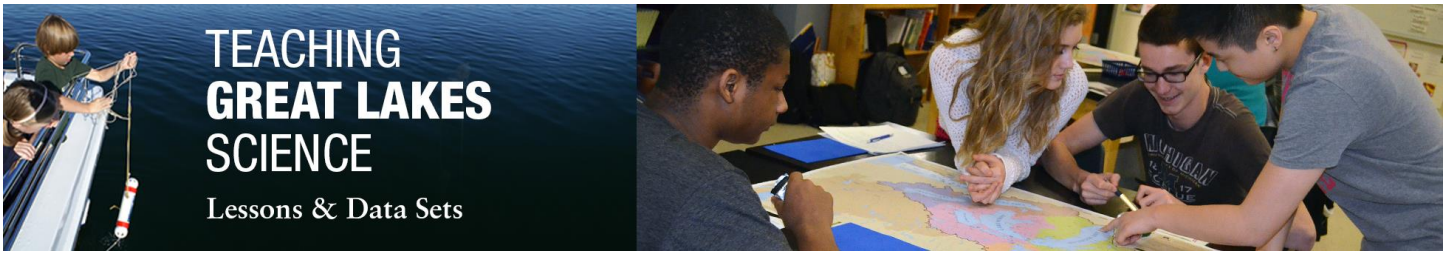

Next Generation Science Standards

Lesson: Habitat Restoration
Activity: Designing Habitat for Sturgeon

Prior Knowledge Should Include:

- Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for various living things. Activities and technologies can be engineered to reduce people's impacts on Earth.
- Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles.
- Ecosystem characteristics vary over time. Disruptions to any part of an ecosystem can lead to shifts in all of its populations. The completeness or integrity of an ecosystem's biodiversity is often used as an indicator of its health.

Performance Expectations:

- HS-LS2-2 Ecosystems: Interactions, Energy and Dynamics. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- HS-LS2-7 Ecosystems: Interactions, Energy and Dynamics. Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
- HS-ESS3-4 Earth and Human Activity. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- HS-ETS1.2 Engineering Design. Design a solution to a complex-real world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Disciplinary Core Ideas:

- **ESS3.C Human Impacts on Earth Systems:** Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and preclude ecosystem degradation.
- **LS4.D Biodiversity and Humans:** Humans depend on the living world for resources and other benefits provided by biodiversity. But human activity also has adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species and climate change. Thus, sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.
- **LS2.C Ecosystems Dynamics, Functioning and Resilience:** A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status, as opposed to becoming a

very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. Moreover, anthropogenic changes in the environment-including habitat destruction, pollution, introduction of invasive species, over exploitation and climate change-can disrupt an ecosystem and threaten the survival of some species.

- **ETS1.C Optimizing the Design Solution:** Criteria may need to be broken down into simpler ones that can be approached systematically and decisions about the priority of certain criteria over others (trade-offs) may be needed.

Practices:

- **Using Mathematics and Computational Thinking (5)** – Progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms and computational tools for statistical analysis to analyze, represent and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.
- **Constructing Explanations and Designing Solutions (6)** – Progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.

Crosscutting Concepts:

- **Scale, Proportion and Quantity** – In considering phenomena, it is critical to recognize what is relevant at different measures of size, time and energy and to recognize how changes in scale, proportion or quantity affect a system's structure and performance.
- **Stability and Change** – For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

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