



Activity #1

Small Wonders: Bogs in the Haleakalā Rain Forest Slide Show

● ● ● Class Period One *Bogs Slide Show*

Materials & Setup

- “Small Wonders” slide show (included with this curriculum)
- “Small Wonders” slide show script (pp. 6-8)
- Slide projector and screen

Instructions

- 1) Show and narrate the “Small Wonders” slide show.
- 2) Use the journal ideas as discussion questions, or have students work on them during the remainder of the class and as homework.

Journal Ideas

- Have you ever overwatered a houseplant or left it without enough sunlight? What happened? (If you’ve never done this, what do you think would happen?) Why would most types of plants have difficulty living in bog areas with heavy cloud cover, frequent fog, and standing water or soggy soils?
- Besides bogs, what are some other waterlogged habitats? Find pictures on the Internet or in magazines to illustrate some of these environments. How do they seem to compare with the bogs on Haleakalā?
- How would you feel if you were the person who discovered the pig damage in Greensword Bog? What would you want to do about it?
- Do you think it’s worth the effort to put up fences to keep pigs out of bogs and other parts of the rain forest and then to continually patrol and repair the fences? Why or why not?

Assessment Tools

- Journal entries
- Participation in class discussion



Slide Show Script

Small Wonders: Bogs in the Haleakalā Rain Forest

Slides #8 and #12: Jeff Bagshaw

All other slides: Betsy Harrison Gagné

- Slide 1 High in the rain forest on the northeastern flank of Haleakalā is a scattering of montane bogs. This is Mid Camp Bog, with the East Maui endemic greenswords in bloom. These plants are in the same family as the well-known *‘āhinahina*.
- Slide 2 In general, bogs sit on relatively level sites within an otherwise steeply sloping, deeply eroded rain forest terrain. They are apparently underlain by a compacted, relatively impervious layer that impairs drainage. This is Lake Wai‘ānapanapa, a freshwater lake surrounded by bog vegetation.
- Slide 3 Why do we call some vegetation “bog vegetation” even though it may grow along the shores of a lake, like Lake Wai‘ele‘ele. . .
- Slide 4 . . . or the banks of a stream like this one in the rain forest above Hāna?
- Slide 5 The type of vegetation that grows in bogs is adapted to a unique set of environmental conditions that are unfriendly to most other plants. These tussocks are dominated by the moss *Racomitrium lanuginosum*. This bog community occurs only on East Maui and only in areas with heavy cloud cover, frequent fog, and a clay substrate that is mostly impervious to water. In other words, only in bogs!
- Rainfall tops 400 inches per year in many of the montane bogs on Haleakalā. Much of the available moisture is a result of plants intercepting clouds, and the moisture they take directly from the clouds is called “fog drip.”
- Slide 6 This is Greensword Bog, and here is another bog plant common in bogs on East Maui and other Hawaiian Islands: *Oreobolus furcatus*. This plant is a “sedge,” a grass-like plant that grows in wet areas. What is the difference between a sedge and a grass?
- (Answer: Sedges have triangular stems and grasses have round stems. Some people like to remember this with the saying “Sedges have edges.”)



- Slide 7 Bogs provide habitat for the *pina'o*, the native Hawaiian dragonfly. This newly emerged dragonfly is perched on *Carex nealae*. What kind of plant is this? (Answer: It's a sedge.)
- The *pina'o* is the largest native Hawaiian insect and the largest insect found in the United States.
- Slide 8 One of the interesting characteristics of bog vegetation is that, unlike the giant *pina'o*, vegetation that grows in bogs tends to be dwarfed because of low levels of nutrients and oxygen in the bog's water-logged soil. Occasional winter frost and wind damage, and extended warm, sunny, drying periods are other challenges encountered by plants growing in montane bogs.
- What is this tree? (Answer: 'Ōhi'a.) 'Ōhi'a can grow to be quite a large tree in a forest environment.
- Slide 9 But in a bog, this is what 'ōhi'a looks like. It's dwarfed!
- Slide 10 Here's another tiny plant of the bogs, the Maui violet (*Viola mauiensis*). This plant is endemic to Maui and Moloka'i, and survives in only the most pristine bog areas.
- Slide 11 This is *Lobelia gloria-montis*, a Maui endemic, that grows at the drier edges of bogs, in the rain forest, and on ridge lines. Unlike its tinier bog companions, this species forms flowering spikes that can tower over ten feet tall. Like the Maui violet, it's a plant that's extremely vulnerable to disturbance.
- Slide 12 But what could be disturbing the bogs on East Maui and the unique plants, like this *Geranium hanaense* that is found only in East Maui bogs?
- Slide 13 Pigs. Feral pigs are currently the primary force damaging the remaining Hawaiian rain forest, including the bogs.
- Slide 14 Although pigs were brought to the Hawaiian Islands by Polynesians as early as the fourth century A.D., the current severe environmental damage inflicted by pigs apparently began much more recently and seems to have resulted from the release of domesticated pigs originally from European stock.
- This is Greensword Bog, and we saw a slide of this bog earlier when we were talking about sedges. The earlier slide was taken in 1974, when the bog was in nearly pristine condition. By 1981, here's what large parts of Greensword Bog looked like. This



damage was caused by feral pigs grazing on and uprooting the vegetation in search of grubs and introduced earthworms.

Slide 15

In order to protect bogs from pig damage—and to allow damaged bogs to recover—volunteers, National Park Service employees, and others have helped to fence many East Maui bogs. Here, Art Medeiros and Terry Lind help to fence a bog above Greensword Bog.

Once fences were erected around the bogs, the pigs had to be removed from inside the fences. And it's an ongoing job to patrol the fence lines, fix areas of broken fence, and make sure no pigs have slipped through the gaps.

Slide 16

After the pigs were fenced out, researchers began monitoring how the bogs recovered. This meant making extensive and regular observations of the plant life in the bogs.

Slide 17

Researchers are monitoring the regrowth of bog species such as this greensword (*Argyroxiphium grayanum*), the plant after which Greensword Bog was named. . .

Slide 18

. . . *Phyllostegia ambigua*, a fragrant mint found only in the wettest areas of Maui and Mauna Loa on the island of Hawai'i. . .

Slide 19

. . . and *Clermontia grandiflora*, one of 22 species in the Hawaiian endemic genus. It occurs only in the rain forest and margins of bogs on Maui, Moloka'i, and Lāna'i.

Slide 20

Keeping pigs out of pristine rain forest areas, as well as out of special areas such as the bogs, is one way that people are protecting Maui's unique plant and animal life for future generations. Fenced areas such as Greensword Bog provide an excellent opportunity to learn about how plant communities recover after disturbances, knowledge that may be applicable to the restoration of other natural areas in the future.