Mālama ʻāina: It's our kuleana!

Forest Management

Grades 5-12 **Meet Kīlauea Visitors Center** **9:30 - 11:30 a.m.**

***Nani i ka ʻōhiʻa ka ʻōiwi o Kīlauea*. (The body of Kīlauea is beautified by ʻōhiʻa trees.)**

***He aliʻi ka ʻāina, he kauā ke kanaka*. (The land is chief, man is its servant.)**

Introduction

Island ecosystems such as those found in Hawaiʻi, are very susceptible to damage caused by humans and the **alien** (non-native) plants and animals they bring with them. More **native species** have been eliminated in Hawaiʻi than anywhere else in the United States and in most places of the world. While **habitat loss** has caused extinction and endangerment, non-native species have also contributed to major ecosystem damage and are now the main cause of loss of **biodiversity** in Hawaiʻi. We are all the **stewards** (caretakers) of the ***ʻāina*** (land) and it is our ***kuleana*** (responsibility) to ***mālama*** (protect and care for) it.

Essential question:

What is ***mālama ʻāina*** and why is it important to the future of our native forests?

Photo Analysis:

Compare what you see in these photos.

Setting the Stage: The problems with non-native species in Hawaiʻi are the most severe among our 50 states. Federally significant resources are at stake, including prime national park and forest areas, and Hawaiʻi is home to a third of the nation's endangered species. In order to help our forests we need to understand what makes a healthy forest, so that our forests can thrive and be sustainable for many generations to come.

Brainstorm: What does a healthy native forest look like?

(By definition; a healthy forest is a balanced, bio-diverse ecosystem that is resilient to harmful factors, has a balance of new growth and morbidity (death) and has climate stability.)

Determining the Facts:

The loss of plant and animal species in our islands has been staggering. What remains occupies only a small fraction of what their former distribution was just two hundred years ago. Much of the loss has been due to non-native invaders, which are particularly troublesome in island habitats where native species don't have strategies to protect themselves against non-native newcomers and other threats.

Brainstorm: What are the major threats to the native plants and animals of Hawaiʻi?

Alien introductions—Himalayan ginger, Morella faya, mongoose, feral cat, ungulates.

1. What invasive species are prevalent in Hawaiʻi Volcanoes National Park and what damage can they cause?

(Himalayan ginger, Morella faya, alien grasses, feral pigs, Himalayan raspberry, mongoose, feral cats, and mosquitoes are examples. In short, they crowd out or in one way or another destroy native species.)

2. How could Global Warming and Climate Change threaten our forests?

Trees are our best natural defense against carbon dioxide based global warming. They not only produce the oxygen we breathe, but also absorb huge amounts of the carbon that is contributing to global warming!

Also, if climate changes take place, some species of plants and animals might need our help to relocate/migrate to more hospitable areas – here in Hawaiʻi Volcanoes National Park that would probably mean out-planting at higher elevations (move, adapt, or die). We need to also determine whether different varieties of native plants might have a better chance of surviving the changing conditions. Other considerations for our native forests include the threat of mosquitoes migrating to areas that were once too cold for them (though certain species of bird are beginning to adapt to mosquito-borne disease).

We know that many species of native birds are very susceptible to avian malaria and avian pox, which can be transmitted by mosquitoes. In addition, warmer and/or drier conditions could lead to insect infestations that could destroy trees and plants that have already become weakened by drought and heat. In other words, our Hawaiian forests could become **endangered** or **extinct.)** So, what can each one of us do? *Eliminate mosquito breeding areas. Reduce CO2 emissions.*

3. How do volcanic eruptions threaten our native forests?

(Native trees like the ʻōhiʻa lehua have had to make special adaptations to survive with poisonous sulfuric gases emitted by volcanic activity. ʻŌhiʻa is one of our most common and special native trees. The underside of their leaves have stomata (like pores on our skin) which close when vog is present. In severely affected areas other plants will die. In addition, lava covers and/or burns any forests that are in its' path. It takes many years for forests to re-grow to a full scale. This forest is only a little over 200 year old.)

Vocabulary - *Words to know have been underlined and bolded throughout the lesson:*

Alien species, habitat loss, biodiversity, native species, invasive species, extinct, endangered, stewards, *mālama ʻāina, kuleana*.

Determining the Facts: Learning from Traditional Knowledge

Our ***kūpuna*** (singular is ***kupuna***) were keen observers of their environment. They worked in harmony with the land. This means that they gathered only what they needed; they were scientists and conservationists in their time. The work we do today is something you can do in your backyard.

The land we walk on today is a result of the eruptions of Pelehonuamea (Pele). The nutrients provided by the ash from the 1790 eruption of Halemaʻumaʻu that blanketed this area as well as decomposing forest material, contribute to the health of this forest. Palapalai is a kinolau; a body form of Pele. ʻAmaʻu is a kinolau for Kamapuaʻa - a husband of Pele that could be a handsome young man, a pig, a fern and a fish (humuhumunukunukuapuaʻa).

Moʻolelo

One version of a story of these two deities speaks of when Kamapuaʻa travelled to Kīlauea to profess his love to Pele. He appeared as a handsome young man, but in the eyes of Pele, she saw the face and of tail of a pig! Pele was not interested and insulted him with, "you are not a man, you are just a pig!" Kamapuaʻa proceeded with his own insults by calling Pele an old hag. This started the battle between the two deities which continued on for a long period of time. Pele fought with all the forces of her nature; fire, lava, fire fountains, and rivers of lava. Kamapua'a called upon the forces of the winds and rains. Each deity tried to outdo the other. In an attempt to escape the fires of Pele, Kamapua'a changed himself into his kinolau of the 'ama'u fern and surrounded Kilauea thus giving it the name Halemaʻumaʻu; fern house. Hiʻiakaikapoliopele is the youngest sister of Pele carried to Hawaiʻi as an egg. She heals the forest with new growth from seed banks left in nearby kīpuka. The puʻulena winds of Kilauea help to spread the spores and small seeds which grow the new forest on lands devastated by Pele.

Scientific Evidence: *Check prior knowledge.*

How plants and animals came to these isolated islands is an exciting story. The few creatures that reached Hawaiʻi before human influence had to travel over thousands of miles of open ocean by floating, being carried by the wind, or being carried by birds. The Hawaiʻi that these plants and animals first inhabited was composed of remarkably diverse habitats. Over time, and in near complete isolation, some 11,000 species are believed to have evolved from roughly 2,000 ancestors that arrived during a 70-million-year period. That's an average of about only one new species every 35,000 years!!

Today, in contrast, 20 to 50 new non-native (alien) species arrive in Hawaiʻi *every single year*. Few visitors realize that the lush vegetation and colorful flowers they marvel at in the lowlands are often not native to the islands but are instead part of a diverse collection of non-native invaders. Many of these pose major threats to the native landscape of Hawaiʻi.

How do alien species threaten native forests: Non-native plants and animals take life-giving sunlight away from native plants, fight for space, change soil composition so that native plants no longer have the ability to thrive, and deprive the natives of needed moisture! These factors cause the natives to die out, making room for the aliens to take over the ground space. This will result in the extinction of many native plants as well as the native birds and insects that depend on them.

Visual Evidence: **Field Activity**

Follow the ranger's instructions for ***mālama ʻāina*** in the park by aiding in the removal of alien species from the native forest.

(Procedures for Ranger: Demonstrate how to eradicate ginger by the use of safe tools, proper green waste disposal and clean-up procedures, then direct students to a suitable area for removal. Leave plenty of time for closing and clean-up. Tools must be cleaned.)

Supplies:

4-One meter PVC plots

4-Tape measure

4-Pole

4-loppers

4-shovels