



Rain Forest Module



You are here.

● ● ● What Does the Rain Forest Zone Mean to You?

These reflections are offered by individuals involved in studying and protecting the native ecosystems of Haleakalā.

I like listening to the native birds there. The first time I saw an *'i'iwi* sipping nectar from a ruby-red *lehua* blossom, I held my breath because I thought that if the *'i'iwi* heard me breathing hard with excitement, it would be disturbed by my loud noise and fly away.

—Kalei Tsuha

Everything covered with ferns, mosses, and plants growing on plants

—Kim Martz and Forest Starr

Here are the elements and senses of life, the musty wet vapor in all her states:

Lilinoe—a cool caressing mist, at times opaque and others rainbow-hued.

Hu'ihu'i—frosty icicles exuding the spectrum of color from leaves of red and green.

Ka wailele—the trickle and rush of a stream cascading over waterfalls.

—Eric Andersen



Illustration: John Dawson

Noho Ana Ke Akua

*Noho ana ke akua i ka nāhelehele
I ālai 'ia e ke kī'ohu'ohu
E ka ua koko
E nā kino malu i ka lani*

Malu e hoe

*E ho'ōulu mai ana 'o Laka i kona
mau kahu
'O mākou, 'o mākou no a*

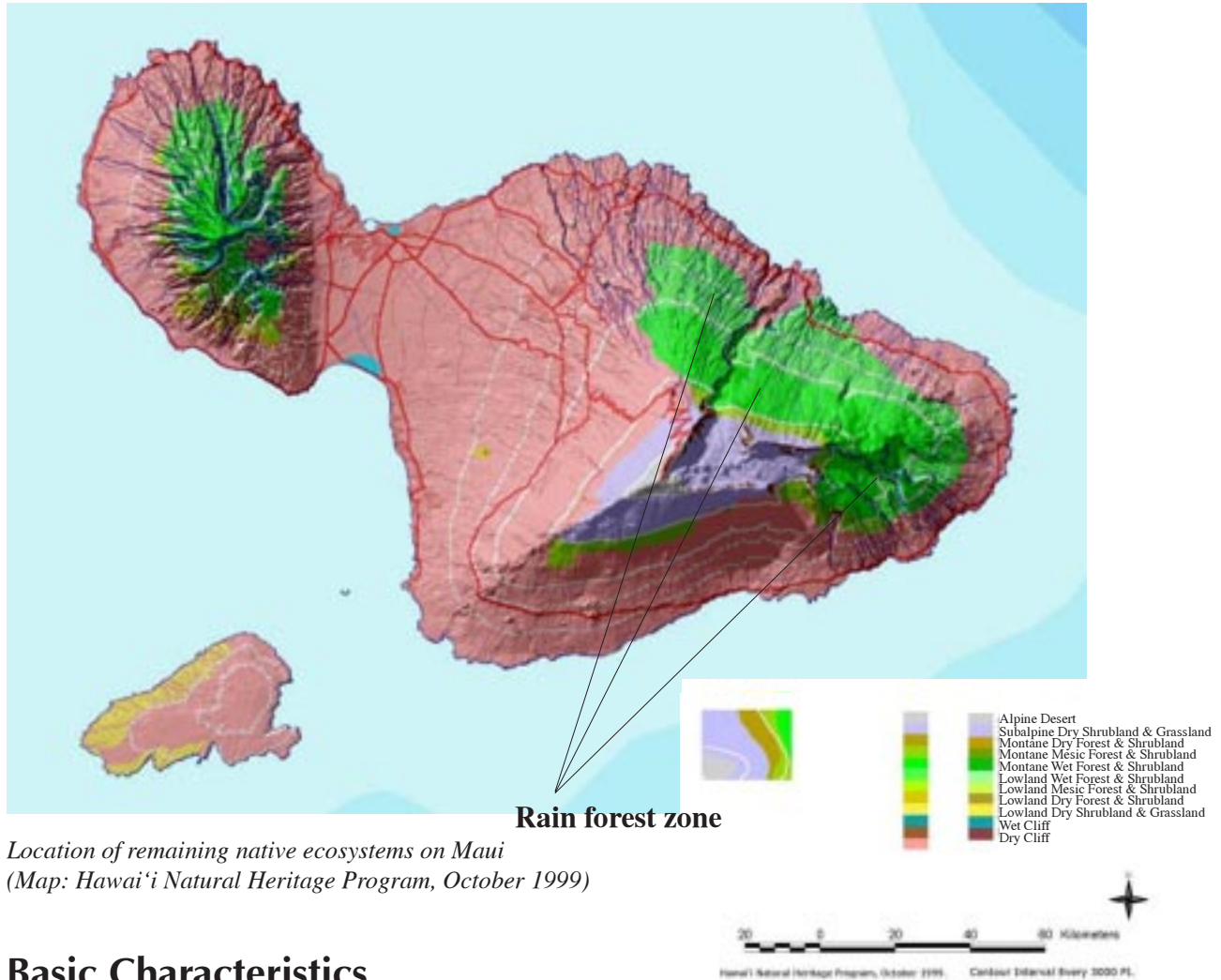
The Gods Dwell

The gods dwell in the forest
Hidden by the mists
By the low lying rainbow
O beings sheltered by the
heavens
Clear our paths (of all that may
trouble us)
Laka will inspire and enrich her
devotees
That's us, us indeed



● ● ● **Ecosystem Summary**
Where on Haleakalā?

Located between 600 meters (1968 feet) and about 1900 meters (6232 feet) elevation on the windward slopes of Haleakalā.



*Location of remaining native ecosystems on Maui
 (Map: Hawai'i Natural Heritage Program, October 1999)*

Basic Characteristics

Rainfall in this zone is over 200 centimeters (80 inches) per year. A continuous canopy layer covers lower subcanopy trees and understory trees and shrubs, and a ground cover layer of herbs and ferns. Epiphytes and climbing vines and shrubs are common.

Unlike other parts of the island, there is not a distinct dry period during the year. Rain normally falls year-round as a result of moisture-laden northeast trade winds that predominate for most of the year.

Did You Know?

In some parts of the Haleakalā rain forest, rainfall can exceed 1000 centimeters (390 inches) per year. The highest rainfall ever recorded in the Haleakalā rain forest was at Kīpahulu Valley in 1994 when a rain gauge measured 14 meters (551 inches) of rain in a single year!

Sixty billion gallons of surface water per year from this part of East Maui already provide much of Upcountry and East Maui drinking water and most of the irrigation water that goes to the Hawaiian Commercial & Sugar Company in Central Maui.



Status and Threats

The native Hawaiian rain forest on Haleakalā once extended from just above the coast up to approximately 2500 m (8200 ft). Much of the lower-elevation rain forest has been extensively altered by cultivation, logging, and introduced plant and animal species. The upper rain forests are a refuge for many species of native birds, insects, and plants. Much of the remaining native rain forest on East Maui is designated as national park, private preserves, and state natural area reserve and forest reserves.

Threats to native rain forest communities include Axis deer, mongooses, black and Polynesian rats, and mice; feral pigs, goats, and cats; nonnative slugs; a number of introduced, invasive plants; and diseases that threaten native birds. These introduced species prey upon and compete with natives, degrade habitat, and restrict the range of many native species to smaller and smaller areas.

● ● ● Traditional Hawaiian Significance

In the traditional system of dividing the Hawaiian Islands into political regions, the *ahupua'a* was the most important land division. *Ahupua'a* usually extended from the mountains to the outer edge of the reef in the ocean, cutting through all of the major environmental zones along the way. Each *ahupua'a* encompassed most of the resources Hawaiians required for survival, from fresh water to wild and cultivated plants, to land and sea creatures. Because of their dependence on the land's resources, the Hawaiians developed a complex system of resource management and conservation that could sustain those resources over time. This system was tied intimately to the religious and cultural beliefs of the Hawaiian people.

In Hawaiian tradition, the upper reaches of the native rain forest were *wao akua*, the realm of Kū, god of war, governance, and upright growth. Humans could only enter this sacred area for specific purposes and with permission from the gods. Below the *wao akua* is the *wao kānaka*, where people lived, worked, and cultivated their crops.

Among those who were allowed to enter the *wao akua* were the skilled *kia manu* (bird catchers). Colorful feathers from native forest birds were fashioned into *lei*, capes, and ceremonial helmets for the *ali'i*. The trained *kia manu* captured birds, plucked the desired feathers, and then released the birds.

Rain forests were also the source of *koa* logs and other wood necessary for making traditional canoes. From the rain forest came plants used for fiber, weaving, *kapa* cloth, and medicines.

In the lower-elevation *wao kanaka* area of the rain forest, *kalo* or taro was grown as a food staple, planted along streams and drainages where it would grow naturally. Today, *kalo* continues to be an important part of the culture of Hawai'i.

The ancient Hawaiians depended upon the rain forests for food, clothing, medicine, transportation, and building materials. They realized that their physical and spiritual well-being depended upon perpetuating these resources and maintaining a respect for the land.



● ● ● Journal Ideas

Use some or all of the following topics for student journal entries:

- Listen to the chant. How would you describe the feeling of the chant? What did it make you think about?
- Listen to the English translation of the chant. Do you have different thoughts and feelings now that you know what this chant means in English?
- Have you ever been to the rain forest? What are your impressions of this area?
- What comes to mind when you think about the rain forest? What are your memories or observations of this ecosystem?

● ● ● To Get a Feel for the Rain Forest Zone

The “Rain Forest Slide Show” (Unit 2, Activity #1 “Rain Forest Slide Show”) helps students visualize the rain forest and learn about basic human connections to and impacts on the Haleakalā rain forest. You may use it as an introduction for any unit or activity if you are not using Unit 2.



● ● ● Rain Forest Units at a Glance

Unit 1

Why is the Rain Forest Wet?

Subjects

Climate of the rain forest

The relationship between rainfall, intact rain forest, and human water supply

Importance

Climate is a key factor in shaping the environmental conditions of the rain forest. Water is one of the defining features of the rain forest, with high levels of rainfall and humidity the norm year-round. And the rain that falls on the rain forest is also an important source of water for human use.

Activities in this unit

- **Climate Connections**
Students identify signs of the importance of climate and weather in traditional Hawaiian society and in their lives. They use Hawaiian descriptions to help them describe the climate of a familiar location.
- **Why Does It Rain on the Rain Forest?**
Working with maps, students identify and explain weather patterns that influence the location of the rain forest on Haleakalā and the environmental conditions within it.
- **Rain Forest on a Budget**
Students create a water budget for the Haleakalā rain forest and hypothesize about how changes in the rain forest structure might affect it. They simulate these changes on a rain forest model to test their hypotheses.



Unit 2

Rain Forest Relationships

Subjects

Native plant and animal species and relationships
Structure of Hawaiian rain forests

Importance

Hawaiian rain forests are among the richest of Hawaiian ecosystems in species diversity, with most of the diversity occurring close to the forest floor. This pattern distinguishes Hawaiian rain forests from continental rain forests, where most of the diversity is concentrated in the canopy layer.

Activities in this unit

- Rain Forest Slide Show
Students learn about the Haleakalā rain forest by watching a slide show and writing about their feelings about the importance of preserving native rain forests.
- Rain Forest Species Research
Students research a native rain forest species, finding and presenting information about it in an educational and attractive format.
- Rain Forest Species Presentations
Students present information about native rain forest species.
- Rain Forest Trivia
In teams, students demonstrate their knowledge of rain forest species.



Unit 3

Rain Forest Birds: A Study in Adaptation

Subjects

Native birds

Adaptive radiation and evolution

Importance

Surviving native bird species and the growing fossil record present plenty of evidence for the remarkable diversity of bird life that evolved on the Hawaiian islands. But human pressures have altered and continue to alter the natural dynamics of evolution.

Activities in this unit

- **Win, Lose, or Adapt Game**
Students play a game to develop a basic understanding of the process of adaptive radiation, the effects of habitat loss and competition for food, and the concepts of feeding “specialists” and “generalists.”
- **Adaptive Radiation in Hawaiian Rain Forest Birds**
Through a homework reading, questions, and class discussion, students learn about adaptive radiation in Hawaiian honeycreepers.
- **Rain Forest Birds Research Projects**
Students select a topic related to native Haleakalā rain forest birds and conduct an independent research project on that topic.



Unit 4

Bogs, Pigs, and Scientists

Subjects

Montane bogs
Feral animal damage, protection, and ecosystem recovery
Field botany skills

Importance

Montane bogs are an important habitat for native rain forest plant species. Beginning in the 1970s, damage caused by feral pigs prompted protective measures for many bogs, and created opportunities to study the recovery of these native plant communities.

Activities in this unit

- **Small Wonders: Bogs in the Haleakalā Rain Forest Slide Show**
Students watch and discuss a slide show to learn about montane bogs and the threats that feral pigs pose to this unique habitat within the Haleakalā rain forest.
- **Bogs and Pigs Don't Mix**
Students read about Greensword Bog and the damage that feral pigs did to the native plant community there. A reasoning activity helps them identify the main threats that pigs pose to rain forest ecosystems including bogs. Students also read about vegetation monitoring at Greensword Bog and analyze data from that study.
- **School Grounds Vegetation Survey**
Students conduct a survey of vegetation on school grounds, using methods similar to those used by researchers studying the Haleakalā bogs.



Unit 5

Weed Warriors

Subjects

Invasive plants and control measures

Values and decision-making

Importance

At least 100 of over 10,000 plant species that have been introduced to the Hawaiian Islands pose a threat to native Hawaiian ecosystems. Resource managers are concerned about these potential invaders, but some people see certain non-native plants in a different light. Differences in values and perspectives sometimes make decisions about invasive plant control difficult.

Activities in this unit

- *Kāhili* Ginger Values and Perspectives
Students role-play different perspectives about a nonnative plant species and a proposal to ban the propagation and sale of this plant in Hawai‘i. They explore different types of values and consider how those values might affect people’s decisions and actions.
- What Makes a Plant Invasive?
Students learn about invasive plant characteristics and how those characteristics influence management decisions by completing homework reading, questions, and a class discussion.
- Managing Invasives on Survivor Island
Students apply knowledge and information about invasive plants to a management scenario.



● ● ● Optional Field Activities

Getting students out in the field puts them in direct contact with the ecosystem and gives them a context for learning. These are excellent supplements to the classroom-based activities of the rain forest module, giving students the excitement and challenge of hands-on experiences. Here is a listing of resources for field trips and other extensions.

Field Trips

Waikamoi Preserve

Rose Gardner Memorial Boardwalk or Bird Loop Hike

Description

Naturalist-guided hikes

Boardwalk Hike

Students walk through a plantation of introduced pine and eucalyptus species into intact native rain forest with a guide from The Nature Conservancy. Students will see native plants and vegetative layers of intact rain forest and common native forest birds as well as possibly the endangered 'ākohekohe and Maui parrotbill. The guide will help students compare the native forest with the plantation forest, and teach them about management activities being used to protect the rain forest.

Bird Loop Hike

Students walk through native and introduced forest vegetation looking for common native forest birds. The guide will teach students about management activities being used to protect the rain forest.

You may end either hike by eating lunch at the picnic tables at Hosmer Grove.

Field Trip Time

9 a.m. to 12 or 1 p.m. (not including lunch or travel time)

Cautions

The weather in the rain forest is most often cool and overcast, but it may also be rainy, windy, or even warm and sunny.

What to Bring

- Rain gear, including a hood or hat
- Dress in layers to accommodate a range of weather conditions. At an elevation of 7,000 feet, this hike can be chilly even in the summer.
- Shoes with good traction (not slippers) that will have good footing in muddy conditions
- Water and a lunch or snacks
- Optional: Camera, binoculars

Group Size Limits

The usual group size limit is 20 people. Larger groups can be accommodated with special arrangements.

**Contact**

The Nature Conservancy—Maui Field Office, 572-7849

Make arrangements at least three months in advance. Parents must sign waivers for students under 18 years of age.

Fees

A donation is requested but not required. The park entrance fee is waived for educational groups doing a hike with The Nature Conservancy.

Getting There

These field trips begin at Hosmer Grove in Haleakalā National Park, about an hour and a half drive from Wailuku.

Ke‘anae Arboretum

Description

Short, unguided walk

Students walk approximately one mile roundtrip through a lush tropical valley planted with native and nonnative plants. In the nonnative plants section, students will see marked plantings of bamboo, palm trees, heliconia, ginger, and other nonnative species. Students will see many varieties of native and Polynesian-introduced plants, such as hibiscus, *ti*, and breadfruit. There are also plantings of different varieties of dryland and wetland taro.

Field Trip Time

One to one and a half hours (not including lunch or travel time)

What to Bring

- Rain gear, including a hood or hat
- Shoes with good traction (not slippers)
- Water and a lunch or snacks
- Mosquito repellent
- Optional: Camera, binoculars

Group Size Limits

None for noncommercial groups

Contact

Inform the Hawai‘i Department of Land and Natural Resources, Division of Forestry and Wildlife office of your field trip plans so field staff are aware that you are a school group and not a commercial group. The number is 984-8100.

Fees

No fees



Getting There

Enter the Ke‘anae Arboretum on foot through a marked gate off the Hāna Highway, 35 1/2 miles (about an hour drive) from Wailuku. You may want to stop and use the restrooms at Kaumahina State Wayside, about six miles before the arboretum. Park the bus or your vehicles in one of the wide turnouts on either side of the highway at the arboretum gate.

Connecting Your Field Trip to the Rain Forest Module

Here are some ideas for student assignments that link the field trips (especially those to Waikamoi Preserve) to the classroom activities of the rain forest module:

- Have students take photographs or make sketches that show the five main vegetative layers of the native rain forest (groundcover or forest floor, understory, subcanopy, canopy, and epiphytes and climbing plants). See Rain Forest Unit 2, Activity #3 “Rain Forest Species Presentations” for an explanatory diagram (p. 43).
- Have students bring their plant and bird species cards from Rain Forest Unit 2, Activity #2 “Rain Forest Species Research,” and look for these species in the field.
- Have students make journal entries that reflect what they learned about management activities designed to protect the rain forest, how and why the nonnative species they saw were introduced, or differences they observed between the native rain forest and the introduced vegetation that has replaced it.

Extensions

Take a Hike

Individual students or small groups may join regularly scheduled hikes to Waikamoi Preserve by The Nature Conservancy or Haleakalā National Park. Park hikes are scheduled for Mondays and Thursdays, and The Nature Conservancy hikes take place on the second Saturday of each month. Contact The Nature Conservancy at 572-7849.

Join a Work Trip

The Nature Conservancy has regular work trips scheduled for the third Saturday of each month. Small groups of up to eight students can volunteer to do trail maintenance or invasive species control on one or more of these work days by calling The Nature Conservancy at 572-7849.

To make arrangements for a larger group or specialized service projects, contact The Nature Conservancy at 572-7849. You may be able to arrange a work day or overnight trip including “roughing it” in tents at high elevations. As with the regularly scheduled work trips, students would volunteer to do trail maintenance or invasive species control.



Volunteer to Maintain Trails

The Hawai'i Department of Land and Natural Resources *Na Ala Hele* Trails and Access Program organizes volunteer trail maintenance opportunities. Individuals or groups of students over age 14 are welcome to volunteer. Trail maintenance takes place in a variety of forested and coastal areas. Call 873-3509 for information about upcoming volunteer opportunities.

Adopt a Fence

Your class or school may volunteer for service projects through the Adopt-a-Trail and Adopt-a-Fence programs at Haleakalā National Park. You will be responsible for maintaining a specific stretch of trail or fence under this program. Find out more about these programs and other volunteer opportunities for individuals and small groups by contacting the park volunteer coordinator at 572-4487 or <HALE_VIP_Coordinator@nps.gov>.