“but people should understand the Hummers do not trump physics or Mother Nature!”

The acceleration of climate change and resulting sea level rise caused directly by human activity may be unprecedented in the history of the Earth.”
"There are no passengers on spaceship Earth. We are all crew."
- Herbert Marshall McLuhan
Unit 1: The Composition, Structure and Functioning of Planet Earth

- Earth Systems
- Earth Materials and Resources (elements and minerals)
- Structure of Planet Earth
- Earth’s Interior Machine
- The Magnetic Field

Unit 2: Understanding the Dynamics of Earth’s Lithosphere – Plate Tectonic Theory and the Scientific Method

- The Rock Cycle
- Continental Drift
- Seafloor Spreading
- Plate Tectonics

Unit 3: Earth Systems and the Control of Climate

- The Carbon Cycle
- Earth’s Climate System
- Global Warming and Climate Change

Earth Systems
Earth Materials and Resources (elements and minerals)
Structure of Planet Earth
Earth’s Interior Machine
The Magnetic Field

Hydrosphere
Atmosphere
Biosphere
Geosphere
“Civilization exists by geological consent, subject to change without notice.”
-Will Durant (U.S. Historian)

- Energy resources
- Water resources
- Mineral commodities
- Agriculture
- Climate change
- Hurricanes
- Earthquakes
- Flooding
- Mass Wasting

Public Policy
- Health
- Insurance
- Sustainability

Foreign Policy
- Political Instability
- War

Earth is the “Goldilocks” planet - just right.

Terrestrial Planets

**Venus**
- Too hot!
- No water
- Thick CO₂ atmosphere

**Earth**
- Just right for life.
- Lots of water
- Moderate nitrogen / oxygen atmosphere

**Mars**
- Too cold.
- Little water
- Thin CO₂ atmosphere

“Civilization exists by geological consent, subject to change without notice.”
-Will Durant (U.S. Historian)
Venus - too hot!

- almost as large as the Earth.
- very thick atmosphere of carbon dioxide and sulfuric acid - NO WATER.
- hottest planet: 890° F at surface.
- Surface pressure = 90 atm
- geologically active (fewer craters) - shield volcanoes.
- Two relatively elevated regions ("continents") - Ishtar and Aphrodite terra.
- Several broad depressions (planitia).

Mars - too cold!

- Most Earth-like of all planets.
- Very thin carbon dioxide atmosphere, .01 Atm.
- Cold: -200° F to 40° F. CO₂ freezes at the surface.
- Water and carbon dioxide ice - possible liquid water underground.
- Shield volcanoes.
- Evidence for ancient rivers, oceans, and lake basins.
- Sedimentary strata.

Questions for Discussion

How else is the Earth different from Mars, Venus, and the Moon?
Barringer Meteor Crater, Arizona

- 50,000 years old
- 1200 meters across, 750 meters deep
- Iron meteoroid - app. 50 meters diameter, 300,000 tons
- Impact speed 26,800 mph (12 km/sec)
- Excavated 175 million tons of rock
- Fireball from impact scorched everything up to 10 km

Peekskill Fireball, Oct. 9, 1992

Peekskill Meteorite
The Earth is a water-rich planet.

1. **Liquid**
2. **Vapor**
3. **Solid**

**Water erodes rock**

**Tungurahua volcano**

**Ecuador**

**Active volcanism**
Mountain Belts - extensive linear tracks of folded and uplifted crust.

Continents and Ocean Basins

Hypsographic Curve for the Earth's Surface
What are the most distinctive features of the Moon’s Geosphere?

- Tharsis
- Valles Marineris
- Hellas Planitia
- Olympus Mons
- Ishtar Terra
- Aphrodite Terra
- Planitia
- Venus - DEM
- Mars - DEM
Questions to Keep in Mind

- Why does the surface of the Earth have a bimodal distribution of elevation?
- Do Earth’s Hydrosphere and Biosphere have anything to do with the evolution of the Geosphere and Atmosphere?
- How did the Earth end up being such a nice place to live?
- What is Earth’s atmosphere so depleted in carbon dioxide?