**\*\*Park Name**

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| --- |
| [Devils Postpile National Monument](http://www.nps.gov/depo/) |

**\*\*Lesson Plan Title (255 characters maximum)**

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| --- |
| Climate Science In Focus: Earth as a System |

**\*\*Essential Question and Quick Lesson Description**

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| --- |
| Students will learn about the four Earth systems and how they are connected. Students will be able to:  1. Explain the Earth as a system of interconnected parts  2. Properly define and use Earth science vocabulary |

**\*\*Lesson Grade Level: (Check One of the following)**

\_\_\_ Lower Elementary: Pre-Kindergarten through 2nd Grade

\_\_\_ Upper Elementary: 3rd Grade Through Sixth Grade

\_\_\_ Middle School: Sixth Grade Through Eighth Grade

\_x\_\_ High School: Ninth Grade through Twelfth Grade

\_\_\_ College Undergraduate Level

\_\_\_ Graduate Level (Masters, PhD)

\_\_\_ Adult Education

**\*\*Lesson Subject: (Check As Many as Apply)**

\_\_ Social Studies

\_\_\_ Math

\_x\_ Science

\_\_\_ Literacy and Language Arts

\_\_\_ Other: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Feature Image for Lesson**

**This will be shown next to your lesson on the Education Portal. Provide filename and location below.**

|  |
| --- |
| In folder |

**Alt Text for Feature Image**

**If the image does not display, what description do you want to appear in its place?**

|  |
| --- |
| The San Joaquin River winds through Soda Springs Meadow in Devils Postpile |

**\*\*Common Core Standards:**

**Want more information about Common Core? Go to [http://www.corestandards.org/](http:///h)**

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| --- |
| Grade Level: 9-12 Subject Area: Science  [CCSS.ELA-LITERACY.RST.9-10.5](http://www.corestandards.org/ELA-Literacy/RST/9-10/5/)  Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).  [CCSS.ELA-LITERACY.RST.9-10.7](http://www.corestandards.org/ELA-Literacy/RST/9-10/7/)  Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |

**\*\*State Standards:**

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**Additional Standards(s) (255 characters maximum): Does this lesson meet additional standards?**

**e.g. Next Generation Science Standards, National Council for Social Studies Standards, Advanced Placement (AP) Courses, International Baccalaureate (IB) Courses, Next Generation Science Standards**

|  |
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| Next Generation Science Standards: HS-ESS3-6 |

**Thinking Skills (Check As Many as Apply)**

The thinking skills listed below are based on Bloom’s Taxonomy. Consider your lesson procedure and activities. Then check off the thinking skills that students will experience through your lesson.

X **Knowledge** – Recalling or recognizing information ideas, and principles

X **Comprehension** – Understand the main idea of material heard, viewed, or read. Interpret or summarize the ideas in own words.

X **Application** – Apply an abstract idea in a concrete situation to solve a problem or relate it to a prior experience.

X **Analysis** – Break down a concept or idea into parts and show the relationships among the parts.

\_\_\_ **Creation** – Bring together parts (elements, compounds) of knowledge to form a whole and build relationships for NEW situations.

X **Evaluation** – Make informed judgments about the value of ideas or materials. Use standards and criteria to support opinions and views.

**Complete Lesson File**

**Is there a downloadable file (or PDF) for this lesson plan? If yes, provide filename and location:**

**Be sure your PDF or other file meets universal accessibility requirements, most PDFs do not.**

|  |
| --- |
| <http://www.nps.gov/depo/forteachers/classrooms/earth-as-a-system.htm> |

**Lesson Duration**

**Time to complete this lesson plan in minutes (25 characters maximum)**

|  |
| --- |
| 60 minutes |

**\*\*Background Information for Teacher**

**What important content, contextual, or practical information and background knowledge does the teacher need to successfully implement this lesson?**

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| The Earth consists of four systems: the atmosphere, hydrosphere, geosphere, and biosphere, which are interconnected. Changes to one part of the system can have consequences on the others. Changes to global or regional climate can be caused by changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activity.  Water is essential for life on Earth. Relative water availability is a major factor in designating habitats for different living organisms. In the United States, things like agriculture and water rights are hot topics. Current models predict that average global temperatures are going to continue to rise even if regional climate changes remain complex and varied. These changes will have an impact on all of Earth's systems.  Studies have shown that climate change is driven not only by natural effects but also by human activities. Knowledge of the factors that affect climate, coupled with responsible management of natural resources, are required for sustaining these Earth systems. Long-term change can be anticipated using science-based predictive models, making science and engineering essential to understanding global climate change and its possible impacts.  National Parks can serve as benchmarks for climate science trends and effects over time because they are protected areas void of human influence. Understanding current climate trends will help set students up to be successful in interpreting and engaging in discussions about climate change, which will lead to informed decision making. |

**\*\*Important Vocabulary and Terms with Definitions:**

**What terms and academic language will students have to know to participate in the lesson? Lessons typically include 5 to 15 terms and definitions.**

|  |
| --- |
| 1. geosphere: the solid portion of the earth, also called the lithosphere 2. hydrosphere: the water on or surrounding the surface of the globe, including the water of the oceans and the water in the atmosphere. 3. biosphere: the part of the earth's crust, waters, and atmosphere that supports life. 4. atmosphere: the gaseous envelope surrounding the earth; the air. 5. geosciences: earth science 6. solar: from the sun 7. reflection: the act of [reflecting](http://dictionary.reference.com/browse/reflect), as in casting back a light or heat, mirroring, or giving back or showing an image; the state of being reflected in this way. 8. transmission: the act or process of transmitting. 9. thermal capacity: the heat required to raise the temperature of a substance one degree. 10. global: pertaining to the whole world; worldwide; universal 11. geography: the science dealing with the areal differentiation of the earth's surface,as shown in the character, arrangement, and interrelations over the world of such elements as climate, elevation, soil, vegetation, population, land use, industries, or states, and of the unit areas formed by the complex of these individual elements. 12. carbon cycle: the circulation of carbon atoms in the biosphere as a result of photosynthetic conversion of carbon dioxide into complex organic compounds by plants, which are consumed by other organisms. |

**\*\*Lesson Preparation: What preparation does the teacher need to do before the lesson? What supplies or materials should be gathered?**

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| Write the following question on the board or projector so the all students can see it: What is a system?  Prepare the following video:  [Earth as a System](http://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.hologlobe/earth-as-a-system/)  Gather the following supplies:   1. Butcher paper and markers (one set per group) 2. Post-it notes (3 per student) |

**\*\*Lesson Hook or Preview: What activity, video, song, or other experience could get the students excited about the lesson and thinking about the topic? Is there a way to make the lesson important to their lives or link the lesson content to what they already know?**

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| Briefly discuss the following question: What is a system? Define and provide an example of a system. Diagram your system. |

**\*\*Procedure: List the instructions the teacher should follow as Step One, Step Two, Step Three, etc.**

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| 1. Distribute worksheet 1.1 (In Materials) and have students complete pre-video questions on worksheet 1.1. 2. Show the video "[Earth as a System.](http://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.hologlobe/earth-as-a-system/)" Students should complete post-video questions on worksheet 1.1. 3. Monitor discussion and distribute butcher paper and markers for posters. Separate students into small groups, have students discuss what "Earth as a system" means. 4. Students should create an illustration that demonstrates, "Earth as a System." Be sure to include the 4 spheres and give at least one example of how humans are impacting/influencing each one. 5. Distribute post-it notes and instruct students on "gallery walk." Students should walk and view posters created by all groups and make 2 positive comments and 1 suggestion on each. |

**\*\*Assessment: How can teachers tell that each individual student has met the objective? How will teachers see if each student knows the answer to the essential questions or has mastered the skills? Below, include below a brief description of how to use the assessment. Later in this template you are provided with the opportunity to upload a digital copy of the assessment for teachers to print and use.**

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| --- |
| Discussion: How do you view the Earth differently after today's activities? |

**Lesson Materials: Any worksheets, photos, primary source, scientific data, maps, graphic organizers, or PowerPoint ‘s should be described and attached using the template below. Please create additional materials boxes if necessary.**

**Material #1**

**Title (255 characters maximum):**

|  |
| --- |
| Worksheet 1.1 |

**Summary (how does the material function in the lesson?):**

|  |
| --- |
| This file provides pre- and post-video questions for students. |

**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

|  |
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| In folder |

**Assessment Materials**

**How can teachers tell that each individual student has met the objective? How will teachers see if each student knows the answer to the essential questions or has mastered the skills? Attach below the assessment and, if applicable, a rubric or answer key.**

**Assessment**

**Title (255 characters maximum):**

|  |
| --- |
| Unit Assessment |

**Summary (how does the material function in the lesson?):**

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| This assessment is for the entire unit. |

**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

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**Assessment Rubric or Answer Key**

**Title (255 characters maximum):**

|  |
| --- |
| N/A |

**Summary (how does the material function in the lesson?):**

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**Downloadable file of this material in original format if possible, such as Microsoft word or PowerPoint (Provide filename and location)**

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**Supports for Struggling Learners**

**If a learner is struggling to understand the objective, essential question, or skills presented in the lesson, what can be done to help this learner? Is there a lower reading level version of text? Is there a more image heavy or simplified version of content? Can supportive devices be provided such as calculators?**

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| N/A |

**Extensions for Excelling Learners**

**If a learner is really excelling at the objective and skills presented in the lesson, what can be done to continue to challenge this learner? Can the student create a product or learn more in depth about the content?**

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| N/A |

**Additional Resources**

**Please list websites, references, or other materials for further research by interested students that is not already provided within the lesson.**

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**Related Lessons or Educational Materials**

**Is this lesson connected to other lessons within a unit? Is this lesson related to a field trip guide or activity? If so, list the website address or titled of these other materials below.**

|  |
| --- |
| Day 1- [Earth as a System](http://www.nps.gov/depo/forteachers/classrooms/earth-as-a-system.htm)  Day 2- [Weather vs Climate](http://www.nps.gov/depo/forteachers/classrooms/weather-vs-climate.htm)  Day 3- [Watershed](http://www.nps.gov/depo/forteachers/classrooms/watersheds.htm)  Day 4- [Climate Science Data and Tools](http://www.nps.gov/depo/forteachers/classrooms/climate-science-data-and-tools.htm)  Day 5- [Field Trip](http://www.nps.gov/depo/forteachers/classrooms/field-trip.htm)  Day 6- [NPS Connections](http://www.nps.gov/depo/forteachers/classrooms/nps-connect.htm)  Day 7- [Project Preparation](http://www.nps.gov/depo/forteachers/classrooms/project-preparation.htm)  Day 8- [Evaluations](http://www.nps.gov/depo/forteachers/classrooms/presentations.htm) |