The Geosphere & Hydrosphere

Suggested Pacing: Approximately 10-14 Blocks

Topics at a Glance:

- What makes up the Geosphere?
- Soil composition and health
- Agriculture
- Land use & urbanization
- Waste Management
  - Composting
  - Reducing, Reusing and Recycling
  - Waste can infiltrate the hydrosphere.
- What is the Hydrosphere?
  - Water availability
  - Watersheds and groundwater
  - Water uses and efficiency
  - Water pollution

Stage 1 – Desired Results

Performance Expectations: (PE) (Established Goals / Content Standards)

- Construct an explanation based on evidence for how the availability of natural resources in the geosphere & hydrosphere, occurrence of geologic and hydrologic hazards and other changes in geosphere & hydrosphere have affected human activity. (HS-ESS3-1)
- Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (HS-ESS2-2).
- Ask questions about the relationships among the management of natural resources including waste management, per capita consumption etc. through the lens of sustainability of human populations. (HS-ESS3-3)
- Use a computational representation to illustrate the relationships among Earth systems (specifically the geosphere) and how those relationships are being modified due to human activity. (HS-ESS3-6)
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Enduring Understandings (1-3 max)
Students will understand that:

- The survival of all living things is dependent upon a sustainable balance of finite resources and complex interactions.
- The greatest human impacts on the geosphere and hydrosphere are due to the production of food and our use of land.
- Water is a limited valuable resource on Earth, it can be polluted, conserved, and treated.

Essential Questions (1-2 EQ per EU)

1. What are the geosphere and hydrosphere?
2. To what extent can individual decisions and societal decisions impact the geosphere & hydrosphere and our planet's life support system (environment) overall?
3. What solutions and or improvements can humans make to mitigate negative impacts of our choices have made on these spheres and move toward sustainability?

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Bolded SEP's are a suggested focus for this unit. • **Ask questions and define problems**	**ESS3.A: Natural Resources** • Resource availability has guided the development of human society. (HS-ESS3-1)	**Bolded CC's are a suggested focus for this unit.** • Patterns

● Develop and use models ● Plan and carry out investigations ● Analyze and interpret data **● Use mathematics and computational thinking** **● Construct explanations and design solutions** ● Engaging in argument from evidence ● Obtaining, evaluating and communicating information	● Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-2) **ESS3.C: Human Impacts on Earth Systems** ● The sustainability of human societies requires responsible management of natural resources. (HS-ESS3-3)	● **Cause & Effect: Mechanism & Explanation** ● Scale, Proportion, & Quantity ● Systems & System Models ● **Energy & Matter: Flow, Cycle, Conservation** ● Structure & Function ● Stability & Change

Stage 2 – Model Assessments	
Summative Performance Task(s) Given 2 acres of land, Design a sustainable farm to feed your family. ● Students will create a detailed feasible plan to sustainably feed their family while: reducing waste, minimizing environmental impacts on all spheres (bio, geo, hydro, atmo), enhancing biodiversity etc. ● Students will reference a more detailed rubric for more specific scoring criteria.	**Formative Assessments:** ● Student worksheets ● Checkpoint questions and submissions. ● Formative quizzes ● Teacher conferences and check-in's ● Student self-assessment & reflection

Stage 3 – Learning Plan / Road Map (Design to make as student-centered as possible)

Suggested Resources for Planning:

Soil Science Society of America
https://www.soils4teachers.org/
NOAA Sea Level Rise Viewer
https://coast.noaa.gov/slr/#/layer/slr/2/-11581024.663779823/5095888.569004184/4/satellite/none/0.8/2050/interHigh/midAccretion
Discovery.com Killing the Colorado
https://go.discovery.com/tv-shows/killing-the-colorado/videos/the-real-story-behind-americas-water-crisis

Withgott, J., Wiggins, G. P., Lisowski, M., Scotchmoor, J., Thanukos, A., & Pearson Education, Inc. (2011). Pearson environmental science: Your world, your turn. Boston, Mass: Pearson.

Learning Activities:

Potential Lab Activities:
Map your local watersheds in Wall to see where your house lies.
Design challenge: Create your own water filtration system.

Potential questions for driving Inquiry:
- Where do the components of a cell phone come from?

- How can cell phones be properly “disposed” of or recycled?
- What is plastic made of and how is it produced?
- If metal is rusted and no longer useful for its original purpose does it still have any value? Why or why not?
- How do we get the metals that go into products we use?
- What factors contribute to the view that our usable fresh water supply is in danger of running out?

- Most food is produced in a way that is known as “conventional agriculture”. This type of food production (developed during the industrial revolution starting in the 19th century, the Green Revolution of the mid to late 20th century, and current changes brought about by genetic engineering) has greatly the stressed Earth’s natural resources (such as arable soil and fresh water).
- Agriculture is dependent on availability of arable soil, fresh water, and suitable climate.
- Different food are grown in areas that are best suited to their particular needs.
- Animal based food (such as meat, dairy and fish) is much more ecologically demanding than plant based foods.
- The consumption of highly processed food contributes significantly to the food demand of industrialized nations and has mostly adverse health impacts on people.
- There are alternative methods of producing food and managing farmland that may play an important role in reducing the food footprint and water consumption/pollution of societies.