

KBS K-12 Partnership 2017 Summer Institute – **WEDNESDAY**, August 9**From Ecosystems to Classrooms: Teaching Global Change**8:00am **Breakfast, Introductions, Announcements** **Auditorium**8:30am **Plenary Speaker: Rachael Pierce**, Migratory Bird Biologist, U.S. Fish & Wildlife Service  
*Avian conservation: creating a world where birds and people thrive* **Auditorium**10:00am **Wednesday – Concurrent Session 1**

A. <b>Engaging Students in Building Computational Models Using an Online Modeling Tool – PART 1</b> (Middle & High School); Organizers: Li Ke & Tom Bielek, CREATE for STEM Institute, MSU; Dan Damelin, The Concord Consortium	<b>Stack Bldg Room 237</b>
B. <b>Slug Snacking Selection</b> (Middle & High School) Organizer: Shaun Davis, 2017 KBS RET & Teacher, Thornapple Kellogg MS	<b>Stack Bldg Room 138</b>
C. <b>Agricultural Education for Elementary: KBS LTER Agriculture &amp; Ecology Trail &amp; NGSS</b> (Elem. School); Organizer: Janelle Holland, 2017 KBS RET & 2 <sup>nd</sup> Grade Teacher, Kellogg Elementary-Gull Lake Community Schools	<b>Stack Bldg Room 139</b>

11:00am **Break**11:15am **Wednesday – Concurrent Session 2**

A. <b>Engaging Students in Building Computational Models Using an Online Modeling Tool – PART 2</b> (Middle & High School); Organizers: Li Ke & Tom Bielek, CREATE for STEM Institute, MSU; Dan Damelin, The Concord Consortium	<b>Stack Bldg Room 237</b>
B. <b>Teaching Climate Change: Using Open Top Chambers in Outdoor Classrooms</b> (Middle & High School) Organizers: Mark Hammond, Ecological Research Technician & Emily Gauci, Research Assistant, KBS	<b>Stack Bldg Room 140</b>
C. <b>Soil Stories: Using Rainfall Simulators in the Classroom</b> (Elem. & Middle School) Organizer: Ruth Pearson, GRAND Learning Network, MSU	<b>Stack Bldg Room 141</b>

12:15pm **Lunch** **McCrary Dining Hall**1:15pm **Wednesday – Concurrent Session 3**

A. <b>Engineering for Elementary Teachers – Part 1</b> (Elem. School) Organizer: Sara Syswerda, Education Director, Pierce Cedar Creek Institute	<b>Terrace Room</b>
B. <b>Human Impact on Biodiversity: Stream Leaf Pack Studies – Part 1</b> (Middle & High School); Organizer: Liz Ratashak, Teacher, Vicksburg HS	<b>Stack Bldg Room 138</b>
C. <b>Dunkadoo: a Tool for Education and Science</b> (All levels) Organizers: Carol Goodman & Russell Conard, co-founders, Dunkadoo	<b>Stack Bldg Room 141</b>

2:15pm **Break**

KBS K-12 Partnership 2017 Summer Institute – **WEDNESDAY**, August 9**From Ecosystems to Classrooms: Teaching Global Change**

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2:30pm **Wednesday – Concurrent Session 4**

A. <b>Engineering for Elementary Teachers – Part 2</b> (Elem. School) Organizers: Sara Syswerda, Education Director, Pierce Cedar Creek Institute	<b>Terrace Room</b>
B. <b>Human Impact on Biodiversity: Stream Leaf Pack Studies – Part 2</b> (Middle & High School); Organizer: Liz Ratashak, Teacher, Vicksburg HS	<b>Stack Bldg Room 138</b>
C. <b>Keeping Up with the Invasives: How Native and Invasive Plants Compete</b> (Middle & High School); Organizer: Ava Garrison, PhD Student, MSU-KBS	<b>Stack Bldg Room 139</b>

3:30pm **Connecting Sessions to NGSS Crosscutting Concepts Stability & Change** **Auditorium**

Organizers: Kara Haas, KBS Science Education & Outreach Coordinator;  
Emma Hollowell, KBS Science Education Intern, MSU

4:00pm **Evaluation & Adjourn** **Auditorium**

**Your feedback helps us improve our programming for you. Please take a moment to complete this online evaluation form.**

Link to today's online evaluation form: <http://bit.ly/2uDslzt>

KBS K-12 Partnership 2017 Summer Institute – **THURSDAY**, August 10**From Ecosystems to Classrooms: Teaching Global Change**8:00am **Breakfast, Introductions, Announcements** **Auditorium**8:30am **Plenary Speaker: Dr. Adina Howe**, Asst. Prof., Iowa State University **Auditorium**  
*The new era of microbiology and what we're learning about agricultural environments*10:00am **Thursday – Concurrent Session 5**

A. <b>Biomimicry: Learning from Nature's Engineering Marvels</b> (Middle & High School) Organizer: Gretchen Hooker, Education Resources Manager, Biomimicry Institute	<b>Terrace Room</b>
B. <b>Teaching Microbiology without a Lab</b> (Middle & High School) Organizer: Heather Kittredge, KBS Science Fellow	<b>Stack Bldg Room 138</b>
C. <b>Open Source Data Collection</b> (All Grade Levels) Organizer: Matt Hawkins, 2017 KBS RET, Gull Lake Community Schools	<b>Stack Bldg Room 139</b>

11:00am **Break**11:15am **Thursday – Concurrent Session 6**

A. <b>Biomimicry: Learning from Nature</b> (Middle & High School) Organizer: Gretchen Hooker, Education Resources Manager, Biomimicry Institute	<b>Terrace Room</b>
B. <b>Conquering iNaturalist &amp; Improving Best Practices in Outdoor Education</b> (Elem. School); Organizer: Emma Hollowell, KBS Science Education Intern, MSU	<b>Stack Bldg Room 140</b>
C. <b>P Soup: Agriculture's Unintended Influence on Aquatic Ecosystems</b> (Middle & High School); Organizer: Matt Trentman, PhD Candidate, University of Notre Dame	<b>Stack Bldg Room 141</b>

12:15pm **Lunch** **McCrary Dining Hall**1:15pm **Thursday – Concurrent Session 7**

A. <b>Hopefully Teaching About Climate Change</b> (Middle & High School) Organizer: Jennifer Metz Brenneman, Experiential Ed. Dir., Kalamazoo Nature Center	<b>Terrace Room</b>
B. <b>CSI Streams: Identifying Hidden Species in Aquatic Systems using eDNA fingerprints</b> (Middle & High School); Organizer: Ariel Shogren, PhD Candidate, University of Notre Dame	<b>Stack Bldg Room 138</b>
C. <b>Birding as a Learning Tool</b> (Elem. & Middle School) Organizer: Mary Grintals, Teacher, Northeast MS	<b>Stack Bldg Room 139</b>

2:15pm **Break**

KBS K-12 Partnership 2017 Summer Institute – **THURSDAY**, August 10

## **From Ecosystems to Classrooms: Teaching Global Change**

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2:30pm    **Lightning Lesson Plans**    **Auditorium**

Teachers will share creative lesson plans in 10-minute ‘lightning’ presentations. There will be time for questions and brief discussion of each lesson shared.

3:30pm    **Connecting Sessions to NGSS Crosscutting Concepts**    **Auditorium**

### **Energy & Matter: Flows, Cycles, and Conservation**

Organizers: Kara Haas, KBS Science Education & Outreach Coordinator;  
Emma Hollowell, KBS Science Education Intern, MSU

4:00pm    **Evaluation & Adjourn**    **Auditorium**

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Link to today’s online evaluation form: <http://bit.ly/2umAw84>

KBS K-12 Partnership 2017 Summer Institute – **FRIDAY**, August 11**From Ecosystems to Classrooms: Teaching Global Change**

8:00am	<b>Breakfast, Introductions, Announcements</b>	<b>Auditorium</b>
8:00am	(Info Booth) <b>RIPPLE: Reduce Invasive Pet and PLant Escapes</b>	<b>Auditorium</b>
8:30am	<b>Plenary Speaker: Dr. Jo Latimore</b> , Outreach Specialist, MSU <i>Protecting Michigan Lakes and Rivers from Invasive Species</i>	<b>Auditorium</b>
9:50am	<b>Load vans to travel to Kellogg Bird Sanctuary</b>	<b>Upper Parking Lot</b>
10:00am	<b>Inquiry-Based Field Investigations</b> Organizers: Misty Klotz, KBS Community Outreach Assistant and the KBS Outreach Team	<b>Bird Sanctuary</b>
11:00am	<b>Break</b>	
11:15am	<b>Inquiry-Based Field Investigations</b> Organizers: Misty Klotz, KBS Community Outreach Assistant and the KBS Outreach Team	<b>Bird Sanctuary</b>
12:15pm	<b>Load vans to travel to McCrary Dining Hall</b>	<b>Bird Sanctuary Parking Lot</b>
12:30pm	<b>Lunch</b>	<b>McCrary Dining Hall</b>
1:25pm	<b>Load vans to travel to MSU's private Lux Arbor Reserve</b>	<b>Upper Parking Lot</b>
1:45pm	<b>Field Tour and Research Overviews &amp; Highlights</b>	<b>Lux Arbor Reserve</b>

Brook Wilke, Lux Arbor Preserve Manager, *Introduction to Lux Arbor Reserve*  
 Daniela Herrera, KBS Research Technician, *The Rhizosphere Microbiome & Plant Productivity*  
 Sara DePew-Bäby, Avian Caretaker, *Ospreys in Michigan*  
 Dustin Kincaid, KBS Science Fellow, *Monitoring Changing Water Levels in Lux Arbor Reserve*  
 Laura Twardochleb, MSU PhD Student, *Predator-Prey Experiments in Natural Ponds*

3:15pm	<b>Return to KBS</b>	
3:30pm	<b>Connecting Sessions to NGSS Crosscutting Concepts Patterns</b> Organizers: Kara Haas, KBS Science Education & Outreach Coordinator; Emma Hollowell, KBS Science Education Intern, MSU	<b>Auditorium</b>
4:00pm	<b>Evaluation &amp; Adjourn</b>	<b>Auditorium</b>

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Link to today's online evaluation form: <http://bit.ly/2wFad9V>

## Session Descriptions – Wednesday

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### **Agricultural Education for Elementary:**

Elem. School

#### **KBS LTER Agriculture & Ecology Trail & NGSS**

*Organizer: Janelle Holland, 2017 KBS RET & Teacher, Kellogg Elementary-Gull Lake Community Schools*

On the Agriculture and Ecology Trail at the Bird Sanctuary students learn about some of the important research being done by KBS scientists. Students discover agriculture and the science behind a bowl of cereal. Come find out about how this interactive field trip can not only entertain and educate your students but also cover your NGSS standards!

### **Dunkadoo: a Tool for Education and Science**

All Grade Levels

*Organizers: Carol Goodman & Russell Conard, co-founders, Dunkadoo*

Dunkadoo is an online service that provides tools and data for experiential learning. Many first discover Dunkadoo through its website where biologists share their research with the public through interactive graphs and real-time data. Now the service that powers professional biologists around the world is available for use in your classroom. Whether you are interested in exploring live data on bird migration happening right here in Michigan or using the Dunkadoo apps and website to conduct your own projects, there's something for every teacher to help get students excited about research, data, and the environment. Dunkadoo can be adapted to any biological field data, and it can turn those cell phones and tablets into scientific tools! The presentation will provide a quick tour of Dunkadoo, offer ideas to bring the fall bird migration into your classroom, and offer a hands-on experience for participants.

### **Engaging Students in Building Computational Models Using an Online Modeling Tool**

Middle &amp; High School

*Organizers: Li Ke & Tom Bielek, CREATE for STEM Institute, MSU; Dan Damelin, The Concord Consortium*

This is a two-part session. Modeling is a core practice emphasized in the NGSS. We have developed a computer-based tool for supporting secondary school students in constructing and revising models and learning dynamic systems thinking. In this workshop we will present the tool and experience building, testing and revising models to explain phenomena.

### **Engineering for Elementary Teachers**

Elem. School

*Organizers: Sara Syswerda, Education Director, Pierce Cedar Creek Institute*

This is a two-part session. Elementary teachers will be learning about how engineering fits into the new Michigan Science Standards and get engineering ideas for each grade level unit. We will walk through an example of an engineering project to do with early elementary and upper elementary students. Teachers will then work through the engineering design process in small groups to build their own retirement islands to test in Gull Lake.

**Human Impact on Biodiversity: Stream Leaf Pack Studies**

Middle &amp; High School

*Organizer: Liz Ratashak, Teacher, Vicksburg HS*

This is a two-part session. I'm sharing with you the most recent iteration of Vicksburg HS stream studies. Together we'll do the investigation "the effect of human impact on biodiversity" lessons and share our experiences with student understanding of the core ideas and scientific practices involved in this fun, place based study.

**Keeping Up with the Invasives: How Native and Invasive Plants Compete**

Middle &amp; High School

*Organizer: Ava Garrison, PhD Student, MSU-KBS*

This lesson plan uses the example of invasive and native plants to teach students about natural selection and competition. The lesson begins with a short introductory lecture about invasive species and the topics mentioned before. After the lecture, students will work in groups to simulate a community of native and invasive plants by playing a short game. There is the option for students to play the game multiple times and plot their results in order to give the students an opportunity to create simple graphs, either by hand or in Excel. Class data can also be combined to add complexity to the exercise.

**Soil Stories: Using Rainfall Simulators in the Classroom**

Elem. &amp; Middle School

*Organizer: Ruth Pearson, GRAND Learning Network, MSU*

We will explore a couple of scenarios and information that I have used to teach about soil. To demonstrate the action of rain on various soil samples we will use a rain simulator appropriate for classroom use.

**Slug Snacking Selection**

Middle &amp; High School

*Organizer: Shaun Davis, 2017 KBS RET & Teacher, Thornapple Kellogg MS*

Most of my time here at KBS this summer was spent working on an investigation that looked at the feeding habits of slugs. Specifically, do they choose plants that are greener? During this session, I'll first summarize the experiment and the preliminary results. Then I'll review my plan to bring this same type of research (not using slugs) into my classroom.

**Session Descriptions - Thursday****Biomimicry: Learning from Nature's Engineering Marvels**

Middle &amp; High School

*Organizer: Gretchen Hooker, Education Resources Manager, Biomimicry Institute*

Biomimicry is an approach to sustainable innovation based on emulating strategies and patterns exhibited in nature. In education, biomimicry offers an exciting context for blending STEM and environmental literacy into inspiring lessons about the future of design. In this session, participants will be introduced to biomimicry and some hands-on activities that can be used for teaching students about what we can learn not just ABOUT, but FROM nature.

**Birding as a Learning Tool**

Elem. &amp; Middle School

*Organizer: Mary Grintals, Teacher, Northeast MS*

Backyard or Schoolyard birding is interesting for students (and teachers)! Setting up a few feeders can create a phenomena that can be used all year long. During this session you will learn to identify common Michigan 'feeder birds', gain knowledge of web-based resources for identification and citizen science programs. As a group you will brainstorm interdisciplinary uses for the data and experience gathered through student feeder observations. You can even walk away with a mini-grant to submit to Kalamazoo Audubon for classroom materials!

**Conquering iNaturalist & Improving Best Practices in Outdoor Education**

Elem. School

*Organizer: Emma Hollowell, KBS Science Education Intern, MSU*

Using technology in the classroom can be tricky, let alone using it with outdoor education! During this session, we will learn how to use iNaturalist as a teaching tool outside and how to use the results in the classroom. We will also cover some best practices for teaching outdoor education in a classroom setting.

**CSI Streams: Identifying Hidden Species in Aquatic Systems using eDNA fingerprints**

Middle &amp; High School

*Organizer: Ariel Shogren, PhD Candidate, University of Notre Dame*

Environmental DNA, or eDNA, is an emerging ecological technique that lets scientists identify aquatic animals from the minute bits of tissue they leave behind, leaving a unique genetic fingerprint from scales, mucus, excrement, or even single cells. Instead of spending time and money hauling nets through a lake or river, trying to capture an organism, researchers can rely on the natural diffusion of DNA in the water to disperse the signal of the organism throughout a water body. The technique is useful for identifying aquatic species that are invasive, endangered, of monitoring interest, or potentially invasive. There is evidence that eDNA identification techniques are more sensitive than traditional methods, such as netting fish or visual surveys. However, eDNA won't tell scientists exactly how many organisms are there or if they are alive or dead, only that they are present. We will use activities to simulate how researchers identify eDNA hotspots to identify A) an aquatic invader and B) an endangered species.

**Hopefully Teaching About Climate Change**

Middle &amp; High School

*Organizer: Jennifer Metz Breneman, Experiential Education Director, Kalamazoo Nature Center*

Hopefully, after this session, you will feel inspired and empowered to tackle climate change in the classroom... hopefully! Effectively communicate about climate impacts in the Great Lakes and empower students to tackle solutions. Use everyday interactions to convey the importance of climate change action using the strategic framing method. Leave the session with a quick spiel to use in your everyday life and career to clarify the "how" of climate change and inspire students, colleagues and family members to act and motivate around solutions as well as links to resources to bring climate education back to your classroom or institution. Communications will focus on hope, clarity and community-level action to reduce our fossil fuel reliance rather than the doom and gloom message presented around climate change in the past.



**Open Source Data Collection**

All Grade Levels

*Organizer: Matt Hawkins, 2017 KBS RET, Gull Lake Community Schools*

Computer Science skills are being promoted at schools through programs like Hour of Code and in makerspaces or innovation labs. These skills are being applied for research at KBS, including providing opportunities for new data collection. See how open source technology is used at KBS and how accessible it can be for students to use their coding skills for integrated science investigations. Hands-on activities will include Little Bits, Arduino, and Raspberry Pi.

**P Soup: Agriculture's Unintended Influence on Aquatic Ecosystems**

Middle &amp; High School

*Organizer: Matt Trentman, PhD Candidate, University of Notre Dame*

We will explore the consequences of too much phosphorous (P) in aquatic ecosystems—especially in relation to agriculture. This will include a hands-on lesson (using standard household supplies) on watersheds and how nutrients move from agricultural fields to downstream water bodies (Elem./Mid. School), as well as a lab based approach using simple bakers yeast to measure the quantity of P in water.

**Teaching Climate Change: Using Open Top Chambers in Outdoor Classrooms**

Middle &amp; High School

*Organizers: Mark Hammond, Ecological Research Technician & Emily Gauci, Research Assistant, KBS*

Several research labs at KBS are actively investigating how predicted changes in temperature and drought due to anticipated climate change may alter the environment. One method commonly used is Open Top Chambers (OTCs) as a way of passively warming air temperature in outdoor conditions for small areas. This session will present current research with OTCs highlighting the effects of elevated temperatures on the phenology and growth and growth of plants and insects. The session will include a few science classroom activities (with data) that have been created based on KBS research. We will also have some OTCs available to look at and would appreciate generating a discussion with interested teachers to possibly loan out the OTCs for outdoor classrooms use.

**Teaching Microbiology without a Lab**

Middle &amp; High School

*Organizer: Heather Kittredge, PhD Candidate, Michigan State University, KBS Science Fellow*

Creating a lab that allow students to learn classic microbiology techniques without a lab space or a large budget for supplies can be challenging, but this session will cover how to use cheap and easily accessible materials to collect data and answer questions about microbes living in the local environment. Students will have the opportunity to identify microorganisms and think critically about how microbial communities are impacted and being impacted by humans. This lesson plan aims to apply the traditional culturing of environmental samples to more advanced scientific questions, that will keep students engaged while learning laboratory techniques.