

***Some Animals Are More Equal than Others: Keystone Species and Trophic Cascades*** (Howard Hughes Medical Institute, 2016, <https://www.biointeractive.org/classroom-resources/some-animals-are-more-equal-others-keystone-species-and-trophic-cascades>)

***Exploring Earth's Keystone Species*** (Google Earth Voyager Module, <https://bit.ly/35cGUgl>)

At the beginning of every school year, many educators are asked to prepare lesson plans for each course they teach, to be used in the case of an emergency absence. Teachers struggle to find resources that are not only engaging, but also present relevant information in a way students can understand without a teacher being there to translate for them. The Howard Hughes Medical Institute (HHMI) BioInteractive website hosts a vast library of biology-related media resources, virtual labs, and simulations that can be used under these circumstances. Two lessons of note include the film entitled *Some Animals Are More Equal than Others: Keystone Species and Trophic Cascades* and a related Google Earth Voyager module called *Exploring Earth's Keystone Species*.

The short film opens by explaining pioneering research by Robert Paine and James Estes into interactions between sea star, sea urchin, and sea otter populations and their

effects on the local Washington State kelp forests. The key concepts covered encompass topics that link across the entire biology or environmental science content, including population dynamics, food webs, trophic structure, biodiversity, ecosystem stability, species interactions, and experimental design. Covering all of these topics makes the film appropriate to show at any point in the course curriculum. Moreover, the video is short, only 20 minutes, which leaves plenty of time for students to discuss and analyze the information and apply their understanding to activities. Students could discuss ideas such as causal loop modeling of a kelp forest, completing a claim-evidence-reasoning prompt, or making predictions related to a different ecosystem of study. The HHMI website has a pretty highly cognitively demanding set of prompts that could fill several class periods with deep discussions related to these areas.

Moreover, HHMI has partnered with Google Earth to provide a Voyager module entitled *Exploring Earth's Keystone Species* to accompany the video that students will find especially interesting. In this module, students explore other keystone species from around the world, such as the gray wolf, Eurasian beaver, and African elephant. In each location, students are provided a slideshow with captivating imagery, a short

description of the organism, and the ability to explore the animal's habitat in greater detail. Be sure to give students a time limit or they could get sucked in for hours! Adding this Google Earth activity to the video is a high-leverage teacher move, not only because it will prompt more detailed discussions and deeper connections to the topic, but also because it presents the content in a more culturally relevant manner. It provides a greater diversity of examples with which students can develop personal connections.

Finally, when combined, these two resources provide a challenging, differentiated, and diverse set of learning tasks that engage students in authentic learning in a personally meaningful way. It challenges students to think beyond their classroom about keystone species and human impacts on these species from a more global perspective. This will hopefully lead the students to the place every biology teacher wants their students to go – having them be better stewards of their dynamic and fragile planet.

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