Related Education Topics and Standards

The following table identifies Earth Observatory articles on the DVD *National Parks—From Space* that are related to specific middle and high school topics and concepts. The links below go to the EO website; having the DVD with the articles is not required. The topics and concepts are from *A Framework for K-12 Science Education (2012)* and *Next Generation Science Standards,* Appendix E: Disciplinary Core Idea Progressions (2013).

NGSS Topic	Grades 6-8	Grades 9-12
ESS1.C: The History of Planet Earth	Rock strata and the fossil record can be used as evidence to organize the relative occurrence of major historical events in Earth's history. **National park EO articles:** Big Bend, Capitol Reef, **Crater Lake**, **Dinosaur National Monument**, **El Malpais National Monument**, **Grand Canyon**, **John Day Fossil Beds**, **Katmai**, **Lassen**, **Lava Beds National Monument**, **Petrified Forest**, **Pinnacles**, **Voyageurs**, **White Sands National Monument**	The rock record resulting from tectonic and other geoscience processes as well as objects from the solar system can provide evidence of Earth's early history and the relative ages of major geologic formations. **National park EO articles: Arches**, **Craters of the Moon**
ESS2.A: Earth Materials and Systems	Energy flows and matter cycles within and among Earth's systems, including the sun and Earth's interior as primary energy sources. Plate tectonics is one result of these processes. **National park EO articles: Hot Springs**, **Yellowstone/Mammoth Hot Springs**	[intentionally blank]
ESS2.B: Plate Tectonics and Large-Scale System Interactions	Plate tectonics is the unifying theory that explains movements of rocks at Earth's surface and geological history. Maps are used to display evidence of plate movement. **National park EO articles: Grand Teton**, **Kings Canyon**	Radioactive decay within Earth's interior contributes to thermal convection in the mantle. **National park EO articles: Hot Springs**, **Yellowstone/Mammoth Hot Springs**

ESS2.C: The Roles of Water in Earth's Surface Processes	Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Water movement causes weathering and erosion, changing landscape features. **National Park EO articles: Arches, Black Canyon of the Gunnison, Canyonlands, Colorado National Monument, Glacier, Grand Canyon, Hot Springs, Katmai, Mammoth Cave, North Cascades, Olympic, Rainbow Bridge National Monument, Redwood, Rocky Mountain, Yosemite, Zion**	The planet's dynamics are greatly influenced by water's unique chemical and physical properties. **National park EO articles: Bryce Canyon**
ESS2.D: Weather and Climate	Complex interactions determine local weather patterns and influence climate, including the role of the ocean. **National park EO articles: Natural Beauty at Risk: Preparing for Climate Change in National Parks**	The role of radiation from the sun and its interactions with the atmosphere, ocean, and land are the foundation for the global climate system. Global climate models are used to predict future changes, including changes influenced by human behavior and natural factors. **National park EO articles: Natural Beauty at Risk: Preparing for Climate Change in National Parks**
ESS3.A: Natural Resources	Humans depend on Earth's land, ocean, atmosphere, and biosphere for different resources, many of which are limited or not renewable. Resources are distributed unevenly around the planet as a result of past geologic processes. **National park EO articles: Bandelier, Yellowstone/Mammoth Hot Springs**	Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits. **National park EO articles: Lewis and Clark National Historic Trail, Yellowstone/Mammoth Hot Springs**
ESS3.C: Human Impacts on Earth Systems	Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth. **National park EO articles: Everglades, Natural Beauty at Risk: Preparing for Climate Change in National Parks**	Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. **National park EO articles: Everglades, Kansas Prairie Fires, Natural Beauty at Risk: Preparing for Climate Change in National Parks**

ESS3.D: Global Climate Change	Human activities affect global warming. Decisions to reduce the impact of global warming depend on understanding climate science, engineering capabilities, and social dynamics. **National park EO articles: Natural Beauty at Risk: Preparing for Climate Change in National Parks**	Global climate models used to predict changes continue to be improved, although discoveries about the global climate system are ongoing and continually needed. **National park EO articles: Natural Beauty at Risk: Preparing for Climate Change in National Parks**
LS2.C: Ecosystem Dynamics, Functioning, and Resilience	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 a measure of its health. **National park EO articles: Acadia, Arches, Cape Lookout, Glacier Bay, Grand Canyon, Great Smoky Mountains, Isle Royale, Katmai, Voyageurs**	If a biological or physical disturbance to an ecosystem occurs, including one induced by human activity, the ecosystem may return to its more or less original state or become a very different ecosystem, depending on the complex set of interactions within the ecosystem. **National park EO articles: Bandelier, Dinosaur National Monument, Everglades, Tallgrass Prairie National Preserve**
LS4.C: Adaptation	Species can change over time in response to changes in environmental conditions through adaptation by natural selection acting over generations. Traits that support successful survival and reproduction in the new environment become more common. **National Park EO articles: Effigy, Redwood, Saguaro, Sequoia, Tonto**	Adaptation means that the distribution of traits in a population, as well as species expansion, emergence or extinction, can change when conditions change. **National park EO articles: Biscayne, Grand Canyon, Joshua Tree**
LS4.D: Biodiversity and Humans	Changes in biodiversity can influence humans' resources and ecosystem services they rely on. **National park EO articles: Canyon de Chelly National Monument**	Biodiversity is increased by formation of new species and reduced by extinction. Humans depend on biodiversity but also have adverse impacts on it. Sustaining biodiversity is essential to supporting life on Earth. **National park EO articles: Bryce Canyon, Castle Mountains, Olympic, Rock Creek**

References
National Research Council. (2012) *A Framework for K-12 Science Education.*
NGSS Lead States. (2013) *Next Generation Science Standards: For States, By States*. Appendix E: Disciplinary Core Idea Progressions. Retrieved from http://www.nextgenscience.org/