

Alpine/Aeolian Module



You are here.

● ● ● What Does the Alpine/Aeolian Zone Mean to You?

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

House of the sun, house of the snow
Silverswords

—Kim Martz and Forest Starr

From here, one can only look up to the heavens, to the edge of our existence. Every day, for those who inhabit this ecosystem, the edge of life and death is as razor-thin as the distant horizon. Here, two worlds can collide: The warmth of the sun and the fire of the Earth!

—Eric Andersen

Sacred elder, the *piko* of East Maui
The wind blowing my hair

—Kalei Tsuha

Looking up at Red Hill or gazing down into that vast expanse of the “crater,” it’s easy to get the impression that the place is lifeless. There is more than meets the eye in this great depression of Haleakalā. The more you look, the more you see.

—Betsy Gagné



Photo: Sharon Ringsven

Mele Ho'āla

*E ala e!
Ka lā i ka hikina
I ka moana
Ka moana hohonu
Pi'i i ka lewa
Ka lewa nu'u
I ka hikina, aia ka lā
E ala e!*

Wake up!
The sun is in the east
In the ocean
Down deep
It climbs upward
To the spacious realm above
Eastward is the sun
Wake up!

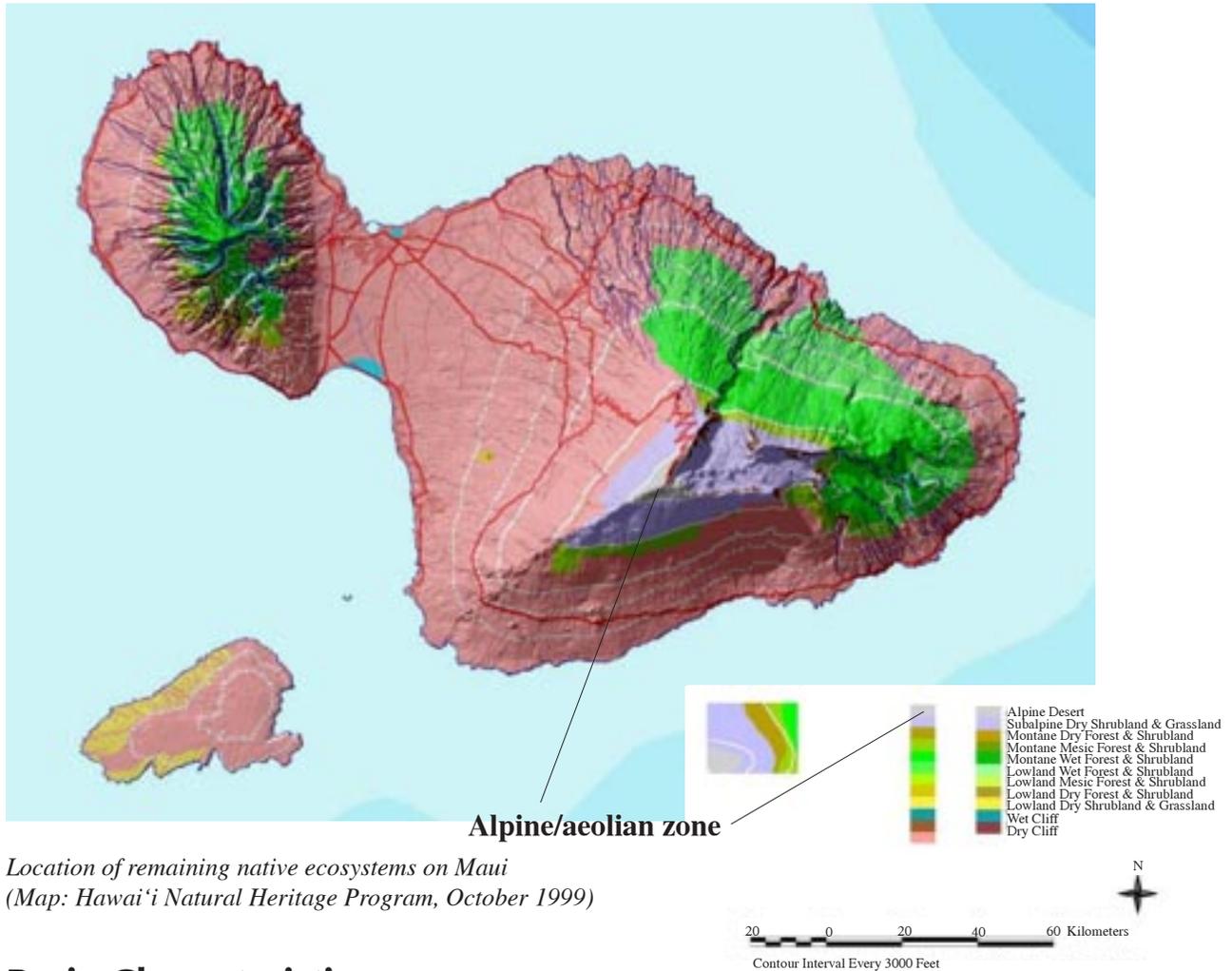
*Pua Kanahale
1992*



● ● ● Ecosystem Summary

Where on Haleakalā?

The alpine/aeolian ecosystem is located above 2300 meters (7544 feet) elevation in the cinder-dominated summit basin; above 2600 meters (8528 feet) on the older western, outer slopes of the summit basin. It extends to the summit at 3056 meters (10,023 feet).



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

Basic Characteristics

This high-altitude region is characterized by sparse vegetation (generally 0-5% cover), scarce food sources for insects and other animals, generally dry conditions, and an extreme climate with widely varying daily temperatures and intense solar radiation.

Did You Know?

“Aeolian” is a term first used in 1963 by L.W. Swan to describe communities of insects that survive on high-elevation landscapes of snowfields and barren rock. These systems, where little vegetation grows, are fueled primarily by organic matter blown in on the winds. These systems are appropriately named after Aeolus, Greek god of the wind.

On Haleakalā, a unique collection of arthropods (the family that includes spiders, insects, and centipedes) has evolved to take advantage of the insect life and plant matter that is blown in by the upslope winds.



Status and Threats

The alpine/aeolian is perhaps the most intact ecosystem type on Maui. Most of its historic extent has been maintained through more than 1500 years of human contact. Until recently, this environment has been little influenced by nonnative species, and the native insect fauna is still nearly intact.

For many years, vegetation in this zone was damaged by feral goats. Much vegetation has recovered following the erection of protective fencing and the removal of the goats.

Ants, rodents, and nonnative parasitic insects threaten native insects and the plants with which they coexist. Careful management of the increasingly popular Haleakalā National Park (which encompasses 50-60 percent of the alpine/aeolian ecosystem on Maui) is necessary to protect this nearly intact system, since human activities tend to expand the range of nonnative species. Activities linked with observatories and communications structures in the summit area must also be managed carefully.

● ● ● Traditional Hawaiian Significance

Keen observers of the islands' natural communities, early Hawaiians identified twelve life zones that stretched from *makai* to *mauka*. Haleakalā and the surrounding ocean encompass all of these zones, many of which have been dramatically changed by human use. At the top of Haleakalā, however, are two zones where the natural communities are still largely intact—the *kuahiwi* (backbone) and *kuamauna* (back mountain). These zones comprise what we know as the alpine/aeolian ecosystem.

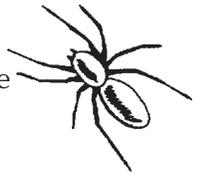
In the traditional system of dividing the Hawaiian Islands into political regions, the *ahupua'a* was the most important land division. *Ahupua'a* usually extended from these upper reaches of the mountains to the outer edge of the reef in the ocean, cutting through all of the major environmental zones 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 mountain are the sacred House of the Sun (a literal meaning of Haleakalā), where every day begins. Today, people still visit the summit just to see the moment when the sun rises above the distant horizon. This is the place where the demigod Māui snared the sun to slow its passage across the sky and make it easier for his mother to dry her *kapa* cloth.

At the height of Hawaiian society, this gathering place of the gods was visited by few people. *Kāhuna*, Hawaiian spiritual leaders and elders, went there for meditation and to receive spiritual information. The *kilo hōkū* (astronomers) brought young men training to be navigators up the mountain to teach them about the sky and the stars. Important people were buried up there, and there is a place where people buried the *piko* (umbilical cords) of their babies.

Hawaiians constructed shelters in the summit area, but no one lived there. Workers came to quarry rocks for making adzes and other tools. Hunters came to hunt 'ua'u (petrels) for food. Travelers sometimes passed through while crossing from one side of the island to the other and perhaps stopped to collect a gift such as a bird feather before continuing on.

Before going to the summit of Haleakalā, Hawaiians had to ask permission from human authorities and from the gods. Among those who were given permission to enter this sacred place were men who quarried basalt rock for making adzes and other tools. Today, many Hawaiians continue to pray for permission before they go to the summit. This area is no less sacred today than it was in times past.



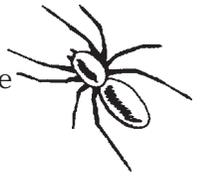
● ● ● Journal Ideas

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

- Listen to the chant as it is read in Hawaiian. 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 top of Haleakalā? What are your impressions of this area?
- If you haven't been to the summit, whom do you know who has been? What do you think that person saw and felt like up at the top of Haleakalā?

● ● ● To Get a Feel for the Alpine/Aeolian Zone

The Living in the Extremes slide show (Unit 3, Activity #1 “Alpine/Aeolian Challenges and Adaptations”) helps students visualize the alpine/aeolian ecosystem. You may use it as an introduction for any unit or activity.



● ● ● Alpine/Aeolian Units at a Glance

Unit 1

Learning from the Mountain

Subject

Geology of the summit area and how people study it

Importance

The geological features of the summit area help shape the conditions under which life survives in the alpine/aeolian zone.

Activities in This Unit

- **Haleakalā Past and Present**
Students study the origin of Hawaiian volcanoes, including Haleakalā, and relate the history of these volcanoes to present conditions in the alpine/aeolian ecosystem.
- **Haleakalā Detective Work**
Students learn how geologists apply the scientific method to posing and answering questions about the past and future of Haleakalā and describe examples of hypothesis creation and testing.
- **The Dating Game**
Students play a game in which they demonstrate their knowledge of the geology of Haleakalā and proper visitor behavior in the alpine/aeolian ecosystem.



Unit 2

Summer Every Day and Winter Every Night: Climate and Conditions in the Alpine/Aeolian Zone

Subject

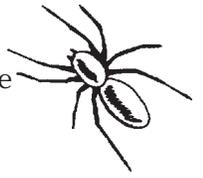
Climate of the summit area

Importance

Climate is a key factor in shaping the environmental conditions to which life in the alpine/aeolian zone is adapted.

Activities in This Unit

- **What's the Temperature at the Summit?**
Students predict the temperature at the summit of Haleakalā based on the current temperature at their school, and discuss possible explanations for differences between their calculations and the actual temperature.
- ***Mauna Lei* Mystery**
By investigating and learning about the climate conditions that form the *mauna lei*, or the layer of clouds that often rings Haleakalā, students learn about the environmental conditions of the alpine/aeolian ecosystem.
- **Summer Every Day and Winter Every Night?**
Students analyze temperature information available on the Internet to draw conclusions about the applicability of the statement “summer every day and winter every night” to the alpine/aeolian ecosystem.



Unit 3

Life in the *Kuahiwi* and *Kuamauna* Zones

Subject

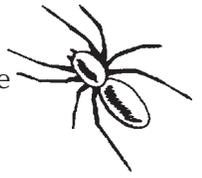
Native and introduced species, relationships, and adaptations

Importance

The small number of plant and insect species native to the alpine/aeolian zone have evolved together into natural communities that are among the least altered of any on Haleakalā. These specialized relationships are threatened by a growing number of introduced species.

Activities in This Unit

- **Alpine/Aeolian Challenges and Adaptations**
Students learn about plant and animal adaptations to the harsh alpine/aeolian environment through a slide show and a group activity.
- **Holding On to Water Lab**
Students perform an experiment in which they replicate alpine/aeolian environmental conditions and devise structural features that prevent desiccation.
- **Adaptations Game Show**
Students play a game to solidify and demonstrate their knowledge of environmental conditions in the alpine/aeolian ecosystem and how plant and animal life is adapted to these conditions.
- **Web of Life Game**
Students play a game to explore the similarities and relationships among species in the alpine/aeolian ecosystem.



Unit 4

Good Critters, Bad Critters

Subject

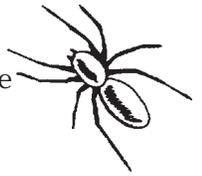
Insect management in the alpine/aeolian ecosystem

Importance

Relationships among insects and plants in the alpine/aeolian zone are only partially understood, but native insect pollinators are known to play a crucial role in plant reproduction. Invasions of alien insects threaten native insect populations and the native plants that depend upon them for pollination.

Activities in This Unit

- **To Spray or Not to Spray**
Students propose a response to a management dilemma that arose in 1968, involving protecting *‘āhinahina*, the Haleakalā silversword, from insect damage.
- **Ant Alert: How Does Invasion Threaten Natives?**
Students compare the invasive Argentine ant to other ant species to understand why the Argentine ant is such a potential threat to the alpine/aeolian ecosystem on Haleakalā. In teams, they teach each other about the threat Argentine ants pose.
- **Controlling the Argentine Ant**
Students propose ideas for controlling the spread of Argentine ants in Haleakalā National Park, compare their ideas to what’s already being done, and evaluate the efficacy of current control efforts.



Unit 5

Observatories, Transmitters, & Sacred Places: How Should the Summit Area Be Used?

Subject

A contemporary issue revolving around the significance and use of the summit area

Importance

People have many different perspectives about the importance of the summit area and which human uses are appropriate there. These perspectives and how they are expressed influence how the top of Haleakalā is used.

Activities in This Unit

- **Exploring the Importance of the Summit**
Students explore the significance of the summit area of Haleakalā from as many perspectives as they can think of, including its traditional Hawaiian importance and its suitability as a place for observatories.
- **In-Class Public Forum**
Students use existing points of view to develop testimony for an in-class “public forum” on an issue about the appropriate use of the summit area. Students also articulate their own perspectives on this issue.
- **What Goes On at the Observatories?**
Students perform Internet research to learn about the work that is being done in the observatories on Haleakalā.



● ● ● 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 alpine/aeolian 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

Haleakalā National Park

Sliding Sands Trail Hike

Description

Ranger-led or unguided hike

Students hike down the Sliding Sands Trail part-way into the summit basin. Students will see the sparse vegetation of the alpine/aeolian zone, the colorful cinder cones of the summit basin, and depending on the time of day, the cloud layers building up around the mountain. Wind up with a picnic lunch at Hosmer Grove.

You may combine this hike with a trip to the Haleakalā Visitor Center.

Field Trip Time

Two hours to a half day (not including travel)

Cautions

- At high elevations, the weather can change rapidly and may range in extremes from hot and sunny to cold, windy, and rainy.
- High elevations may complicate health conditions such as asthma.
- The Sliding Sands Trail is steep in spots with shifting footing, which can be strenuous at the high elevation. Allow approximately twice as long to hike back up as it takes to hike down.

What to Bring

- Dress in layers with warm clothes to protect against the wind and cold weather at the summit.
- Sunscreen and a hat
- Sturdy walking shoes (not slippers)
- Water and a lunch or snacks
- Optional: Camera

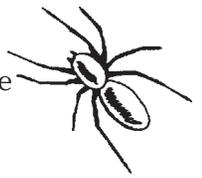
Group Size Limits

Ranger-led hikes, maximum group size of 40 people

Unguided hikes, maximum group size of 12 people including students and teacher

Contact

Call the Environmental Education Coordinator at 572-4453 to arrange ranger-led hikes and programs. Allow two to three months advance notice to arrange a ranger-led hike.

**Fees**

No fees for a ranger-led hike

For unguided hikes, apply two to three weeks in advance for a fee waiver from the Fee Supervisor at 572-4441.

Getting There

Begins in the summit area of Haleakalā National Park, about a two hour drive from Wailuku.

Haleakalā Visitor Center

Description

Unguided field trip

Take students to the Haleakalā Visitor Center near the summit of Haleakalā, and to the summit, where interpretive exhibits explain aspects of the geology and ecology of the alpine/aeolian zone. Students will see the sparse vegetation of the alpine/aeolian zone, the colorful cinder cones of the summit basin, and depending on the time of day, the cloud layers building up around the mountain. Wrap up with a picnic lunch at Hosmer Grove.

Field Trip Time

Two to four hours (not including travel)

Cautions

- At high elevations, the weather can change rapidly and may range in extremes from hot and sunny to cold, windy, and rainy.
- High elevations may complicate health conditions such as asthma.

What to Bring

- Dress in layers with warm clothes to protect against the wind and cold weather at the summit.
- Sunscreen and/or a hat
- Water and a lunch or snacks

Group Size Limits

None

Contact

Call the Environmental Education Coordinator at 572-4453 to discuss options for ranger-led programs or an introductory talk.

Fees

No fees for a ranger-led program

For unguided field trips, apply two to three weeks in advance for a fee waiver from the Fee Supervisor at 572-4441.



Getting There

This field trip begins in the summit area of Haleakalā National Park, about a two-hour drive from Wailuku. A full-size bus must stop at the Haleakalā Visitor Center and cannot go to the summit. Vans and cars are allowed in the summit parking lot.

Skyline Trail

Description

Unguided hike

Hike with students along the upper portion of the Skyline Trail past the Haleakalā Observatories and the proposed site of the coordinated broadcast facility. Students will see the sparse vegetation of the alpine/aeolian zone, the cinder cones of the Southwest Rift Zone (along which the most recent eruptions have occurred), and a landscape covered with red, gray, orange, and pink volcanic cinders interspersed with red and black lava bombs.

You may combine this hike with a trip to the Haleakalā Visitor Center.

Field Trip Time

Depending upon the length of your hike along the Skyline Trail, allow three to four hours for this hike and lunch (not including travel time).

Cautions

- At high elevations, the weather can change rapidly and may range in extremes from hot and sunny to cold, windy, and rainy.
- High elevations may complicate health conditions such as asthma.
- At high elevations, allow approximately twice as long to hike back up as it takes to hike down.
- Take care to stay on the main trail, avoiding the turnoffs to the scientific and broadcast facilities in the area. Staying on the trail is also important because exploring lava fields can be dangerous and because the few plants and insects that inhabit this high country are vulnerable to being crushed by hikers straying from the trail.

What to Bring

- Dress in layers with warm clothes to protect against the wind and cold weather at the summit.
- Sturdy walking shoes (not slippers)
- Sunscreen and/or a hat
- Water and a lunch or snacks

Group Size Limits

None for noncommercial groups

Contact

You should inform the 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.



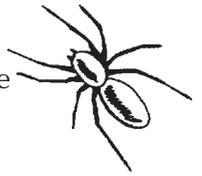
Getting There

The trail begins in the summit area of Haleakalā National Park, about a two-hour drive from Wailuku. Have the bus drop your group at the turnoff for Haleakalā Observatories and follow the road to the trailhead. Or park smaller vehicles at the summit and carefully walk back down the road to the turnoff. The Skyline Trail branches off from this road to the left (*makai*), a little past the National Park boundary sign.

Connecting Your Field Trip to the Alpine/Aeolian Module

Here are some ideas for student assignments that link the field trips to the classroom activities of the alpine/aeolian module:

- Take along the game board from Alpine/Aeolian Unit 1, Activity #3 “The Dating Game.” Have students see if they can locate sites on the game board from the various overlooks or interpretive exhibits.
- Have students identify characteristics of rocks they see along the trail. You may want to bring along a hand lens for this activity. (Do not break or remove rocks. Leave them in place for observations.)
- Take along photocopied sections of the roadway from a topographic map of Haleakalā National Park. Have students observe cloud patterns at different elevations and different times, or changes in vegetation patterns, and sketch their observations on the map.
- Have students identify plants they see in the summit area based on what they learned in Alpine/Aeolian Unit 3, Activity #1 “Alpine/Aeolian Challenges and Adaptations” and Activity #4 “Web of Life Game.”
- Using a topographic map and the background materials from Alpine/Aeolian Unit 5, Activity #2 “In-Class Public Forum,” have students locate the proposed site of the coordinated broadcast facility.
- Have students make journal entries reflecting their thoughts about the summit area, the Haleakalā Observatories and broadcast facilities, or the interpretive exhibits at the Visitor Center.



Extensions

Stay in the Wilderness

Take a group of students for an overnight stay at one of the wilderness cabins or campgrounds in Haleakalā National Park. Group size is limited to 12, including adults and students. Educational groups may reserve cabins and campground space up to six months in advance by sending a letter to Haleakalā National Park, P.O. Box 369, Makawao, HI 96768, Attn: Cabins. Submitting your request at least three months in advance increases the likelihood that your requested dates will be open. Call the park Environmental Education Coordinator at 572-4453 if you would like to arrange an educational program to accompany your visit.

Offer Volunteer Service

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.