The goal of the BWET-STEM program is for students to understand what UHI effect is & how it impacts stream health (environment & human health)

Learning Objectives:	**BWET-STEM LESSONS**
1. Students will understand the issue of thermal heat from urban development and impervious surface on the local environment.	I3, S1, A1, W1, R1
2. Students will identify areas of a developed property with potential thermal energy increase based on land cover/surface types and suggest solutions to mitigate such temperature increases to reduce impact to the local environment.	I3, S2, S4, R2
3. Using several methodologies, students will collect temperature measurements at their schoolyard (surface, air, water), analyze the temperature data in comparisons to references, and provide interpretations of the results.	S3, A3, W3, S4, A4, W4, R1
4. Students will investigate the thermal properties of different objects.	S2
5. Using a variety of online tools, students will determine local stream classifications and ratings, as well complete assessments of schoolyard land use.	W2
6. Given temperature data from the schoolyard and reference sources, students will be able to explain temperature differences between various locations in a watershed and identify if a geolocation demonstrates characteristics of a Urban Heat Island.	S4, A4, W4

EDUCATION STANDARDS ALIGNMENT

- **NEXT GENERATION SCIENCE STANDARDS (NGSS):**
  - HS-LS2 Ecosystems: Interactions, Energy, and Dynamics
    - LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
  - HS-ESS3 Earth and Human Activity
    - ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems

  Disciplinary Core Ideas
    - ESS3.C Human Impacts on Earths Systems

- ESS3.D Global Climate Change

- HS-ETS1 Engineering Design
  -

Disciplinary Core Ideas

- ETS1.B Developing Possible Solutions

- **MARYLAND ENVIRONMENTAL LITERACY STANDARDS (MEL)**:

Standard 1 Environmental Issues:
Topic A: Environmental Issue Investigation

- Indicator 1: Identify an environmental issue.
- Indicator 2: Develop and write research questions related to an environmental issue.
- Indicator 3: Given a specific issue, communicate the issue, the stakeholders involved and the stakeholders' beliefs and values.
- Indicator 4: Design and conduct the research.
- Indicator 5: Use data and references to interpret findings to form conclusions.

Topic B. Action Component

- Indicator 1: Use recommendation(s) to develop and implement an environmental action plan.
- Indicator 2: Communicate, evaluate and justify personal views on environmental issue and alternate ways to address them.
- Indicator 3: Analyze the effectiveness of the action plan in terms of achieving the desired outcomes.
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Standard 2 Interactions Of Earth's Systems: The student will analyze and apply the properties of systems thinking and modeling to the study of Earth's systems.

Topic A: Earth Systems

- Indicator 1: The student will analyze and explain the interactions of earth's systems.

Topic B: Systems Thinking

- Indicator 1: Analyze, explain and apply the properties of systems thinking to earth systems interactions.
- Indicator 2: Use models and computer simulations to extend his/her understanding of scientific concepts.

Standard 3 Flow of Matter and Energy
Topic B: Energy Distribution through Earth Systems

- Indicator 2: Explain that transfer of thermal energy between the atmosphere and the land or oceans produces temperature and density gradients in the atmosphere and the oceans.

- Indicator 3: Explain that transfer of thermal energy between the atmosphere and the land or oceans influences climate patterns.

Topic C: Interaction of Physical Systems and the Biosphere

- Indicator 1: Analyze and explain the movement of matter and energy through earth's systems and the influence of this movement on the distribution of life.

Standard 5 Humans and Natural Resources:

Topic A: Human Impact on Natural Processes

- Indicator 1: Analyze the effects of human activities on earth's natural processes.
- Indicator 2: Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes.

Topic B: Human Impact on Natural Resources

- Indicator 1: Analyze, from local to global levels, the relationship between human activities and the earth's resources.

Standard 6 Environment and Health

Topic B: Human-Induced Changes and Human Health

- Indicator 1: Describe and explain that many changes in the environment designed by humans bring benefits to society as well as cause risk.

Standard 7 Environment & Society

Topic A: Environmental Quality

- Indicator 1: Investigate factors that influence environmental quality

Topic B: Individual and Group Actions and the Environment

- Indicator 1: Examine the influence of individual and group actions on the environment and explain how groups and individuals can work to promote and balance interests through

- **MEANINGFUL WATERSHED EDUCATIONAL EXPERIENCE (MWEE):**
  1. Issue Definition
  2. Outdoor Experiences
  3. Action projects
  4. Synthesis and conclusions