

DLNR Virtual Field Trips: Snail Lab

NGSS, Nā Hopena A'o , and 'Āina Aloha Competencies Alignment for Educators



Alignment Summary

The Snail Lab virtual field trip offers an educational experience that explores the Snail Extinction Protection Program (SEPP) lab for protecting Hawai'i's rarest kāhuli. The content presented with this field trip aligns with Next generation Science Standards (NGSS), the Nā Hopena A'o framework from the Office of Hawaiian Education (OHE), and the competencies from OHE's 'Āina Aloha pilot program. The field trip aligns with NGSS listed below, highlighting diverse ecosystem behaviors and relationships. The ecosystem relationships unpacked include discussion of the impacts of human activity on ecosystems. Within the Nā Hopena A'o framework, our field trips align with the goals of strengthening students' sense of Hawai'i and sense of belonging. Further, the videos found throughout the field trip correspond with 'Āina Aloha competencies, as the speakers educate young learners about how systems work, why conservation efforts are important for the 'āina, and human impacts on ecosystems. The tables below provide specific references to standards, goals, and competencies addressed by this field trip.

NGSS Alignment

The standard codes below have been hyperlinked to direct you to a description of the standard.

NGSS Code and Link	Discipline	Core Idea	Subitem	Relevant DCIs	Connections Field Trip Connections to DCIs
K-ESS2-2	ESS: Earth and Space Sciences	2: Earth's Systems	2: Construct an argument supported by evidence for how plants and animals (including humans)	"ESS2.E: Biogeology: Plants and animals can change their environment. ESS3.C: Human Impacts on Earth Systems: Things that people do to live comfortably can affect the	Humans reduced forest habitat in Hawai'i where these snails live, and introduced animals like mongoose, and Jackson's chameleons to Hawai'i. A garmer introduced mongoose thinking it would get rid of rats for him,

			can change the environment to meet their needs	world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things."	and people introduced chameleons as pets. These animals eat native snails.
K-ESS3-1	ESS: Earth and Space Sciences	3: Earth and Human Activity	1: Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.	"ESS3.A: Natural Resources Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do."	Native tree snails live on plants that have the food they need: fungus that grows on certain leaves. They also live where the temperature and amount of water is just right for them.
K-ESS3-3	ESS: Earth and Space Sciences	3: Earth and Human Activity	3: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.	"ESS3.C: Human Impacts on Earth Systems Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. ETS1.B: Developing Possible Solutions Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary)"	Humans reduced forest habitat in Hawai'i where these snails live, and introduced animals like rats, mongoose, and Jackson's chameleons to Hawai'i. These animals eat native snails. Students can develop solutions for invasive species removal, reforestation, and other ways to protect native snails.
1-LS1-1	LS: Life Sciences	1: From Molecules to	1: Use materials to design a solution	"LS1.A: Structure and Function All organisms have	Whether it is processing the fungus on a leaf as food, or sensing the time of

		Organisms: Structures and Processes	to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.	external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow."	day via the eye spots on their attanae to determine sleeping patterns, snails are structured to process the information of their surroundings to carry out their functions.
3-LS1-1	LS: Life Sciences	1: From molecules to Organisms: Structures and Processes	1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	"LS1.B: Growth and Development of Organisms Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles."	Reproduction is essential for the continued existence of our native snail species. In the wild, invasive rats and the cannibal rosy wold snail eat our natve snails. This is part of the reason the scientists you meet in this virtual field trip bring snails into the lab, where conditions are just right for reproduction and there are no predators. When the snails are released into forests, they are inside predator-proof fences so they can continue to live and reproduce safely.
3-LS4-4	LS: Life Sciences	4: Biological Evolution: Unity and Diversity	4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live	"LS2.C: Ecosystem Dynamics, Functioning, and Resilience When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to	The environment where our native snails live has changed drastically due to warming temperatures and the introduction of invasive predators like rats, mongoose, and the rosy wolf snail. This has caused some snail species to go extinct, while others are still present but need our help to survive.

			there may change.	new locations, yet others move into the transformed environment, and some die. (secondary) LS4.D: Biodiversity and Humans Populations live in a variety of habitats, and change in those habitats affects the organisms living there."	
4-LS4-1	LS: Life Sciences	4: Biological Evolution: Unity and Diversity	1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction	"LS1.A: Structure and Function Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction."	Whether it is processing the fungus on a leaf as food, or sensing the time of day via the eye spots on their attanae to determine sleeping patterns, snails are structured to process the information of their surroundings to carry out their functions.
5-LS2-1	LS: Life Sciences	2: Ecosystems: Interactions, Energy, and Dynamics	1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	"LS2.A: Interdependent Relationships in Ecosystems The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers."	The Amastra snails that students meet in the kāhuli kīpuka are decomposers that help cycle nutrients through our food webs.

				<p>Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. LS2.B: Cycles of Matter and Energy Transfer in Ecosystems Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment."(see link for more)</p>	
MS-LS1-4	LS: Life	1: From	4: Use argument	"LS1.B: Growth and	Creating ideal conditions for the

	Sciences	Molecules to Organisms: Structures and Processes	based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Development of Organisms Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction."	rehabilitation of Hawai'i's kāhuli species is essential for continuing their existence. Healthy kāhuli support healthy forests by cleaning fungi from the surface of leaves. Some snails are also decomposers, helping to recycle leaf litter into soil.
MS-LS2-2	LS: Life Sciences	2: Ecosystems: Interactions, Energy, and Dynamics	2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	"LS2.A: Interdependent Relationships in Ecosystems Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of	Kāhuli rely on fungi from native plants and are directly impacted by predators. Students can predict patterns in snail populations based on scenarios of whether native plant populations increase or decrease, and whether invasive predator populations increase or decrease.

				interactions of organisms with their environments, both living and nonliving, are shared."	
MS-LS2-4	LS: Life Sciences	2: Ecosystems: Interactions, Energy, and Dynamics	4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	"LS2.C: Ecosystem Dynamics, Functioning, and Resilience Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations."	The environment where our native snails live has changed drastically due to warming temperatures and the introduction of invasive predators like rats, mongoose, and the rosy wolf snail. This has caused some snail species to go extinct, while others are still present but need our help to survive.
MS-LS2-5	LS: Life Sciences	2: Ecosystems: Interactions, Energy, and Dynamics	5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	"LS2.C: Ecosystem Dynamics, Functioning, and Resilience Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. LS4.D: Biodiversity and Humans Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary) ETS1.B: Developing Possible Solutions There are	Protective exclosures are built in the forests for when the kāhuli are healthy enough to be released back into the wild. These exclosures decrease the competition the snails will face from unnatural threats such as Jackson chameleon or rats.

				systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary)"	
MS-ESS3-3	ESS: Earth and Space Sciences	3: Earth and Human Activity	3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	"ESS3.C: Human Impacts on Earth Systems Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise."	Native forests where these snails live have been impacted by human activities, including the introduction of predators and changes in climate. Students may design solutions to monitor or minimize these impacts.
MS-ESS3-4	ESS: Earth and Space Sciences	3: Earth and Human Activity	4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of	"ESS3.C: Human Impacts on Earth Systems Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are	Our native ecosystems are impacted by human activities like deforestation, introduction of invasive species, and climate change. Students may construct an argument about how these impacts are related to human population size in Hawai'i, or to the amount of people/goods arriving in

			natural resources impact Earth's systems.	engineered otherwise."	Hawai'i.
HS-LS2-6	LS: Life Sciences	2: Ecosystems: Interactions, Energy, and Dynamics	6: Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	"LS2.C: Ecosystem Dynamics, Functioning, and Resilience A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability."	Our native ecosystems are impacted by human activities like deforestation, introduction of invasive species, and climate change. Students may evaluate the changes in stability of our ecosystems over time as human impacts have increased in Hawai'i.
HS-LS2-7	LS: Life Sciences	2: Ecosystems: Interactions, Energy, and Dynamics	7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	"LS2.C: Ecosystem Dynamics, Functioning, and Resilience Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species,	Our native ecosystems are impacted by human activities like deforestation, introduction of invasive species, and climate change. Students may evaluate the changes in stability of our ecosystems over time as human impacts have increased in Hawai'i. Students may design or evaluate

				<p>overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.</p> <p>LS4.D: Biodiversity and Humans Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary) Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving</p>	<p>solutions to these impacts, such as invasive plant removal, native plant restoration, installation of hoofed-animal fencing, installation of predator-proof fencing, or captive animal care.</p>
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				landscapes of recreational or inspirational value. (secondary) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.) ETS1.B: Developing Possible Solutions When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. (secondary)"(see link for more)	

Alignment with [Nā Hopena A'o Statements](#)

<u>Hopena</u>	<u>Statement</u>
1. Strengthened Sense of Belonging	a. Know who I am and where I am from
	b. Know about the place I live and go to school
2. Strengthened Sense of Hawai'i	b. Use Hawaiian words appropriate to their task

	c. Learn the names, stories, special characteristics and the importance of places in Hawai'i
	d. Learn and apply Hawaiian traditional world view and knowledge in contemporary settings
	e. Share the histories, stories, cultures and languages of Hawai'i
	g. Treat Hawai'i with pride and respect
	h. Call Hawai'i home

‘Āina Aloha Competencies:

This link will direct you to the Office of Hawaiian Education (OHE) ‘Āina Aloha competencies.

<https://sites.google.com/k12.hi.us/ohehub/hawaiian-studies-program-hsp/%CA%BB%C4%81ina-aloha-a%CA%BBa-choice-board?authuser=0>

Competency	Sub Competency	Competency Highlight
Aina Ulu: Growth Cycle	Kupu	Young and fresh learner
Kuana'ike: Mahalo & Hō'ihi	Pua	Practices and protocols demonstrating mahalo and hō'ihi for kāhuli
Honua: Pono	Hua	Advocates for living pono and contributes to aina well-being

Honua: Kuleana	Hua	Fulfills kuleana for well-being of human and natural communities
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