# DLNR Virtual Field Trips: Pia Valley

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

**Alignment Summary**

The Pia Valley virtual trip offers an educational experience that explores some of O‘ahu’s protected ecosystems. The content presented with this 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 Earth’s complex systems within the valley. The diverse characteristics and adaptations of native (and non-native) species in Hawai‘i are elaborated upon. 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 text and imagery educate young learners about how systems work, why conservation efforts are important for the ‘āina, and the cultural significance of associated 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 | Field Trip Connections to DCIs |
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| 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) can change the environment to meet their needs | "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 world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things." | In Pia Valley we can see evidence of farming by humans, which changed the landscape. There are old wire fences along the trail, and the strawberry guava have filled in spaces that were once cleared for livestock. |

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| 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." | As we move along the trail in Pia Valley, we move higher up the mountain and see different plants and animals. This is because different sections of the mountain have the right conditions for different plants and animals to live: the lower sections might be warmer and drier and have more non-native plants. The upper sections may be wetter, cooler, and have more native plants. |
| 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)" | In Pia Valley we can see evidence of farming by humans, which changed the landscape. There are old wire fences along the trail, and the invasive strawberry guava have filled in spaces that were once cleared for livestock. Students can develop solutions for reforestation or removal of invasive plants. |
| 1-LS1-1 | LS: Life Sciences | 1: From Molecules to Organisms: Structures and Processes | 1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. | "LS1.A: Structure and Function All organisms have 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, | Students can examine the different types of plants that are introduced through the field trip. Small plants like ʻuluhe ferns have shallow roots, while larger trees like ʻōhiʻa have deep roots to help them get more water, support their larger weight, and be stable in the wind. |

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| | | | | leaves, flowers, fruits) that help them survive and grow." | |
| 2-LS2-2 | LS: Life Sciences | 2: Ecosystems: Interactions, Energy, and Dynamics | 2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. | "LS2.A: Interdependent Relationships in Ecosystems Plants depend on animals for pollination or to move their seeds around. 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)" | Strawberry guava is an invasive plant in Pia Valley. Its seeds are distributed by animals that eat the sweet fruits of strawberry guava, like pigs (and sometimes people!). In the upper sections of the valley we see the ʻōhiʻa tree. The ʻōhiʻa tree can be pollinated by insects or birds that visit its lehua flowers for nectar. |
| 2-LS4-1 | LS: Life Sciences | 4: Biological Evolution: Unity and Diversity | 2: Make observations of plants and animals to compare the diversity of life in different habitats. | "LS4.D: Biodiversity and Humans There are many different kinds of living things in any area, and they exist in different places on land and in water." | As we move along the trail in Pia Valley, we move higher up the mountain and see different plants and animals. This is because different sections of the mountain have the right conditions for different plants and animals to live: the lower sections might be warmer and drier and have more non-native plants. The upper sections may be wetter, cooler, and have more native plants. |
| 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 there may change. | "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 new locations, yet others move into the transformed | The forests of Pia Valley have changed over time in part due to human activity like ranching. Invasive strawberry guava forests now cover areas that would have once been home to native plants. Native species like our tree snails used to be found here in greater numbers but have |

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| | | | | 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." | declined due to the changing environment. |
| 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." | Students can examine the different types of plants that are introduced through the field trip. Small plants like ʻuluhe ferns have shallow roots, while larger trees like ʻōhiʻa have deep roots to help them get more water, support their larger weight, and be stable in the wind. |
| 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.” (see link for more) | Native plants such as ʻōhiʻa rely on species such as kāhuli to keep them healthy, as kāhuli consumes ʻōhiʻa's unwanted fungi and bacteria. |
| MS-LS1-4 | LS: Life Sciences | 1: From Molecules to Organisms: Structures and Processes | 4: Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant | "LS1.B: Growth and 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." | Interconnected species promote successful reproduction. An example of this is the relationship between a kāhuli snail and an ʻōhiʻa tree. The fungus on the ʻōhiʻa keeps the snail fed and the feeding of this fungus keeps the plant clean and healthy for continued growth. |

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| | | | structures affect the probability of successful reproduction of animals and plants respectively. | | |
| MS-LS1-5 | LS: Life Sciences | 1: From Molecules to Organisms: Structures and Processes | 5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. | "LS1.B: Growth and Development of Organisms Genetic factors as well as local conditions affect the growth of the adult plant." | The effect of local conditions on adult plant growth can be seen as we move from the warmer, drier habitats on the lower section of the trail to the cooler, wetter habitats on the upper section of the trail. The plants growing in these habitats are different collections of species, each suited to their respective habitats. |
| 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 interactions of organisms with their environments, both living and nonliving, are shared." | Native forest birds and snails are impacted by predation and rely on native plant communities for their survival. As native forest habitats decline or predator populations increase, native animal populations are likely to decrease. |
| 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 | "LS2.C: Ecosystem Dynamics, Functioning, and Resilience Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or | The forests of Pia Valley have changed over time in part due to human activity like ranching. Invasive strawberry guava forests now cover areas that would have once been |

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| | | | of an ecosystem affect populations. | biological component of an ecosystem can lead to shifts in all its populations." | home to native plants. Native species like our tree snails used to be found here in greater numbers but have declined due to the changing environment. |
| 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 systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary)" | Changing dynamics of the Pia Valley forests are a result of human impact. Invasive and native species compete for the resources of Pia Valley. This may mean loss of biodiversity as native plant and animal species become rare or disappear from this valley. Students may evaluate multiple solutions being used at this site: the designation of the are as a protected Natural Area Reserve, the installation of protective fences to keep hoofed animals out, the removal of invasive plants, the planting of native plants, or the use of biocontrol on strawberry guava. |
| 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 | Native species in Pia Valley, incluuding plants, snails, and birds, have been impacted by human activities, including the introduction of predators and disease carrying mosquitoes, as well as changes in climate. Students may design |

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| | | | | 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." | 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 natural resources impact Earth's systems. | "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 engineered otherwise." | Our native ecosystems are impacted by human activities like deforestation, introduction of invasive species, introduction of disease-carrying mosquitoes, 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 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 | Our native ecosystems are impacted by human activities like deforestation, introduction of invasive species, introduction of disease-carrying mosquitoes, and climate change. Students may evaluate the changes in stability of our ecosystems over time as human impacts have increased in Hawai‘i. |

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| | | | | ecosystems in terms of resources and habitat availability." | |
| 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, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. LS4.D: Biodiversity and Humans Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (see link for more) | Our native ecosystems are impacted by human activities like deforestation, introduction of invasive species, introduction of disease-carrying mosquitoes, and climate change. Students may evaluate the changes in stability of our ecosystems over time as human impacts have increased in Hawaiʻi. Students may design or evaluate solutions to these impacts, such as invasive plant removal, native plant restoration, installation of hoofed-animal fencing, installation of predator-proof fencing, reductions in mosquito population, or captive animal care. |

**Alignment with Nā Hopena Aʻo Statements**

| **Hopena** | **Statement** |
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| 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 |
| | b. Use Hawaiian words appropriate to their task |

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| 2. Strengthened Sense of Hawai‘i | 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** |
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| Aina Ulu: Growth Cycle | Kupu | Young and fresh learner |
| Kuana‘ike: Ahupua‘a | Kupu | Understanding the significance and importance of stewardship, systems and cycles |
| Honua: Pono | Hua | Advocates for living pono and contributes to aina well-being |