Considerations for Adopting Mobile Digital Technologies to Enhance Outdoor Education

NAAEE Virtual Conference 2017

Justin Hougham, Ph.D.
Assistant Professor & Director of Upham Woods Outdoor Learning Center
University of Wisconsin - Extension
justin.hougham@ces.uwex.edu

Steve Kerlin, Ph.D.
Director of Education
Stroud Water Research Center
skerlin@stroudcenter.org
stroudcenter.org
wikiwatershed.org

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

Stroud Water Research Center

50 Years Est. 1967

Our Mission

STROUD™ WATER RESEARCH CENTER

Photo: Marissa Morton

To advance knowledge and stewardship of freshwater systems through global research, education, and watershed restoration

STROUD WATER RESEARCH CENTER

LEED Facility

1800 ACRES EXPERIMENTAL WATERSHED

Moorhead Environmental Complex, 2012

STROUD WATER RESEARCH CENTER

UPHAM WOODS

Upham Woods

Outdoor Learning Center

"These lands are to be used as an outdoor laboratory and camp for youth, such as 4-H clubs and other people cooperating with the University of Wisconsin in the advancement of conservation, of agriculture and rural culture."

—Elizabeth and Caroline Upham, 1941

For more information, please contact Upham Woods at:
608-254-6461 or uphamwoods@ces.uwex.edu
http://fyi.uwex.edu/uphamwoods/

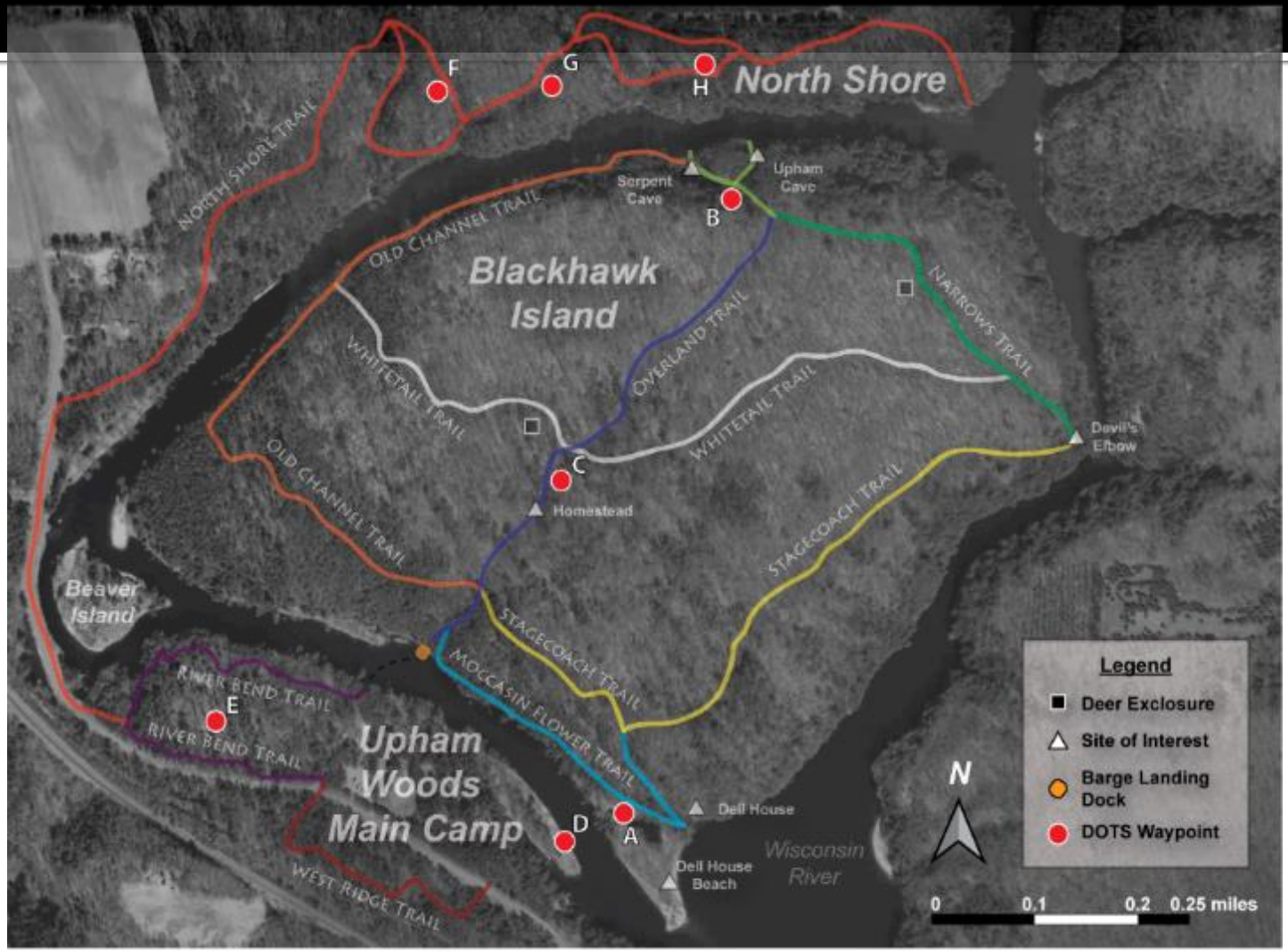
UW Extension
University of Wisconsin-Extension

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Upham Woods



Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

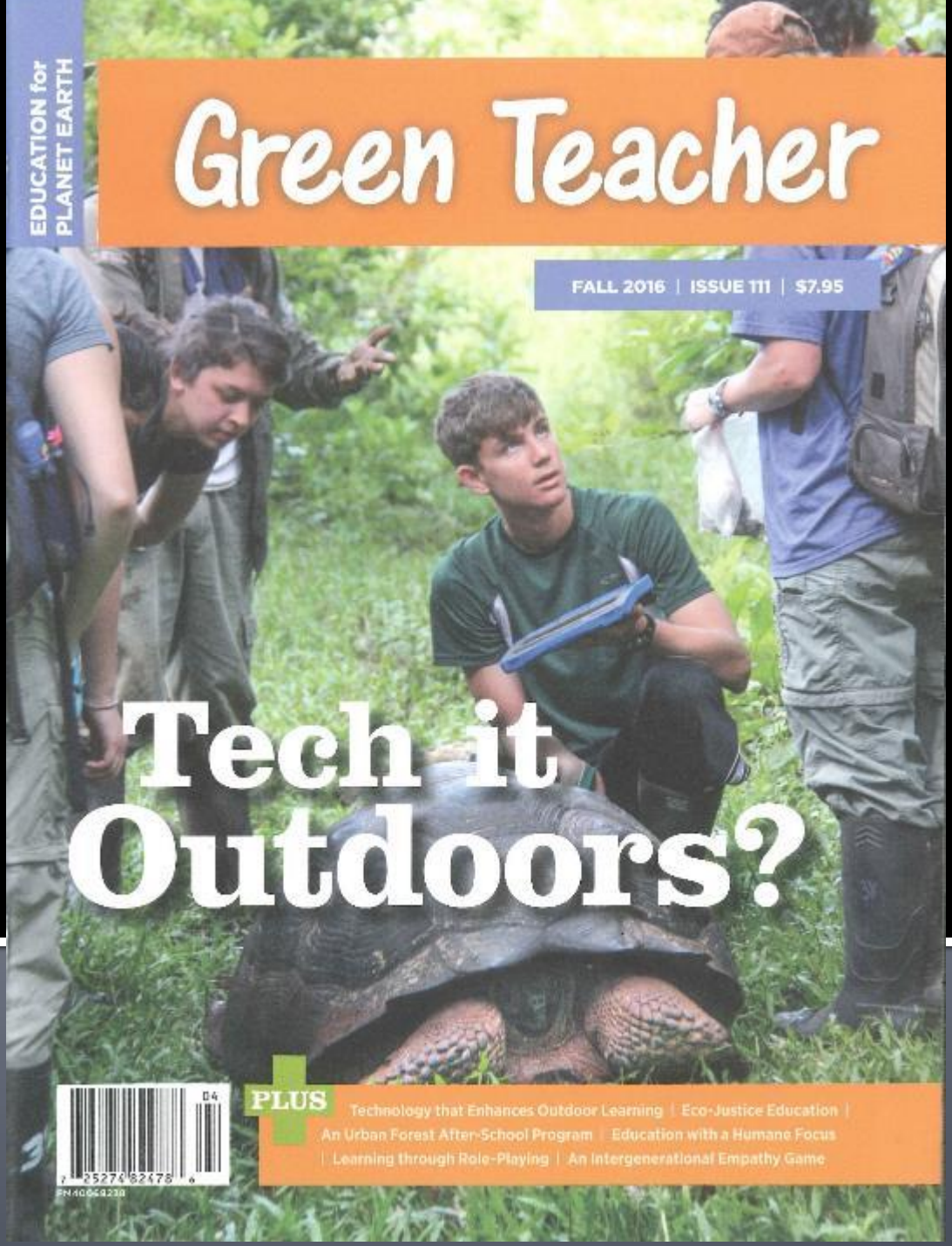
DOTS Digital Observation Technology Skills

Upham Woods

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

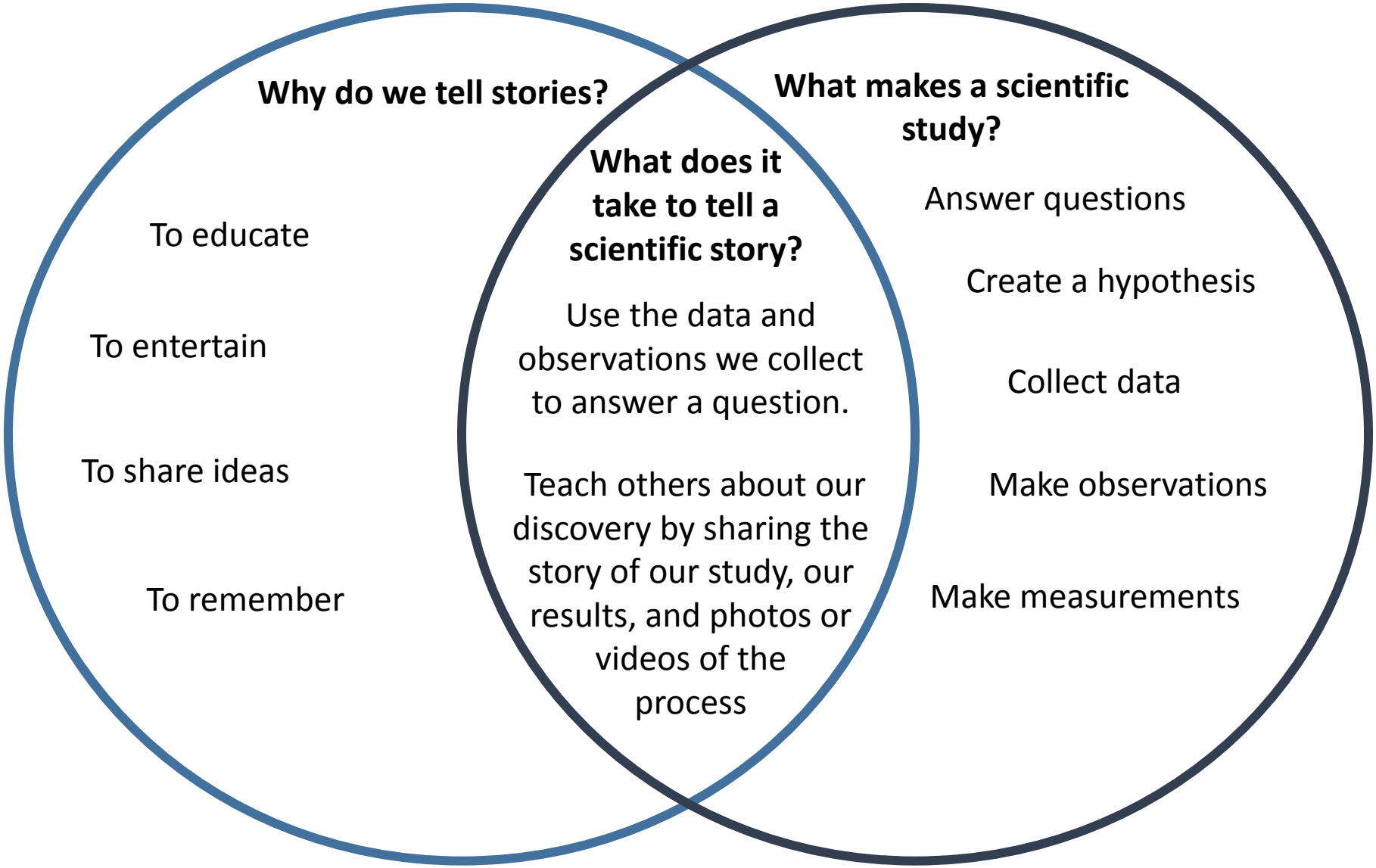
DOTS Digital Observation Technology Skills



Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills




"The exploration of nature should be a critical component of education."
–David Sobel, 2015
Upham Woods
Outdoor Learning Center
UW Extension
University of Wisconsin-Extension
DOTS
Digital Observation Technology Skills

Changing Education

"In order to engage learners, educators must first be able to recognize and navigate in the learner's own landscape."

-Jan Visser, author of Learners in a Changing Learning Landscape (2008)

- **"Digital Natives"**: The generation of youth who have developed learning strategies shaped around the use of technology.

  (Prensky, 2006)

Taking it Outdoors

- "Many educators believe that the most feasible learning activities of natural science is **outdoor inquiry**, which takes science investigation outside the classroom." (Liu 2009)

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

Place-Based Education

Place-based education provides a way to understand new concepts through making connections with relevant locations.

- "…this approach to education increases academic **achievement**, helps students develop **stronger ties** to their **community**, enhances students' **appreciation for the natural world**, and creates a heightened commitment to serving as **active, contributing citizens**." (Sobel 2004)

- "Place-based teaching includes all learners as they connect new **science-related ideas** to **community-based experiences**. We adopt the view that place-based learning can **connect** out-of-school learners to their communities." (Zimmerman 2014)

Technology

- Liu studied the use of mobile technologies in an outdoor lab setting, with students using mobile computers to enhance their lesson, finding that

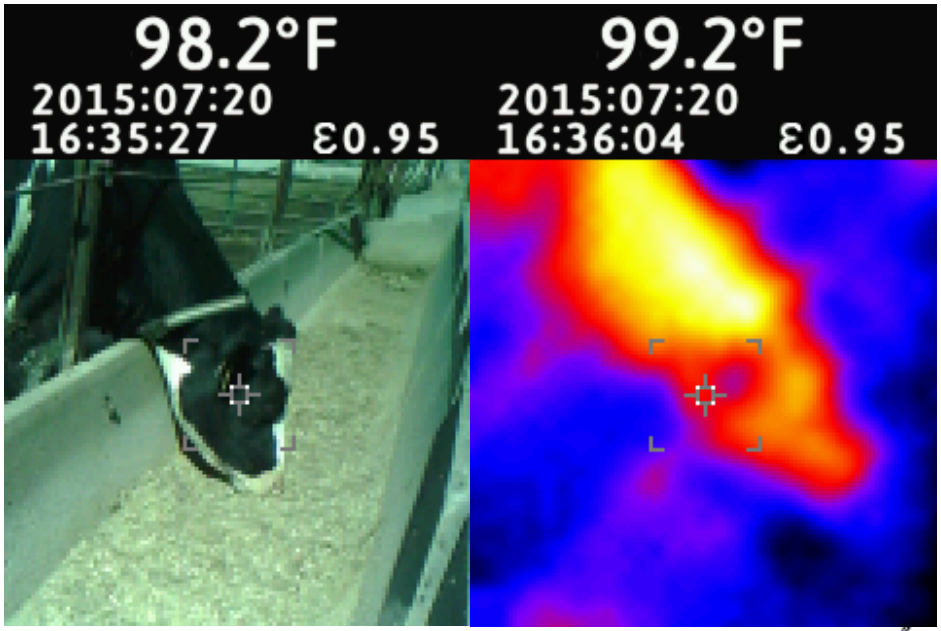
  49% of students "felt that their opportunity to use a tablet PC throughout the learning activities was a **source of motivation**." (2009)

- These students described their experience using the mobile technologies as more "personal," "collaborative," "hands-on," and "interesting and interactive" than a typical class lecture. (2009)

Upham Woods Outdoor Learning Center
UW Extension University of Wisconsin-Extension
DOTS Digital Observation Technology Skills

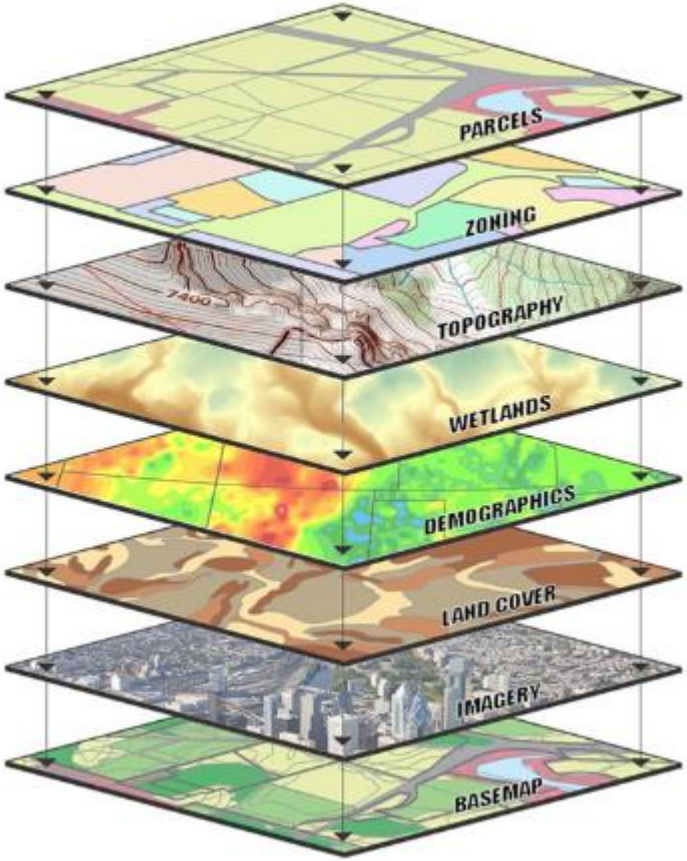
Technology

- "Technology can support reflection and articulation of new knowledge if artifacts are captured for sharing." (Zimmerman 2014)



Upham Woods Outdoor Learning Center
UW Extension University of Wisconsin-Extension
DOTS Digital Observation Technology Skills

How can technology help us see?

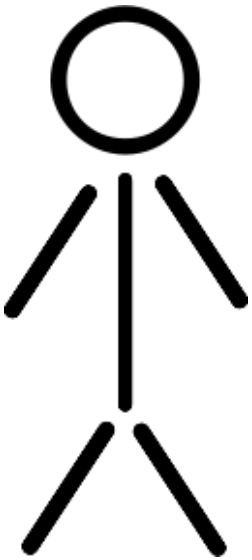


GIS DATA LAYERS

Many different types of data can be integrated into a GIS and represented as a map layer.

Examples can include: streets, parcels, zoning, flood zones, client locations, competition, shopping centers, office parks, demographics, etc.

When these layers are drawn on top of one another, undetected spatial trends and relationships often emerge. This allows us to gain insight about relevant characteristics of a location.



Upham Woods Outdoor Learning Center

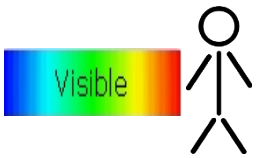
UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Visible Light	What we can see

Radio

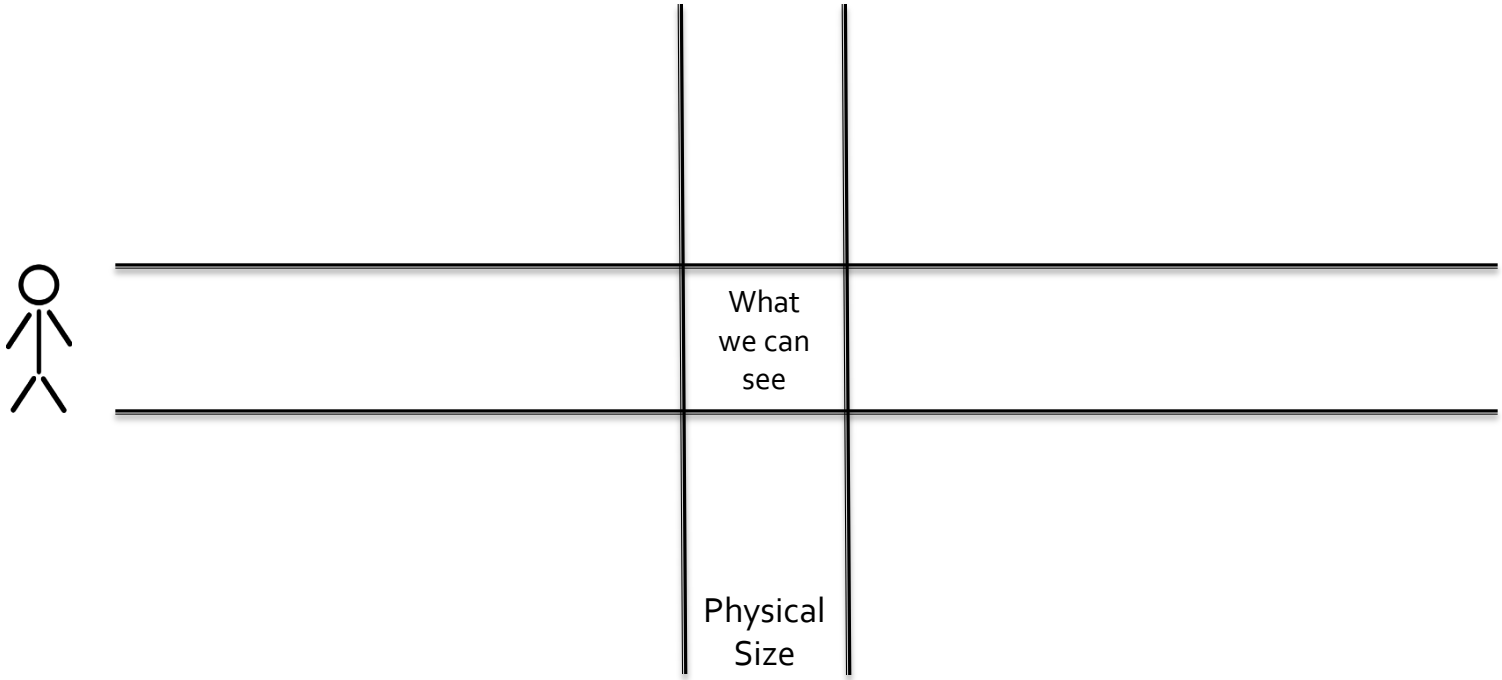
Infrared



Visible Light	What we can see

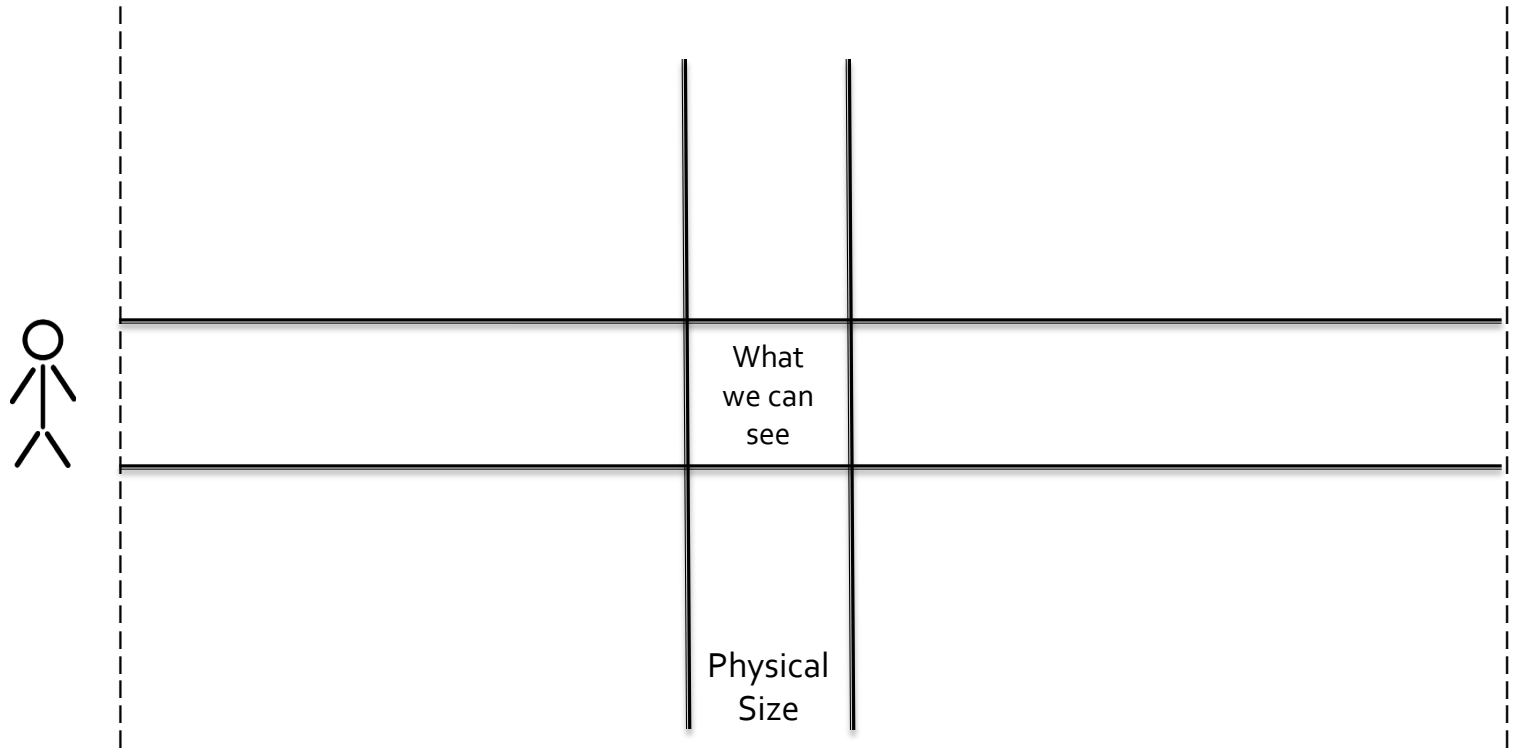
Ultra Violet

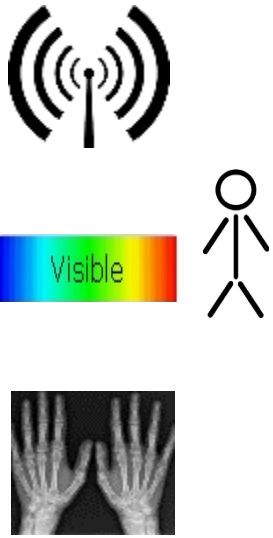
X-Ray



Sand particles

Landscape


What we can see
Physical Size
Microns
Sand particles
Landscape
Galaxy



Radio Infrared		
Visible Light	What we can see	
Ultra Violet X-Ray	Physical Size	

Microns

Sand particles

Landscape

Galaxy

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

What can technology see?

Technology helps us visualize attributes of space

Radio Infrared		
Visible Light	What we can see	
Ultra Violet X-Ray	Physical Size	

Microns

Sand particles

Landscape

Galaxy

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

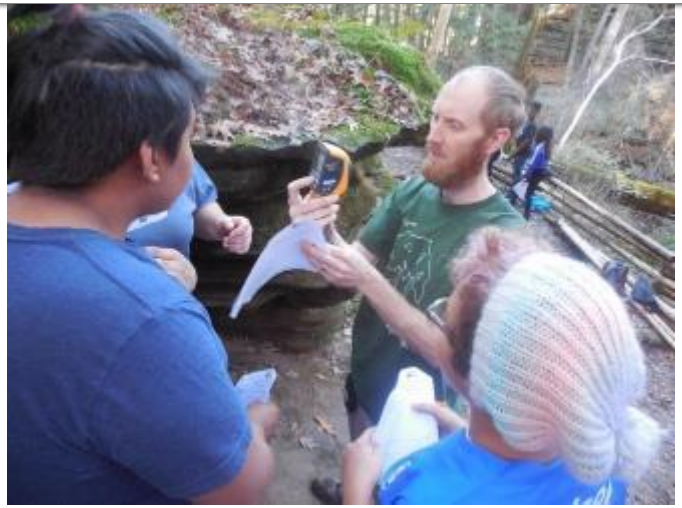
Career Scientists

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

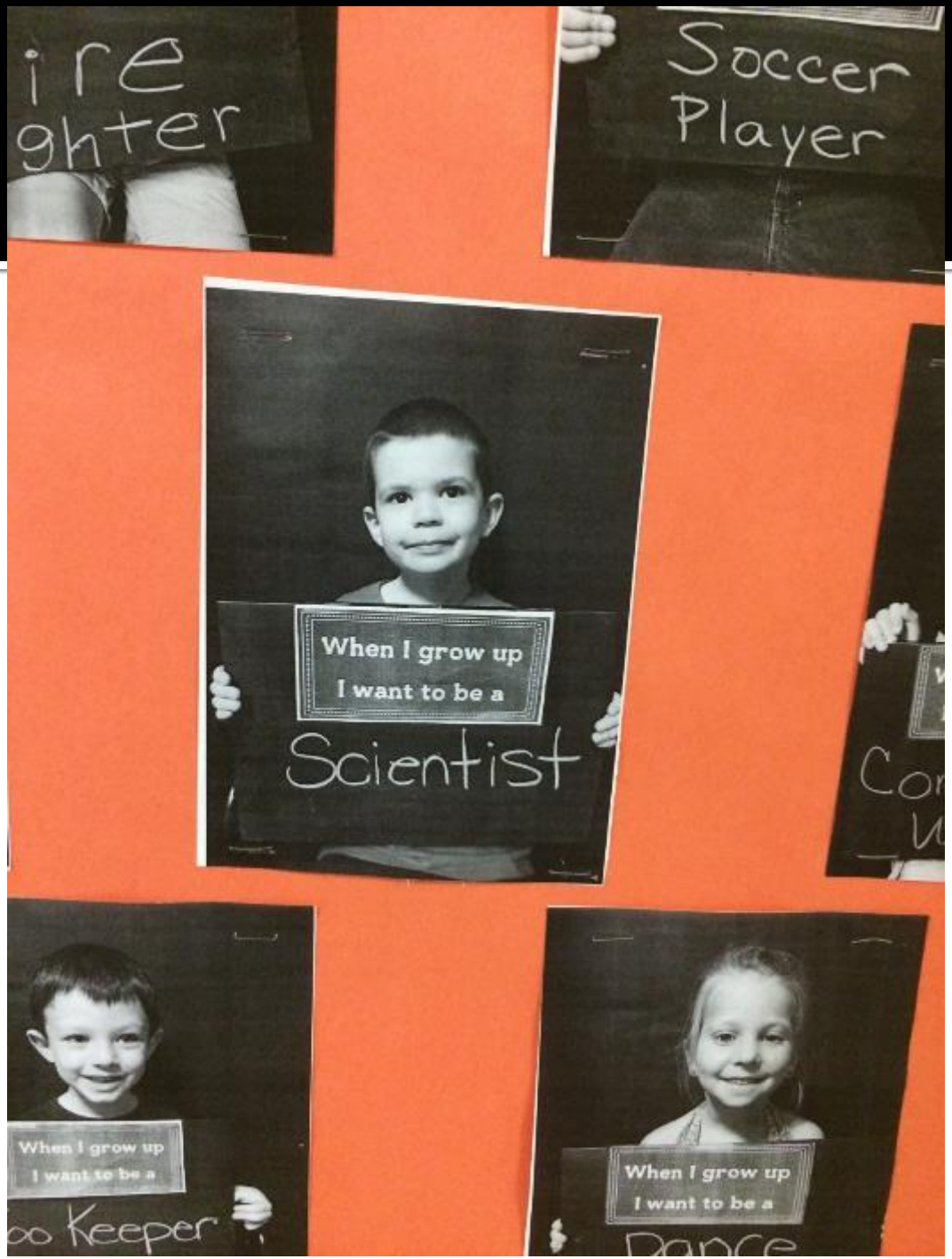
We can all think scientifically about the world around us….



Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills



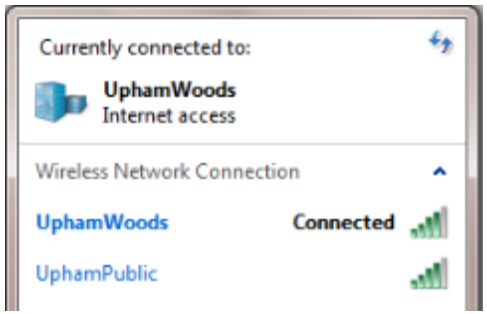
Upham Woods Outdoor Learning Center

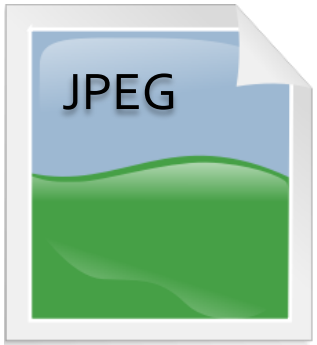
UW Extension
University of Wisconsin-Extension

DOTS
Digital Observation Technology Skills

Design Considerations

- Memory
- Power
- Portability
- Off-line
- Dedicated device
- Platform neutral
- Digital artifact





Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Digital Observation Technology Skills (DOTS) kits

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Navigator

- Provides direction to study sites
- Locates group geographically using a personal Global Positioning System
- Coordinates data collection with other team members

Navigator

Tool: Garmin etrex 10 and map of Blackhawk Island

Purpose: A handheld GPS unit. Use this instrument to successfully navigate your team from waypoint to waypoint.

Task: Guide your group to each location as efficiently as possible using both the GPS and the map. All travel must be done on paths. At each point, record the latitude and longitude of the location.

How-to:

1. Turn on the Garmin etrex 10 by holding down the button on the right side labeled 'light'.
2. Once on, use the toggle on the front to highlight the 'Where to?' square.
3. Select the 'Where to?' square by pressing in on the toggle.
4. Scroll through the waypoints and select the one your instructor tells you.
5. Once selected, toggle down to highlight 'GO' and click.
6. Your screen will now look like a map. To follow an easy-to-use compass instead, press the back button in the upper right. Toggle down and select 'Compass'. Keeping the compass level, line up the arrow and the line at the top. This screen tells you how far you are to your next point.
7. Using both the GPS and the map, guide your group to the correct location. Remember to stay on the trails.
8. Once you are at the correct location, identify its latitude and longitude. Do this by pressing the 'Back' button and selecting 'Map'. Press the toggle to the right and the information will appear on the top of the screen. Make sure to tell the Recorder these numbers.
9. Turn off the etrex when not in use.

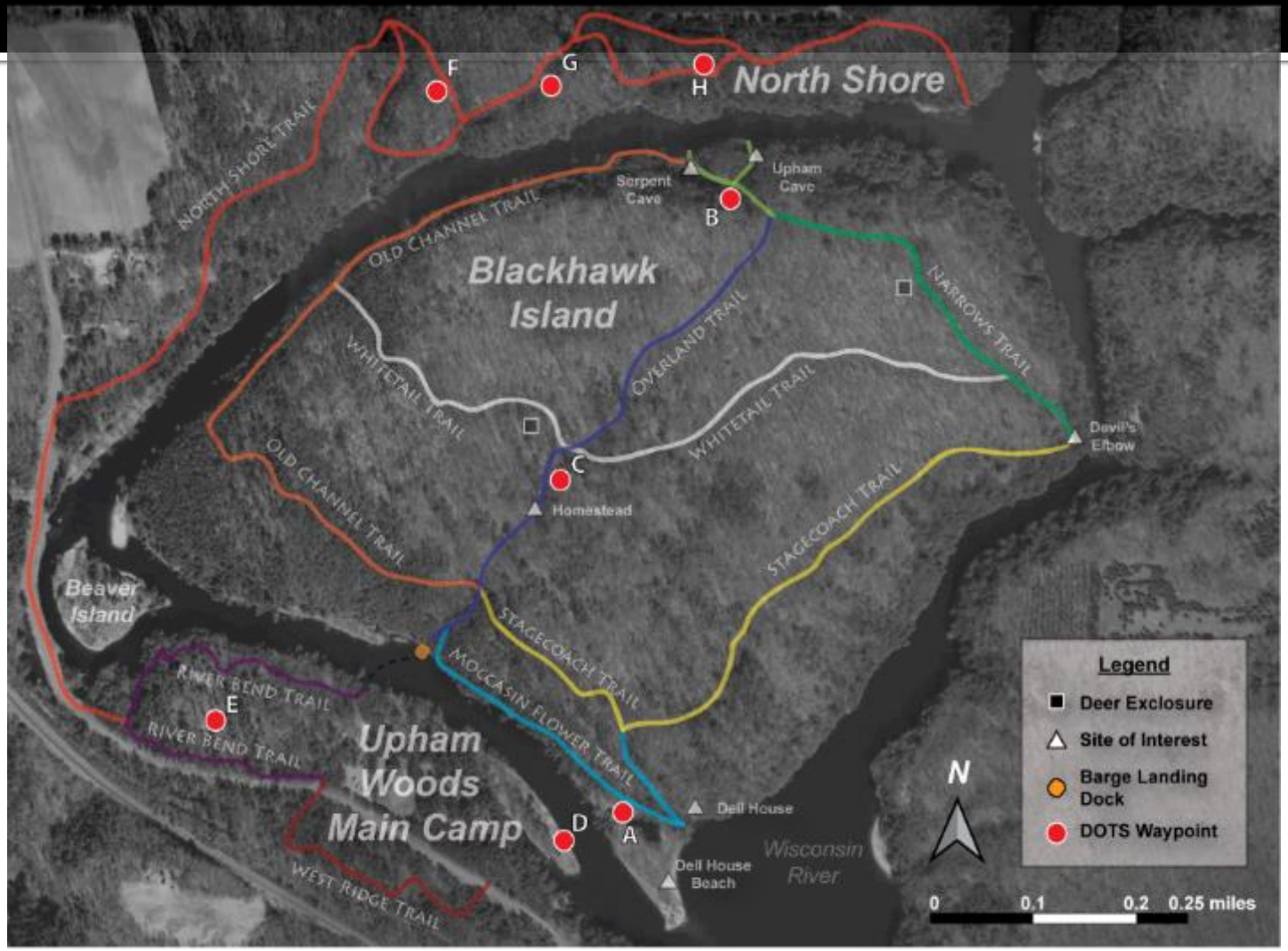
Helpful Hints:

- Use both the Garmin and the map together.
- All waypoints will be on trails, so DO NOT leave the trails.
- If it is too dark to see the screen, press the 'light' button on the side.

http://www.uwex.edu/ces/4h/uphamwoods/
uphamwoods@ces.uwex.edu
(608) 254-6161

Upham Woods Outdoor Learning Center
UW Extension University of Wisconsin-Extension
DOTS Digital Observation Technology Skills

Navigator



Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Media Specialist

- Captures photos and videos of the group
- Downloads stills from wildlife cameras
- Shares scientific story with others through images, movies, and writing

Media Specialist

Tool: Garmin Virb, keys, and tablet to upload pictures

Purpose: A handheld camera designed to record images on the go. The media specialist is responsible for recording their team's experience through images and videos.

Task: At each waypoint and while traveling, take pictures and record images that may help explain to viewers what the team is doing. Document things as you see fit.

How-to:

1. Turn on the Garmin Virb by holding down the button on the side labeled 'mode' until the green light appears.
2. To record an image, press the button labeled 'OK'.
3. To record a video, slide the bar forward in the direction of the red 'Rec'.
4. Turn the Garmin Virb off by holding down the 'mode' button until the green light turns off.
5. Remove the SD card from the trail camera at each location. Use the key that is the same color as the lock to unlock the camera.
6. Remove the iPad from its case.
7. Insert the card into the card reader.
8. Plug the card reader into the iPad.
9. The 'Photo' tab should open.
10. Select which images you would like to download onto the iPad and press import.
11. Do not delete the images.
12. Return the SD card to the trail camera and relock the device.

Helpful Hints:

- Before recording images, ensure that there is an SD card in the Garmin Virb.
- Use the color coded keys to unlock the boxes accordingly.

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Meteorologist

- Collects atmospheric data
  - Temperature
  - Wind speed
  - Relative humidity
- Finds and explores microclimates

Meteorologist

Tool: Kestrel 4000 Pocket Weather Tracker.

Purpose: A handheld weather station. Take this instrument with you to determine microclimates across Upham Woods and Blackhawk Island and note the differences.

Task: At each waypoint, measure the wind, temperature, humidity, and altitude.

How-to:

1. Turn on the Kestrel 4000 Pocket Weather Tracker by holding the red power button in the lower left.
2. The home screen should appear. Make note of the time of your observation.
3. Press the down arrow to begin reading the data. They are as follows:
   a. Wind - measured in miles per hour (mph). Make sure to open the plastic cap from the anemometer so the wind can blow through it.
   b. Temperature - given in Fahrenheit (°F).
   c. Chill - Wind chill. This measures how cold it feels when the wind and the temperature are combined together. Measured in Fahrenheit (°F).
   d. Humidity - the amount of moisture in the air. Measured in a percentage (%).
   e. Heat Index - a combination of the air temperature and the humidity to describe how hot a person feels. Measured in Fahrenheit (°F).
   f. Dew Point – the temperature at which the water in the air would be condensed and come down as rain. Measured in Fahrenheit (°F).
   g. Wet bulb - wet bulb temperature. This refers to the lowest temperature that can be reached by evaporating water into the air. It will always be equal to or less than the air temperature. Measured in Fahrenheit (°F).
   h. Baro - barometric pressure. This is the force exerted on you by the tiny particles in the air. Measured in inches of Mercury (inHg).
   i. Altitude – the height of a location above sea level. Measured in feet (ft).
   j. Dens Alt- density altitude. Pressure altitude corrected for non-standard temperature. Measured in feet (ft).
   k. After all of the screens, the down arrow will lead you to User Screens 1, 2, and 3. This will show each measurement in order, using just a symbol. User Screen 1 has the three measurements that need to be recorded on it.
4. Remember to turn off the instrument by holding the power button.

Helpful Hints:

- If at any point the screen shows the same name (for example "Wind"), but the maximum (Max) and average (Avg) readings, or a screen with a line that says "for data" at the bottom, that means one of the sideways arrows was pressed. Continue pressing one of the side arrows until the main screen reappears.
- If it is too dark to read the screen, press the button with a half colored-in circle in the upper right. That will turn the screen light on. To turn the light off, press the same button again.
- To store data and revisit it later, press the camera button in the upper left. By pressing this button, every measurement will be stored and can be revisited at a later time.

Extension

Upham Woods Outdoor Learning Center

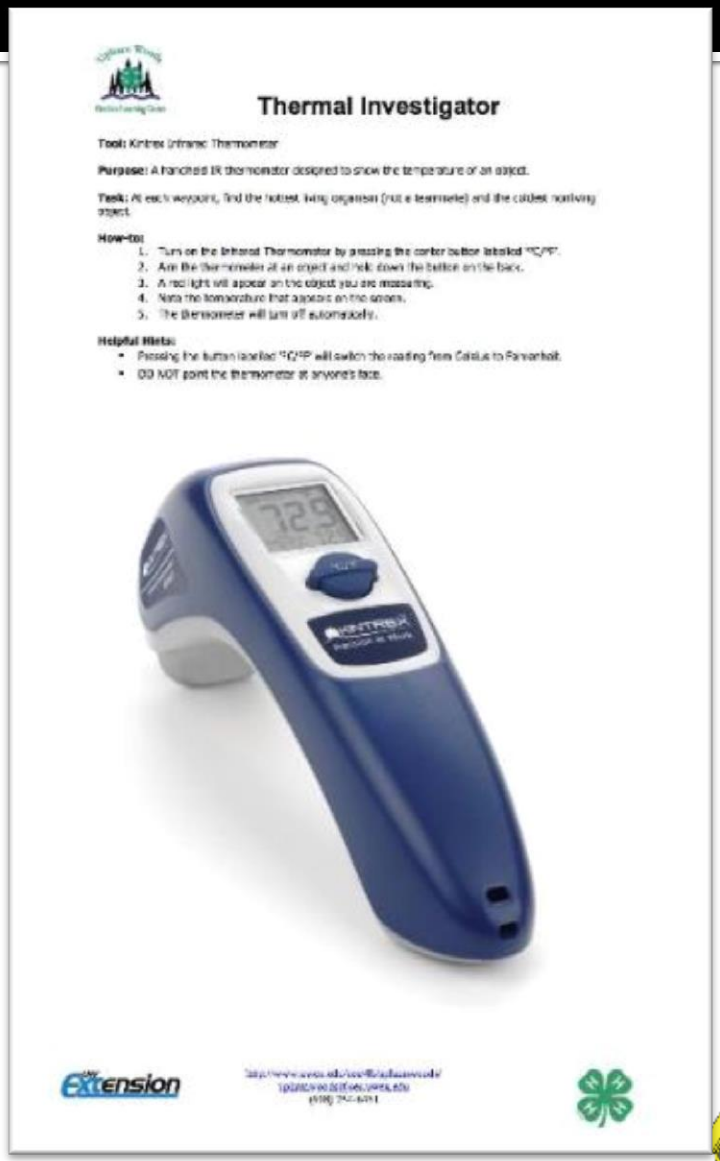
UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Meteorologist

Thermal Investigator

- Uses atmospheric data to make predictions of surface temperatures
- Tests predictions to find the warmest and coldest objects in the study site



Thermal Investigator

Tool: Kintrex Infrared Thermometer

Purpose: A handheld IR thermometer designed to show the temperature of an object.

Task: At each waypoint, find the hottest living organism (not a teammate) and the coldest nonliving object.

How-to:

1. Turn on the Infrared Thermometer by pressing the center button labeled °C/°F.
2. Aim the thermometer at an object and hold down the button on the back.
3. A red light will appear on the object you are measuring.
4. Note the temperature that appears on the screen.
5. The thermometer will turn off automatically.

Helpful Hints:

- Pressing the button labeled °C/°F will switch the reading from Celsius to Fahrenheit.
- DO NOT point the thermometer at anyone's face.

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Thermal Investigator

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Thermal Imager

- Collaborates with Thermal Investigator to capture interesting thermal differences in the study site visually
- Shares interesting findings with team and facilitates additional inquiry

Thermal Imager

Tool: Fluke Visual IR Thermometer

Purpose: A handheld IR thermometer designed to show the temperature of an object.

Task: At each waypoint, find the boundary of hot to cold using the thermal image screen and note what objects have the highest difference in temperature.

How-to:

1. Turn on the IR thermometer by holding down the menu button.
2. Turn the dial on the back of the thermometer to open up the lenses.
3. Be patient while the screen is loading. Once loaded, begin pointing the thermometer at various living and nonliving objects.
4. Note that the thermometer gives readings in Fahrenheit (°F), and the thermal imaging shows warm objects as red and cold objects as blue.
5. Keep the thermometer as still as possible while pointing at an object for about ten seconds.
6. Experiment with pressing the up and down arrows. This will change the view on the screen from a video to a true thermal image and back again.
7. To record an image, press the green button on the back of the thermometer. Make sure that there is an SD card in the thermometer to store the images.
8. To look back at past data, press the menu button and scroll up or down to find what you are looking for.
9. Turn off the thermometer by holding down the menu button.
10. Turn the dial on the back of the thermometer to cover the lenses when not in use.

Helpful Hints:

- Make sure you are close enough to an object to get an accurate reading. Generally about an arm's length is a good distance.

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

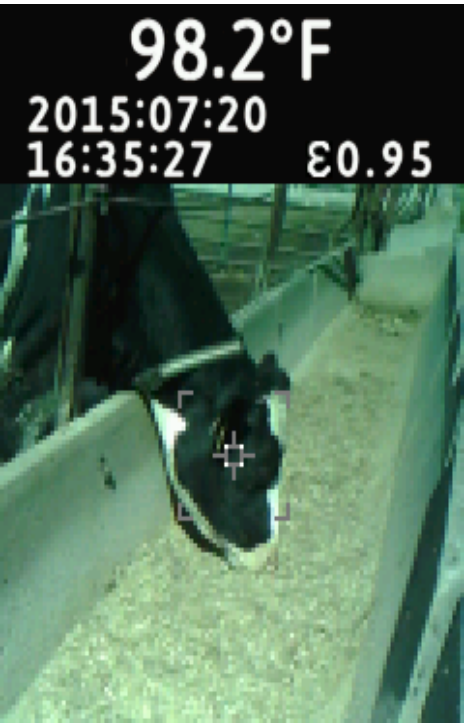
Thermal Imager

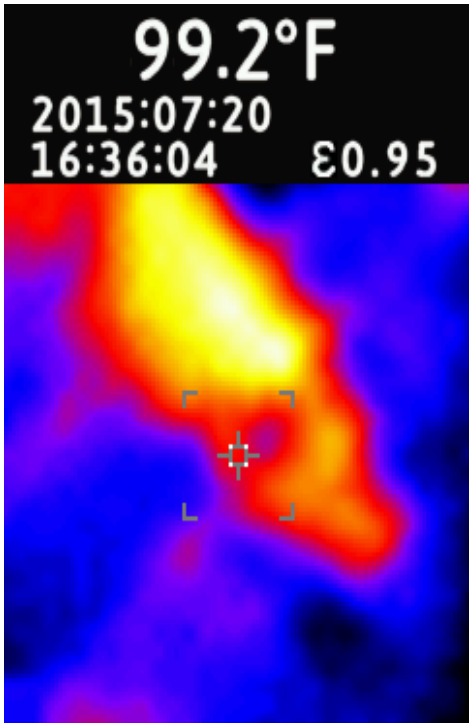
Upham Woods Outdoor Learning Center

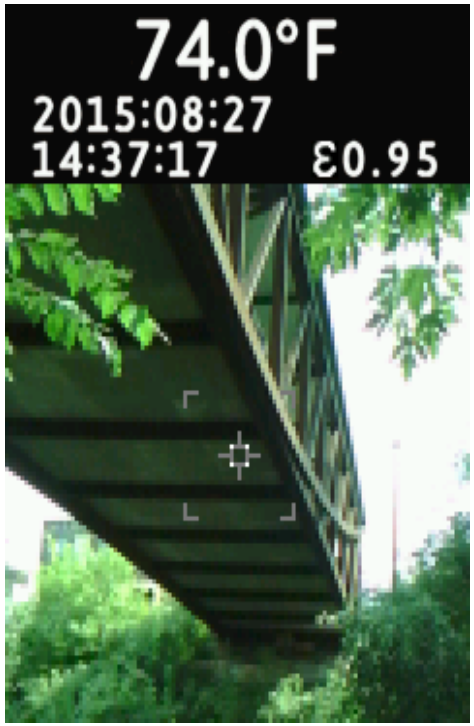
UW Extension University of Wisconsin-Extension

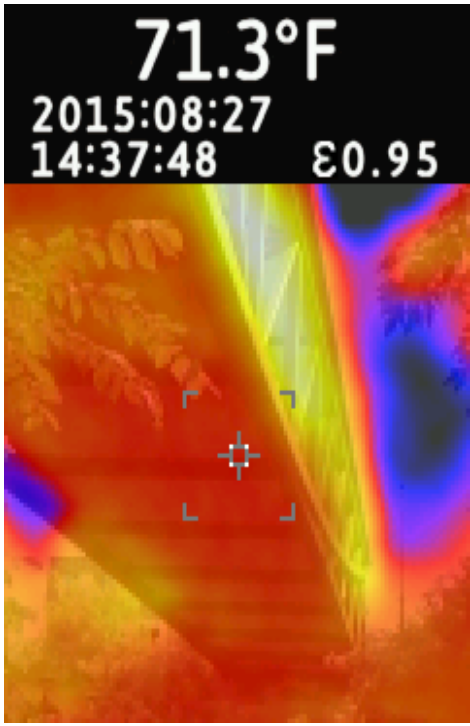
DOTS Digital Observation Technology Skills

Thermal Imager









Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Microbiologist

- Finds and photographs interesting microscopic patterns
- Shares findings with team members through Wi-Fi connection to iPad

Microbiologist

Tool: Aven Mighty Scope and iPad.

Purpose: A handheld microscope that uses the tablet as a screen for the whole team to see at the same time.

Task: At each waypoint, find a living object that you have not seen at other waypoints and capture a unique adaptation that helps it survive in this microclimate.

How-to:

1. Turn on the microscope by sliding the switch to the 'on' position.
2. Turn on the tablet in your team's bin.
3. Scroll to the 'Administrator' app and open it.
4. Open settings and click on the Wi-Fi.
5. When it appears, select the Wi-Fi named microscope and a number.
6. If prompted for a password, enter 'upharmwoods'.
7. Go back to the main screen of the tablet.
8. Open the app on the tablet named Wi-Viewer.
9. Press the 'On' button on the lower left of the iPad.
10. Point the microscope toward an object and the image will appear on the tablet.
11. If the image is blurry, adjust the magnification by turning the yellow dial on the front of the microscope.
12. If it is too dark, adjust the light by turning the dial on the handle of the microscope.
13. To take a picture, either press the camera button on the front of the microscope or on the iPad.
14. When done, turn off the microscope and tablet.

Helpful Hints:

- You can freeze an image to study it more carefully by pressing the "freeze" button on the iPad.
- You can record videos on the iPad as well.

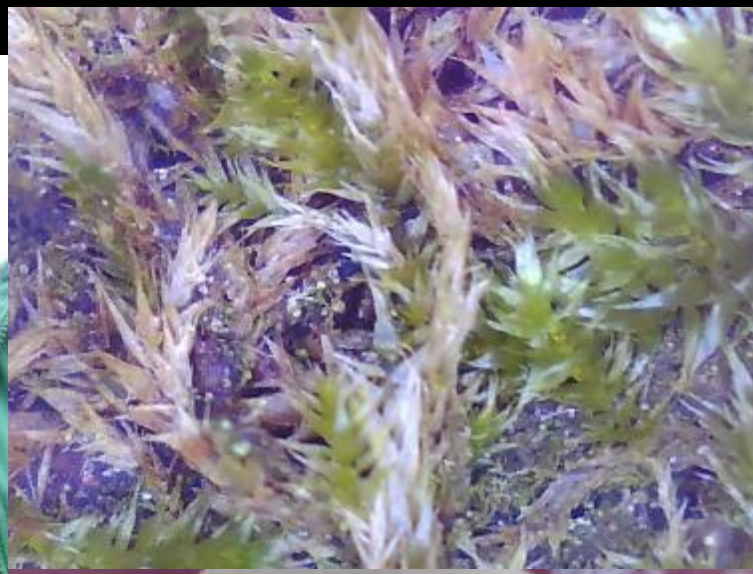
Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Microbiologist

Microbiologist



Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Research Results

Assessment Questions	Pre	Post	Difference	p value
I know about different types of technologies*	3.81	4.15	0.34	<0.001
I like to be outside	4.39	4.48	0.09	0.236
I like to use technology*	4.25	4.46	0.21	0.017
I know how to use different technologies*	3.76	4.11	0.35	<0.001
I like to use technology outside*	3.40	3.99	0.59	<0.001
I can use technology to learn	4.33	4.44	0.11	0.12
I care about nature	4.57	4.52	-0.04	0.53
I use technology at home	4.38	4.51	0.13	0.098
I can use technology to have fun*	4.35	4.54	0.20	0.024
I like to look at birds*	3.53	3.87	0.34	<0.001
I like to look at plants*	3.57	3.97	0.40	<0.001
I want to learn more about technology	4.15	4.29	0.15	0.123

Students were asked the above questions before and after the EARPOD lesson. Answers were collected on a five-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). The average response was calculated with the total paired student responses (n=136). Differences in the average between pre and post assessment were then calculated. To test for significance, a paired t-test was calculated for each assessment question. *Assessment questions that have significantly different post assessments scores when compared to pre assessments. This means that the measured change in response is due to the EARPOD lesson and not random error.

EARPOD Conclusions and Take Home Messages

- Increase student's eagerness to use technology outside by showing them the capabilities of technology
- Improve student confidence in scientific observation skills by using technology
- Increase student awareness of technology tools available for learning
- Increase student knowledge of plant biology and science careers in an exciting way

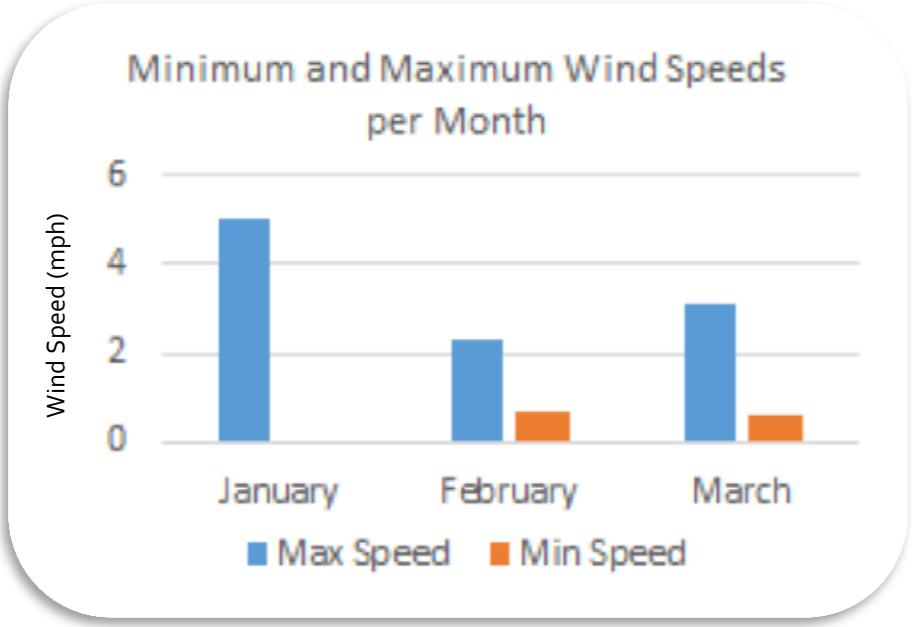
Teacher Reflections

"The students spent more quality time observing leading to more purposeful writing."

Mary Roberts 5th grade teacher, Portage Elementary

"The students were able to see and make connections from educational readings to real life situations (Aha moments)."

Amy Luebke 5th Grade Teacher, Lake Delton Elementary



"Scientific thinking allowed them to have better understanding and processing due to practical data."

Mary Roberts 5th grade teacher, Portage Elementary

"Students understood negative and positive numbers much more completely due to thermometer work." *Amy Luebke 5th Grade Teacher, Lake Delton Elementary*

Upham Woods Outdoor Learning Center

UW Extension University of Wisconsin-Extension

DOTS Digital Observation Technology Skills

Software & Mobile Apps

- Formatted for desktop, optimized for smaller computers and touchscreens, programmed for tablets & smartphones? (different programming considerations & languages)
- Need WiFi or cellular connection or not?
- Ability to store and share data?
- Designed as a learning resource?
- Enhance or distract from the outdoor education experience?

STROUD WATER RESEARCH CENTER

Field Friendly Apps

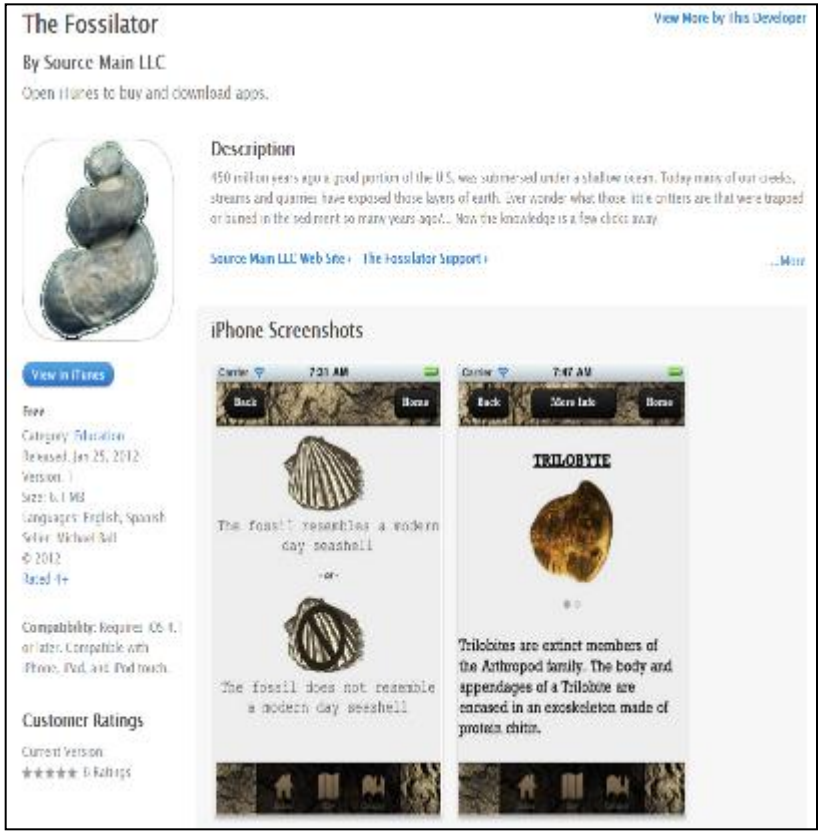
- WiFi or cellular is not needed.
- Purposely designed and chosen to enhance learning experience.
- Data gathering - pics, video, sounds, learner collected scientific data,...
- Learning tools - identification, healthy data ranges, geospatial features & maps, access to scientific data,...

Fieldfriendlyapps.org by Joy Kacoroski, *"Mobile devices and apps can be an appropriate and effective way to connect children to the natural world. Apps provide additional tools to enhance a child's learning, support efforts to appeal to different learning styles, and can create a multidisciplinary approach to learning. By using apps educators are able to provide a more in depth learning experience for a child so that they can create a greater understanding of the natural world processes."*

STROUD WATER RESEARCH CENTER

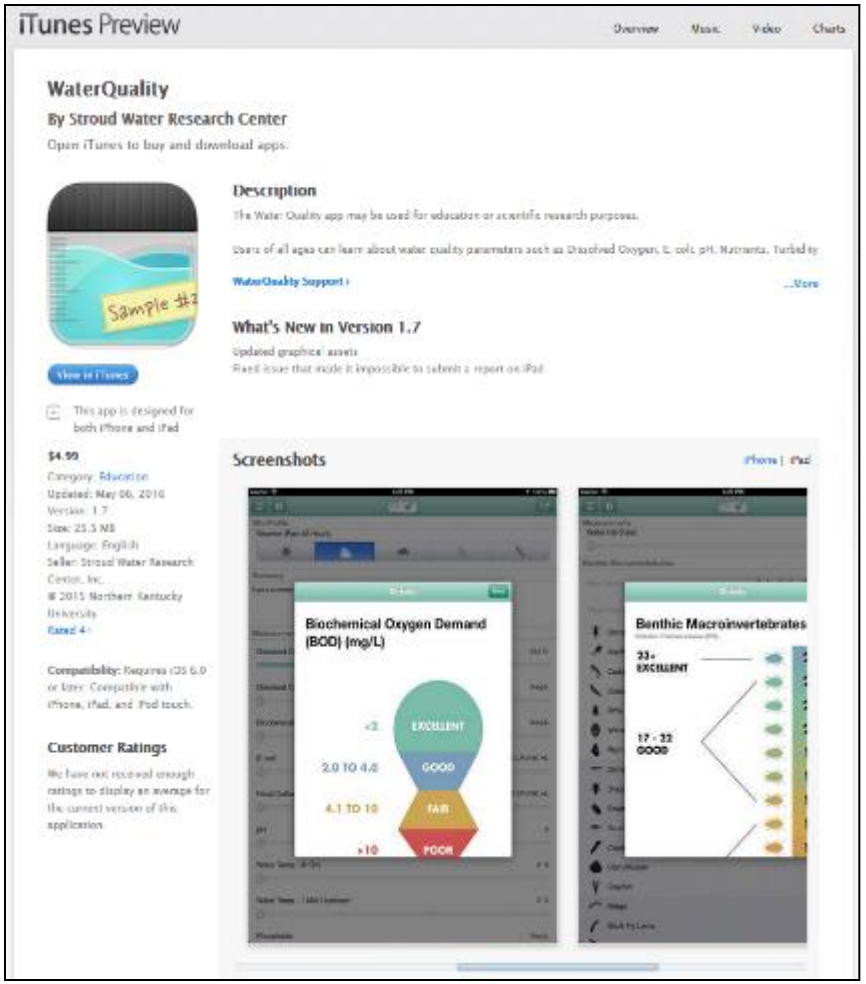
Mobile Apps

- Make your own: online templates to make simple apps (e.g. The Fossilator).
- Contract with a programmer for more complex apps (e.g. Water Quality).
- Review and select from available apps (e.g. Audubon Field Guides, Leaf Snap, StoryMe).



Water Quality mobile app

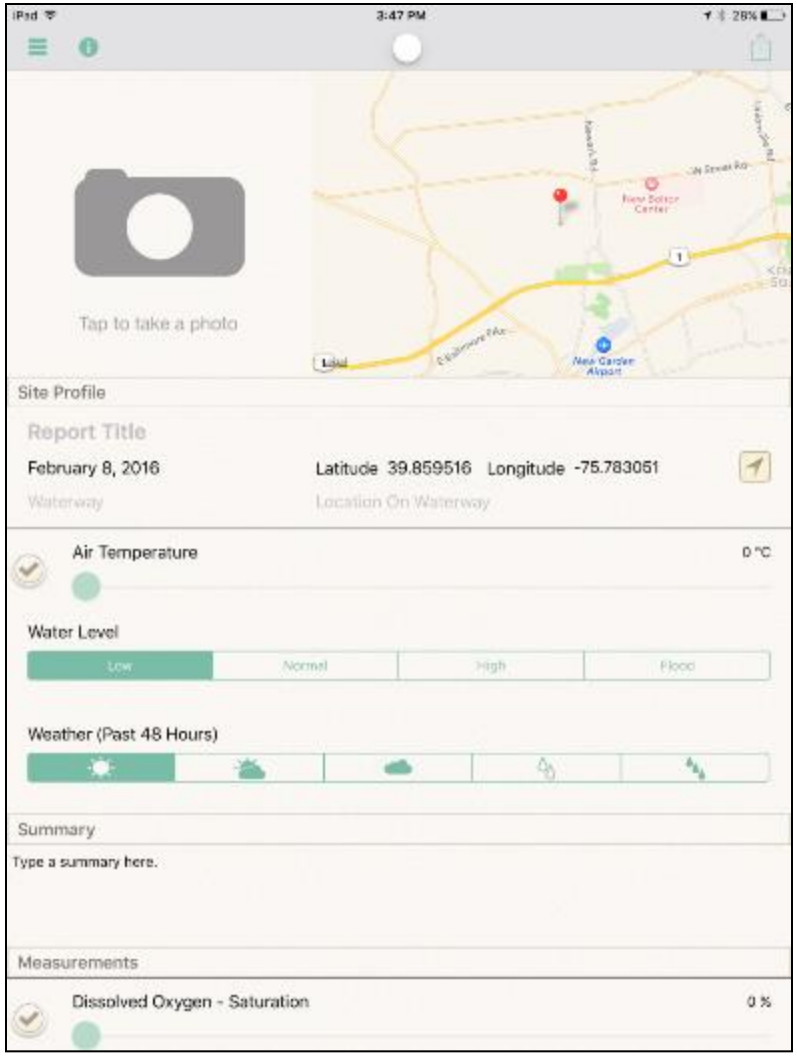
- Data collection tool and learning tool with digital field guide to basic macroinvertebrates, calculate macro PTI, chemical and physical stream data, site profile information, learning pop-ups, and export data.
- Available on Apple and Android tablets and smartphones.



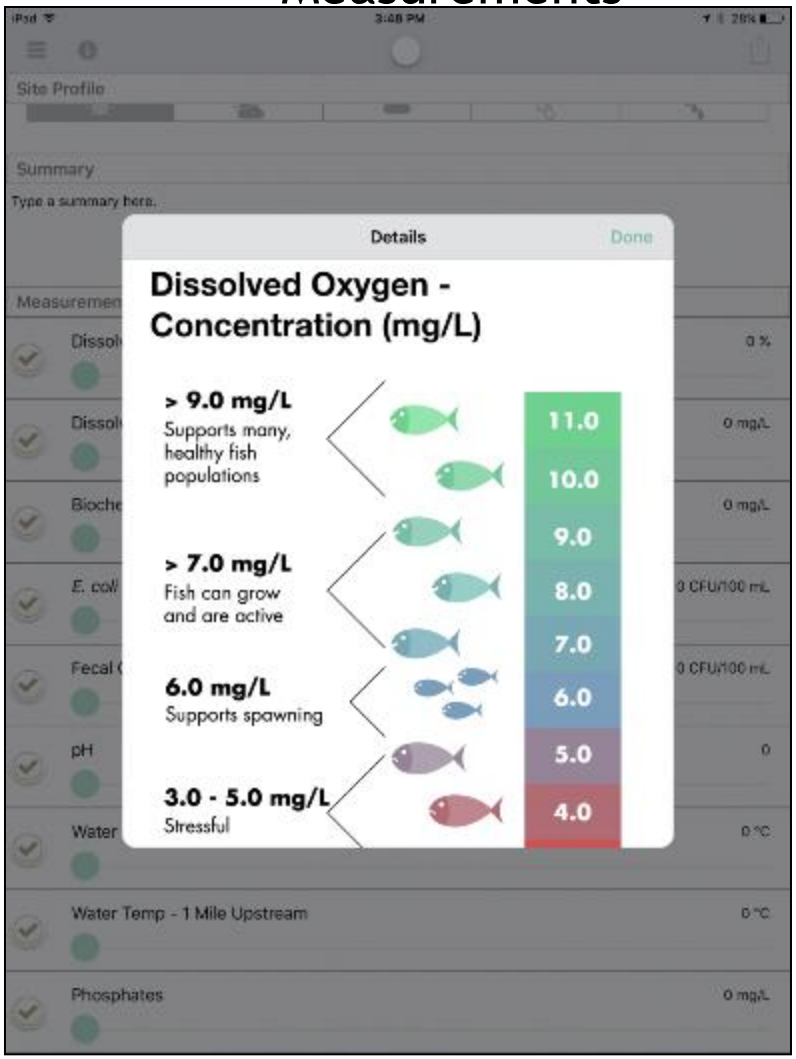
STROUD WATER RESEARCH CENTER

Water Quality mobile app

Site Profile

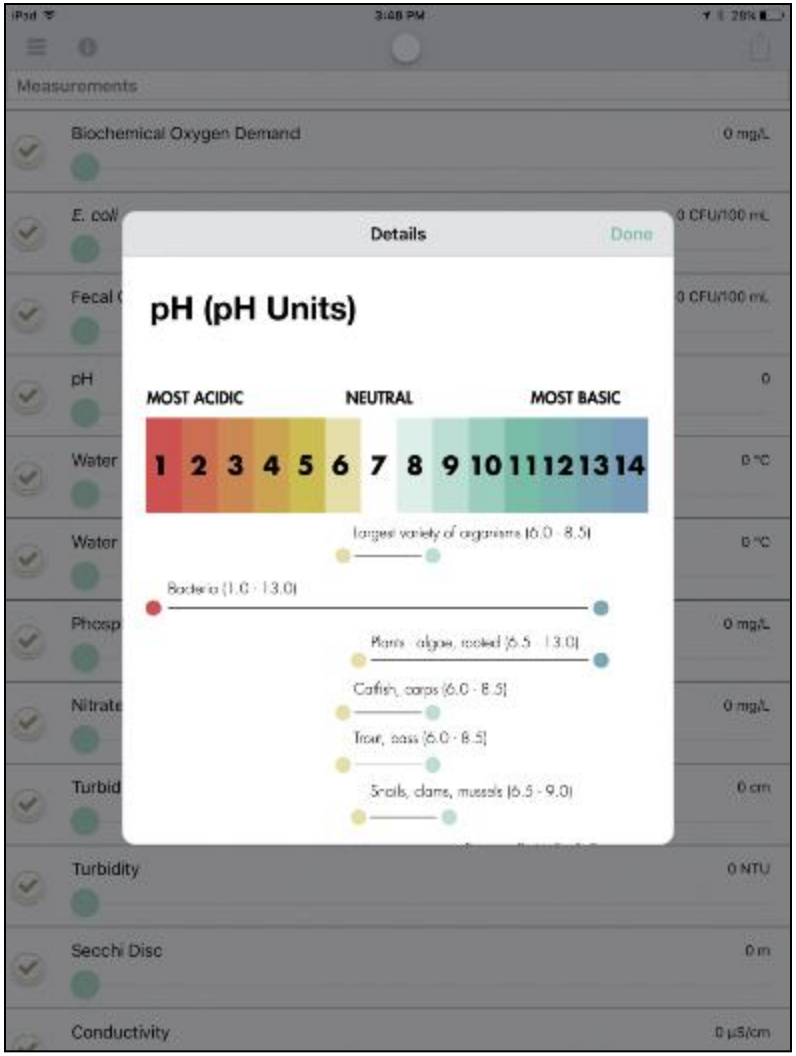


Chemical and Physical Measurements



Water Quality mobile app

Chemical and Physical Measurements



Macroinvertebrate Digital Field Guide & PTI

Citizen Science

Scientific Data

Participant Engagement

http://rabble.ca/news/2010/02/makerculture-dr-everyman

STROUD WATER RESEARCH CENTER

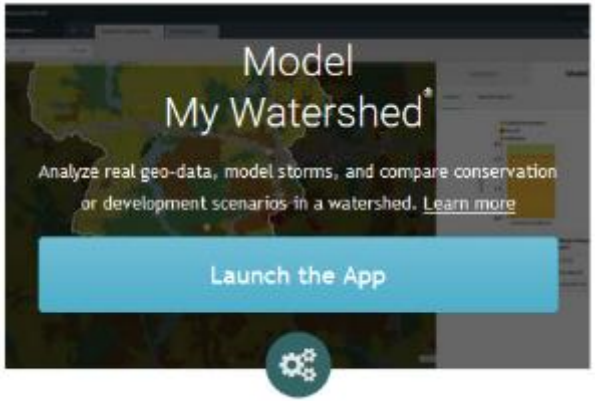
Students as Citizen Scientists

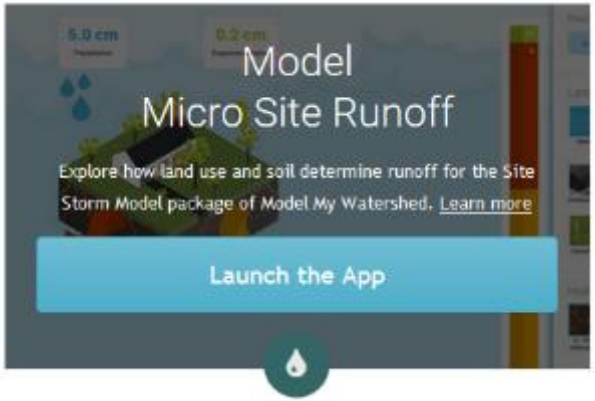
- The National Ecological Observatory Network (NEON)
- eBird
- GLOBE Program
- Digital Earth Watch Network and Picture Posts
- Kestral Watch
- Journey North
- Model My Watershed
- Leaf Pack Network
- Project Budburst
- Habitat Network
- iNaturalist
- Monarch Watch

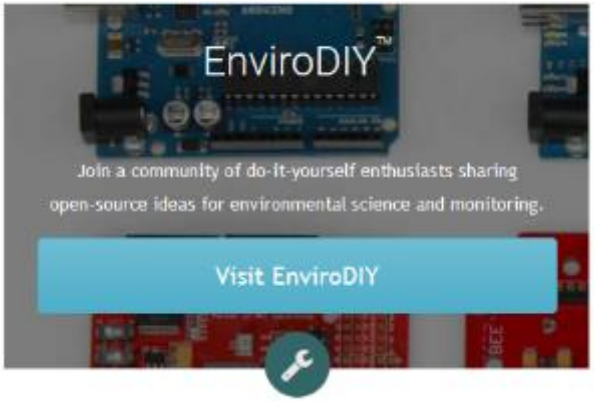
STROUD WATER RESEARCH CENTER

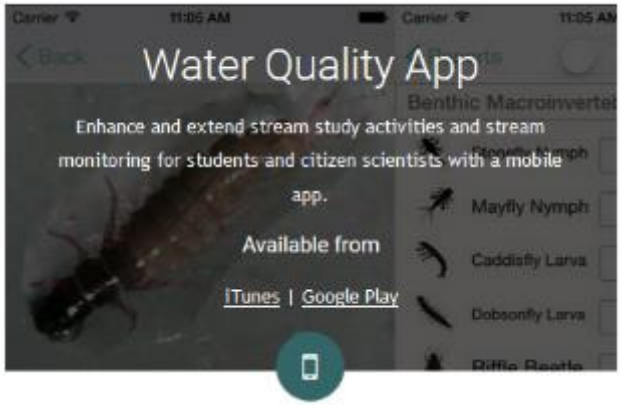
Wiki Watershed

Toolkit for citizens, conservation practitioners, municipal decision-makers, researchers, educators, & students to collaboratively advance knowledge & stewardship of fresh water.



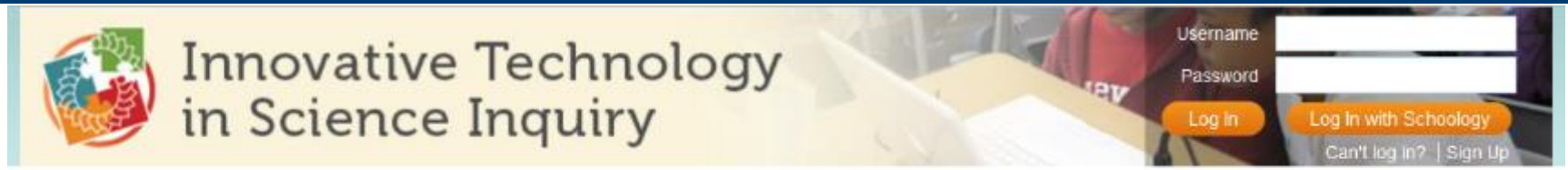






Stroud Water Research Center

Pilot Curricula: Middle School and High School



Innovative Technology in Science Inquiry

The Innovative Technology in Science Inquiry project engages students in STEM activities through the integrated use of technologies that include modeling, computational thinking, and real-time data acquisition. This comprehensive project will assist teachers in preparing diverse students for STEM careers by engaging them in exciting, inquiry-based science projects.

- Elementary 3-4 Engineering
- Elementary 3-4 Life Science
- Elementary 3-4 Physical Science
- Elementary 5-6 Earth Science
- Elementary 5-6 Life Science
- Elementary 5-6 Physical Science
- Middle School Earth Science

TES:MMW activities (2016 - 2017)

- **Part I: Exploring Watersheds (2016 - 2017)**
- **Part II: Conservation Practices in My Watershed (2016 - 2017)**
- **Part III: Tracking Water in My Schoolyard (2016 - 2017)**
- **Part IV: Managing Water (2016 - 2017)**
- **Part V: Modifying and Improving My Schoolyard (2016 - 2017)**

Watershed (MS)

- **Optional Pre-Activity: Crumpled Paper Watershed**
- **Part I: What affects your watershed? (2016 - 2017)**
- **Part II: How healthy is your watershed? (2016 - 2017)**
- **Part III: How murky is your water? (2016 - 2017)**
- **Part IV: Can you filter your water?**

https://itsi.portal.concord.org/

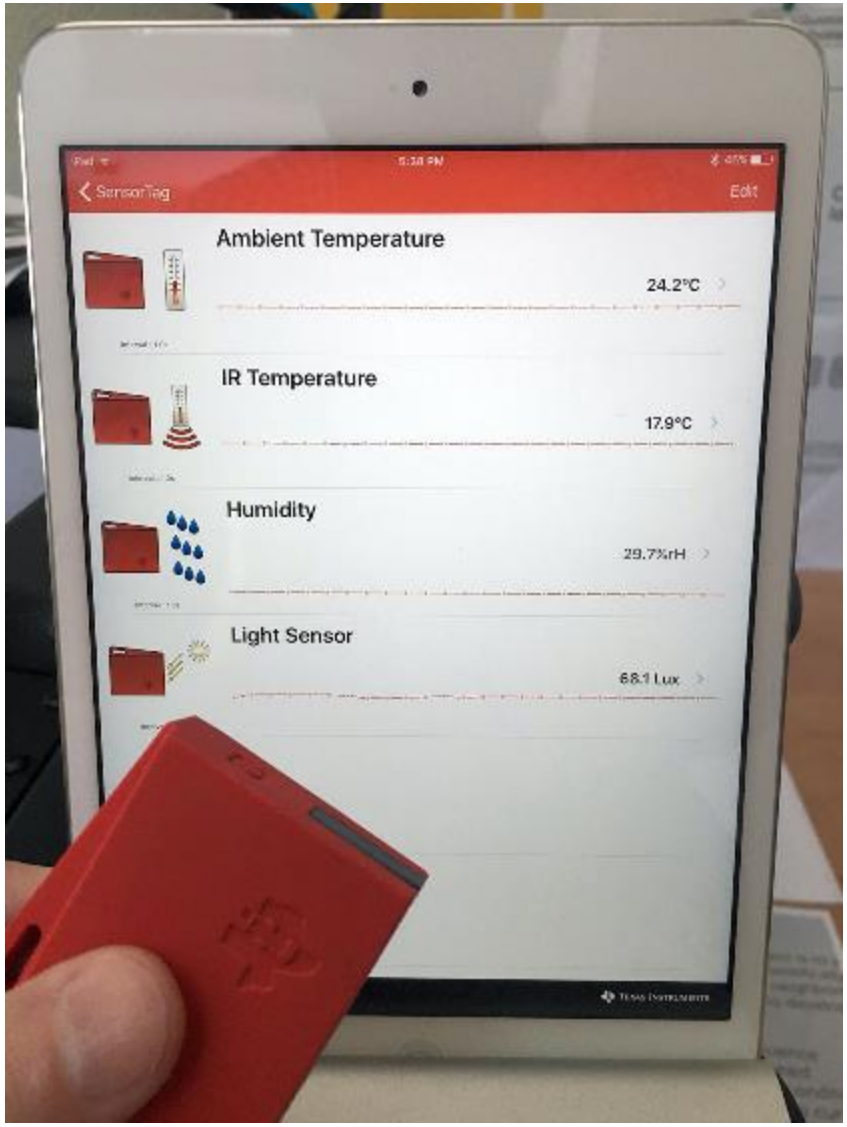
STROUD WATER RESEARCH CENTER

Simulations: Micro Site Storm Model

- Animated model results from the USDA TR-55 runoff model for 24-hour rain storm over a hypothetical small unit of land with a single land cover class and hydrologic soil group.
- Students can vary land cover type, soil type and rainfall to obtain a typical water budget that petitions evapotranspiration, runoff, and infiltration.

STROUD WATER RESEARCH CENTER

Sensors and Apps



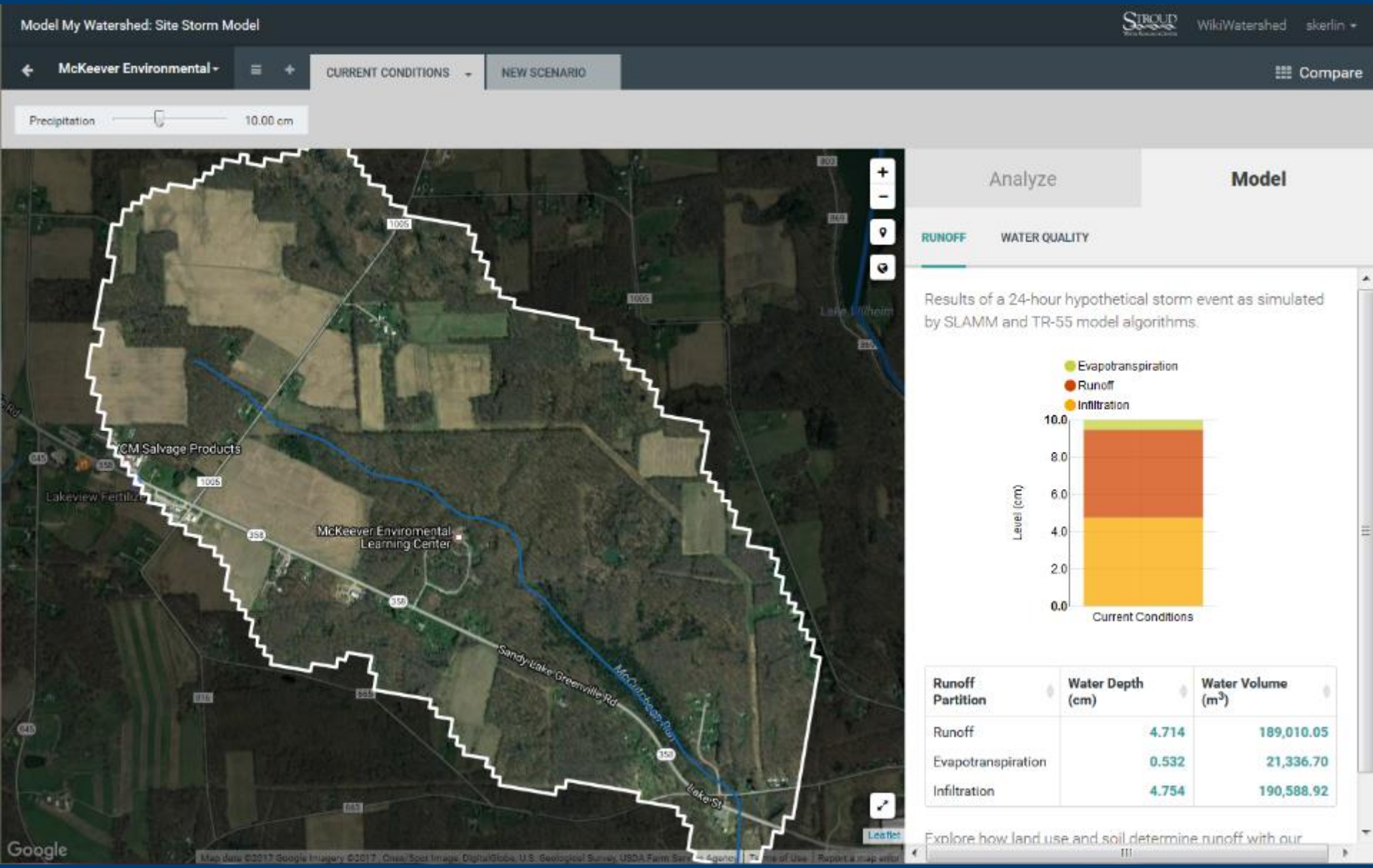
- Light, temperature, humidity data collected with low-cost Blue Tooth environmental monitoring device (TI Sensor Tag).
- Students use mobile device to view sensor data then enter it in ITSI portal where the data can be viewed, graphed, and analyzed.

STROUD WATER RESEARCH CENTER

Sensors

STROUD WATER RESEARCH CENTER

Model My Watershed

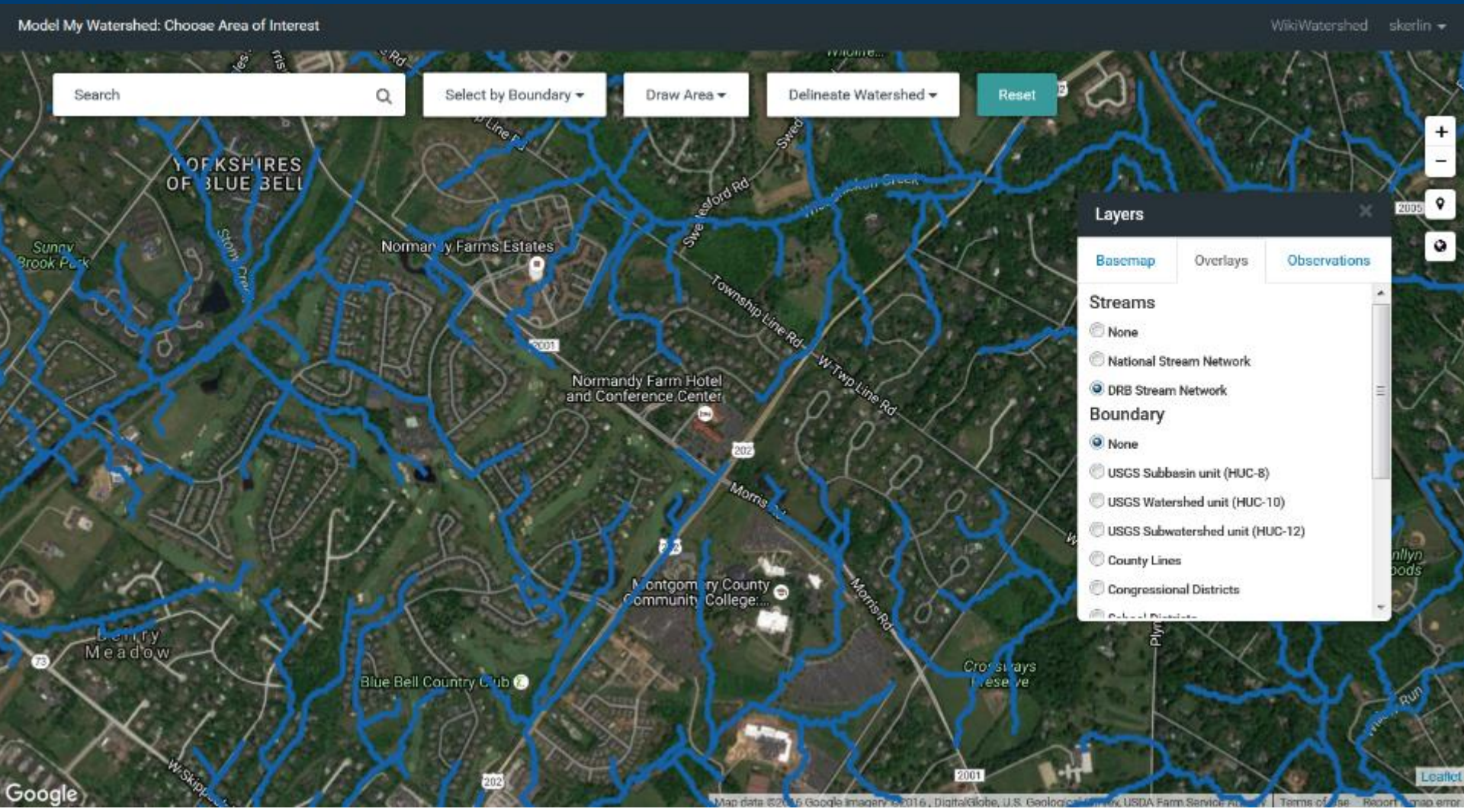


Access to Scientific Data

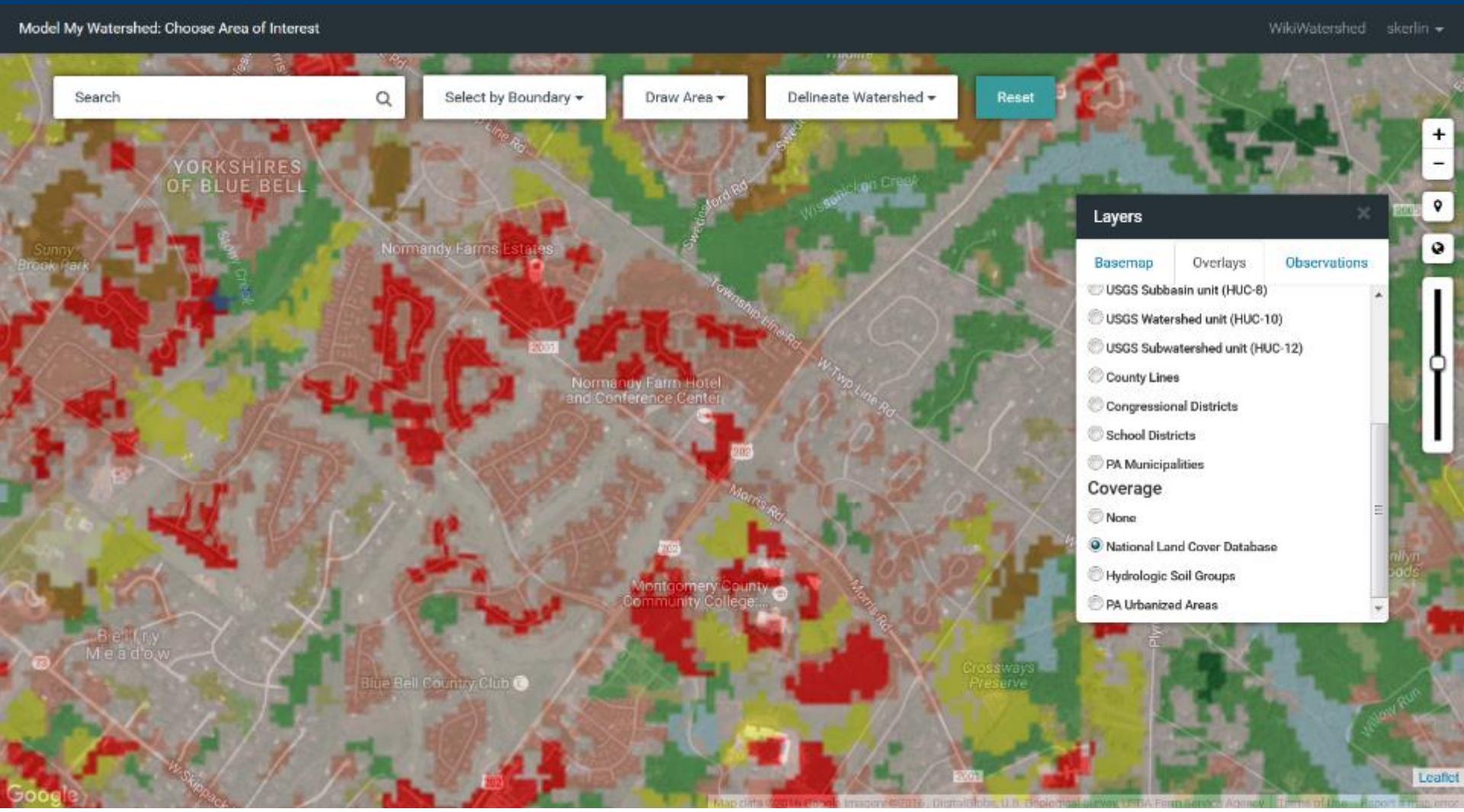
- Model My Watershed users gather & analyze data and model changes in land cover and conservation practices
  - Data: USGS NHDplusV2 Stream Network, USGS National Land Cover data layer, USDA Hydrologic Soils data layer, USEPA National Climate Data, ESRI and Google terrain maps, county animal surveys, point source discharges, Stream Reach Assessment Tool water quality data, real-time USGS River Gauge Stations.
  - Model My Watershed boundaries for analysis: USGS Subbasin Units (HUC-8, 10, & 12), counties, congressional districts, school districts, PA municipalities, free draw a polygon to study, 1 square Km, or delineate a watershed from any point.

STROUD WATER RESEARCH CENTER

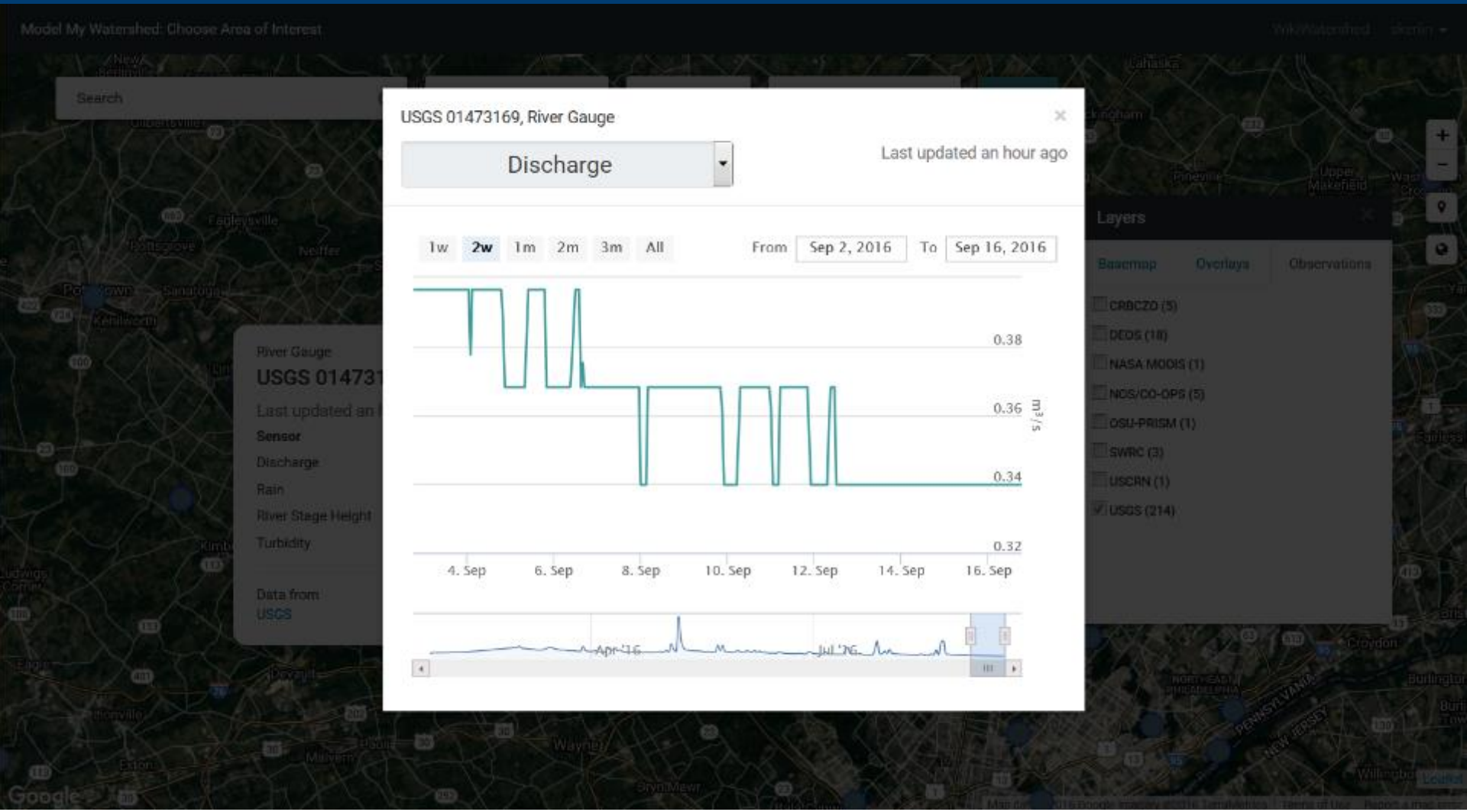
Model My Watershed: Stream Network Overlay



National Land Cover Database



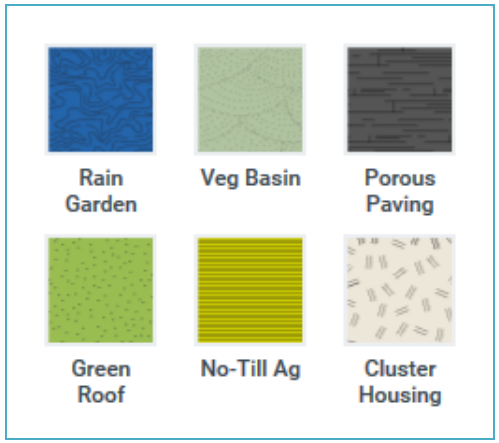
Observation Data - USGS



Modeling Using Real Scientific Data

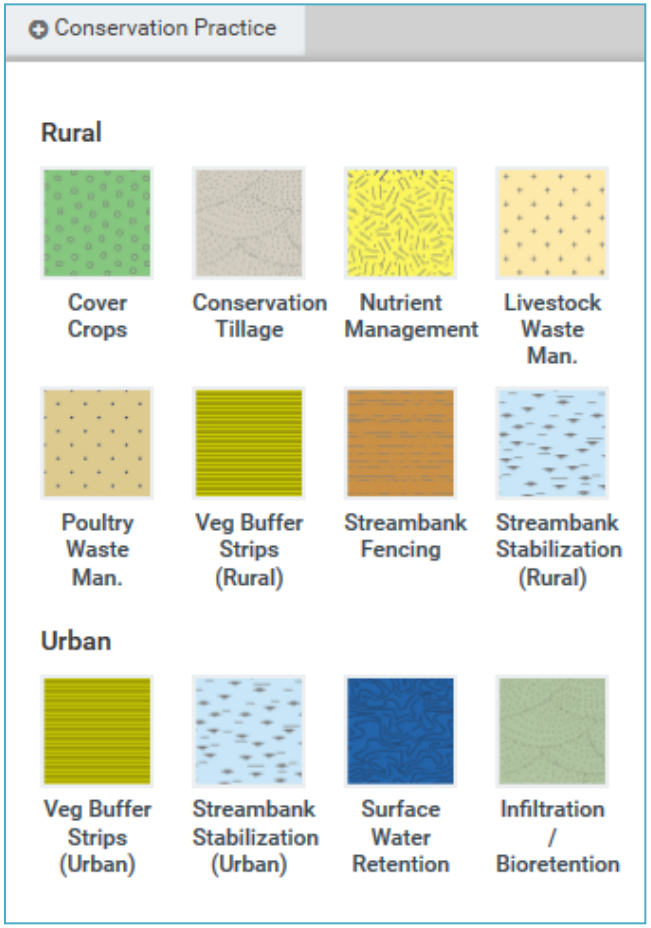
- Design & model scenarios to improve their local watershed by changing land cover (land use) and proposing conservation practices (best management practices)
  - Site Storm Model a 24 hr. storm event: hybrid of TR-55, SLAMM, FAO, & STEP-L professional models
  - Create scenarios changing land cover and conservation practices

Conservation Practices



STROUD WATER RESEARCH CENTER

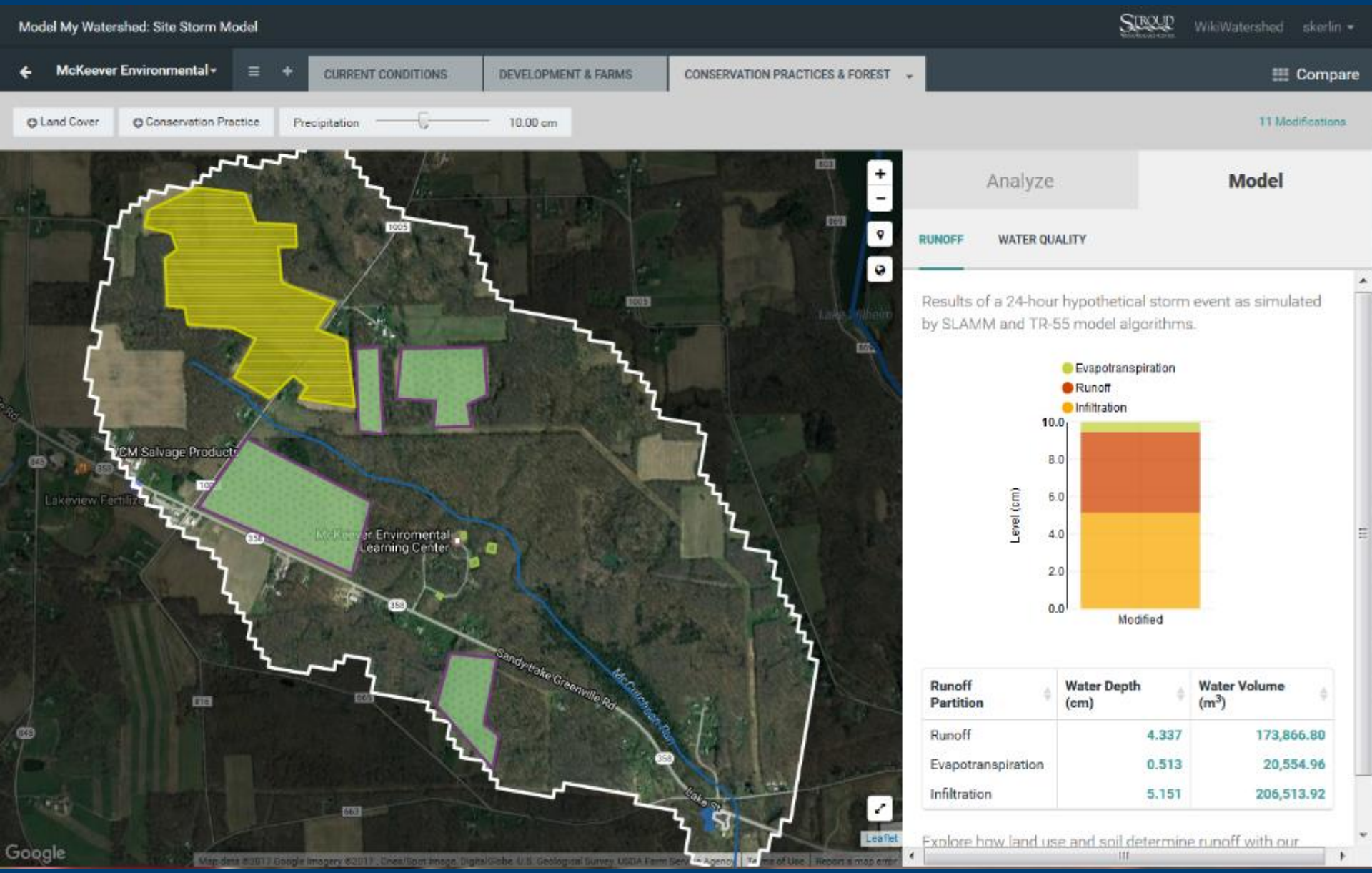
Modeling Using Real Scientific Data



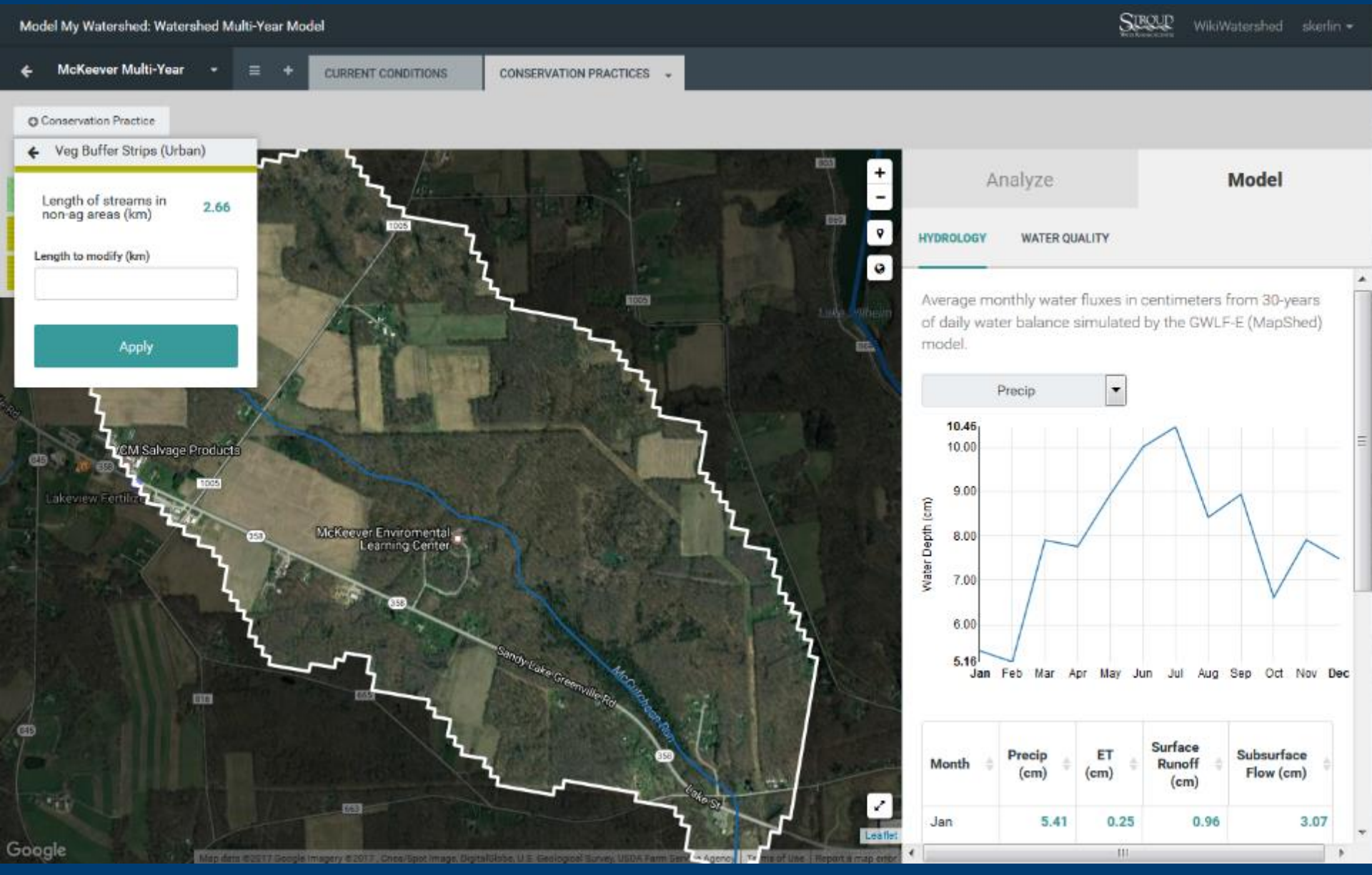
- Design & model scenarios to improve their local watershed by changing land cover (land use) and proposing conservation practices (best management practices)
  - Watershed Multi-Year Model using Mapshed, customized version of GWLF-E watershed simulation
  - Create scenarios of proposed conservation practices

STROUD WATER RESEARCH CENTER

MMW: Land Cover Changes (+)



MMW: Multi-year Model - Hydrology



Take Home Ideas

- Carefully review and select technologies and apps to enhance outdoor education.
- Treat technology as any other educational resources.
- Students as citizen scientists using technology for access to data, sharing their data, and making sense of data.
- Use tech to engage 21st Century Learners.
- Use tech to extend learning beyond the classroom to outdoor learning and out of school learning.

STROUD
WATER RESEARCH CENTER

2017 NAAEE Strand: Applying Research to Increase our Impact

2017 NAAEE, October 17-21, San Juan, Puerto Rico

- *Cutting-edge research that is important and relevant to all environmental educators*
- *Linking research and practice: applying what we know to what we do*
- *Strategies for evaluating and improving environmental education programs*
- *Using research results to influence decision makers and demonstrate the value of EE*
- *Developing shared outcomes that allow us to better measure our collective impact*
- *Research and case studies about the benefits and challenges of learning and teaching in outdoor settings and in a culturally relevant context.*

This strand has always- and continues to- interrogate the question - What is the role that research plays in our practice as Environmental Educators? For 2017, we invite practitioners and researchers to submit proposals that advance meaningful discourse around science and the environment. To this end, we are seeking submissions that address how our field uses research findings to not just build our programs, but engage stakeholders, communities and citizens across the political spectrum.

We are also seeking proposals that include examples of programs that have undergone robust evaluation and/or empirical research studies that can promote best practices for practitioners as well as advance the community of scholarship contributing to the research-based tradition of our field. Proposals should advance the entire field of environmental education, not simply promote an individual successful program.

Go to https://naaee.org/conference to submit your proposal and volunteer to be a reviewer by April 10.

STROUD
WATER RESEARCH CENTER

Thank you!

Justin Hougham, Ph.D.
Assistant Professor & Director of Upham Woods Outdoor Learning Center
University of Wisconsin - Extension
justin.hougham@ces.uwex.edu

Steve Kerlin, Ph.D.
Director of Education
Stroud Water Research Center
skerlin@stroudcenter.org
stroudcenter.org
wikiwatershed.org

Go to https://naaee.org/conference to submit your EE research to practice presentation proposal and volunteer to be a reviewer.