ Understanding Erosion on the Lake Erie shoreline
* July 28th :
	+ Microplastics Online Education Initiative Lesson
	+ Native American History
	+ Stormwater Runoff Online Education Initiative Lesson

**School Year Schedule**

* September 2021 (each class has a specific date): Field trip to the Maritime Museum, Flagship Niagara (TBD), and Lettie G. Howard (<https://www.flagshipniagara.org/>)
	+ Students will get to set sail on the Lettie! (must be >33 lbs.) (weather dependent; however dress for weather) – Capacity 37 (teachers + students)
	+ Maritime Museum Tour
	+ Sample Collection and Analysis
* October 2021 – March 2022: Schedule your field trip to the RSC! Select the topic and MWEEs that you and your students are interested in learning more about.
* October 2021 – April 2022: Student group(s) should be working on their Stewardship Action Projects (SAPs) throughout the year.
* January – April 2020: Students present their Stewardship Action Projects at their school. Presentations will be live-streamed on the RSC YouTube Channel, [www.RegSciTV.com](http://www.RegSciTV.com) . We would like the other students in this program to watch as many live presentations as possible (we will let you know a schedule of dates and times of presentations). Presentations will be accessible to watch at a later time if necessary. Each student group should send 1-3 questions/comments to the presenters about their project. Presenters should respond if appropriate.

**Resources**

* RSC Staff! Need some assistance with learning more about a topic or educational resources? Need supplies or equipment to use in the classroom? Need some ideas for a Stewardship Action Project? We are here to assist you and your students learn more about your topic.
* Our website! [www.RegSciTV.com](http://www.RegSciTV.com)
	+ Use these Video Files on the RSC website to access the following information:
		- Expert talks from the teacher trainings
		- Tall Ships Erie 2019 (August 22-25) – Since the Tall Ships festival is scheduled before the school year, we did not want your students to miss this great event! The RSC will have video tours of the ships and interviews with the crew.
* NOAA – National Weather Service, Weather Ready Nation Ambassadors
	+ <https://www.weather.gov/wrn/ambassadors>
* NOAA Online Resources Home
	+ [https://www.noaa.gov/office-education/grants/noaa-assets#educations](https://www.noaa.gov/office-education/grants/noaa-assets%22%20%5Cl%20%22education)
* NOAA Education Resources and Programs
	+ NOAA B-Wet Information: <https://www.noaa.gov/office-education/bwet>
	+ MWEE’s: <https://www.noaa.gov/education/explainers/noaa-meaningful->
	+ Resource Collection – Great Lakes ecoregion: <https://www.noaa.gov/education/resource-collections/freshwater/great-lakes-ecoregion>
	+ NOAA in your backyard: <https://www.noaa.gov/education/noaa-in-your-backyard>
	+ NOAA Educational Games: <https://games.noaa.gov/>
* Center for Great Lakes Literacy
	+ <https://www.cgll.org/for-educators/great-lakes-literacy-principles/>
* NOAA Data Visualizations and Satellite Imagery:
	+ Geophysical Fluid Dynamics Laboratory: <https://www.gfdl.noaa.gov/visualization/>
	+ Environmental Visualization Program: <https://www.nnvl.noaa.gov/view/globaldata.html>
* Real-time Data and Data Archives
	+ River and stream gauges: <https://water.weather.gov/ahps/>
	+ National Data Buoy Center: <https://www.ndbc.noaa.gov/>
* Weather-Related Information
	+ Snow Cover Monitoring: <https://www.nohrsc.noaa.gov/>
	+ [National Weather Service Radar](https://radar.weather.gov/?settings=v1_eyJhZ2VuZGEiOnsiaWQiOm51bGwsImNlbnRlciI6Wy05NSwzN10sInpvb20iOjR9LCJhbmltYXRpbmciOmZhbHNlLCJiYXNlIjoic3RhbmRhcmQiLCJjb3VudHkiOmZhbHNlLCJjd2EiOmZhbHNlLCJzdGF0ZSI6ZmFsc2UsIm1lbnUiOnRydWUsInNob3J0RnVzZWRPbmx5IjpmYWxzZSwib3BhY2l0eSI6eyJhbGVydHMiOjAuOCwibG9jYWwiOjAuNiwibG9jYWxTdGF0aW9ucyI6MC44LCJuYXRpb25hbCI6MC42fX0%3D#/)
	+ Current Satellite Data: <https://www.star.nesdis.noaa.gov/GOES/index.php>
* Tracking Nutrient Impacts to Waterways: <https://www.blueaccounting.org/progress/source-water-nutrient-impairments>
* NASA Climate Education Resources: <https://climate.nasa.gov/resources/education/>
* Erosion: <https://climate.nasa.gov/images-of-change?id=658#658-beach-erosion-near-freeport-texas>

**MWEEs (Meaningful Watershed Educational Experiences)**

MWEEs are multi-stage activities that include learning both outdoors and in the classroom, and aim to increase the environmental literacy of all participants. Teachers should support students to investigate topics both locally and globally that are of interest to them, learn they have control over the outcome of environmental issues, identify actions available to address these issues, and understand the value of those actions.

1. Making Watershed Connections – Students will utilize the Regional Science Consortium’s Interactive Wetland model to explore wetland ecosystems, management, and the impacts of various stressors on wetlands.
	1. Great Lakes Literacy Principles:
2. Lake Erie Rocks! – Students will experience a tour of the PA shoreline of Lake Erie observing the movement of sediment, use collected GIS drone imagery to overlay on previous years’ images to determine differences in shorelines, and identify rocks and minerals found in this region.
	1. Great Lakes Literacy Principles:
3. Water, Water Everywhere *– but not all is a drop to drink!* – Students will compare properties between fresh water and salt water using a semi-permeable membrane tube to demonstrate the process of osmosis and relating that to how it impacts plants and animals that inhabit the water.
	1. Great Lakes Literacy Principles:
4. Wetlands and Lake Erie – Students will have the opportunity to tour the wetlands at Presque Isle State Park, identify native and invasive plants, remove invasive species, install native plants, collect, press, and dry plants using standard museum techniques, collect and identify macroinvertebrates, use macroinvertebrates to scale the level of water quality, record and identify frog calls, collect fish using a variety of methods (trapping, seining, and electrofishing), and identify different species of fish.
	1. Great Lakes Literacy Principles:
5. Marine Debris, Microplastics, and Beach Cleanups – Students will participate in a beach cleanup, collect and categorize marine debris, examine microplastics samples collected on PISP beaches, learn about plastic fibers entering the Lake through washing machines, design and test their own water filters to remove plastic fibers, and dissect fish stomach and gut contents for microplastics and plastic fibers.
	1. Great Lakes Literacy Principles:
6. Lettie G. Howard Tall Ship – Students will set sail to explore Lake Erie by boat; this sail will include the collection of water, benthic, and plankton samples; upon returning to shore, students will test water for bacteria, examine water samples for phyto- and zooplankton, and pick through benthic samples for macroinvertebrates.
	1. Great Lakes Literacy Principles:
7. Monitor the Environment – Students/teachers will select an environmental parameter to monitor (temperature, rainfall, soil moisture, etc.) over the course of the school year. Students will compare their data to other datasets and graph their data over time to measure fluctuations in the observed parameter.
	1. Great Lakes Literacy Principles:
8. Fish Fight! – Students will actively learn how storm water, invasive species and pollution impact the necessary resources for a healthy fish population.
	1. Great Lakes Literacy Principles: 3, 4, 5, 6, 7, 8

**Stewardship Action Projects**

Students participate in an age appropriate project during which they take action to address environmental issues at the personal or societal level. Participants in B-WET MWEE activities should understand they have control over the outcome of environmental issues, be encouraged to identify actions to address these issues and understand the value of those actions. Examples of stewardship activities include:

* Watershed Restoration or Protection (e.g., create schoolyard habitat, planting trees or grasses, invasive species removal, community cleanup, stormwater management)
* Everyday Choices (e.g., reduce/reuse/recycle/upcycle, composting, energy conservation, water conservation)
* Community Engagement (e.g., presentations, social media, event-organizing, messaging at community events/fairs/festivals, mentoring, PSAs, flyers, posters)
* Civic Action (e.g., town meetings, voting, writing elected officials/decision makers, advocating for policy change)

With the guidance of the teachers, students will develop their own Stewardship Action Project (SAP). This can be as one group, or several smaller groups. RSC staff is available to assist you and your students with brainstorming ideas for a project.

**Budget**

* Field trip to Maritime Museum and Sail on the Lettie (RSC)
* Field trip to RSC, and MWEEs (RSC)
* Teacher Trainings (RSC)
* Video Resources (RSC)
* Teaching Tote w/ Supplies for Classroom (RSC)
* Teacher stipends (must attend teacher trainings) - $500/school (class)
* Bussing - $400
* Stewardship Action Projects - $200