



Activity #1

To Spray or Not to Spray

● ● ● Class Period One *To Spray or Not to Spray?*

Materials & Setup

- Silversword image acetate (master, p. 7)
- Silversword species card from Alpine/Aeolian Unit 3, Activity #4 “Web of Life Game,” p. 30
- Overhead projector and screen

For each student

- Student Page “What Would You Decide?” (pp. 8-9)
- Student Page “Now You Know . . .” (pp. 10-11)

Instructions

- 1) Show the acetate of the silversword. Ask students if they know what it is. Once you have identified this plant as the *‘āhinahina*, or Haleakalā silversword, ask students if they have ever seen this plant or know anything about it. Use the notes on the species cards to raise interesting points about the *‘āhinahina* as the discussion progresses.
- 2) Divide the class into groups of three or four students.
- 3) Hand out the Student Page “What Would You Decide?”
- 4) Give groups about 20 minutes to read the scenario, discuss alternative courses of action, and agree on one.
- 5) Bring the class back together and discuss the scenario and group decisions for the remainder of the class period. Have student groups present their courses of action and explain their reasoning. Then draw out common themes by asking questions such as these:
 - a) How easy was it to come to an agreement about what to do?
 - b) What were some of the disagreements or different points of view that came up?
 - c) Do you have any doubts or uncertainties about the course of action you chose? If so, what are they? Why did you decide to take this course of action despite those doubts?
- 6) Assign the Student Page “Now You Know . . .” as homework. Note that students will need to take home their copies of the “What Would You Decide?” student page as well to complete this assignment.

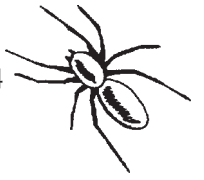
Journal Ideas

- Do you think it is important to protect native plants such as the *‘āhinahina* from possible extinction? Why or why not?
- Describe a decision you wish you could have changed later. What can you do to help make good decisions even if you don’t know what will happen in the future? How can resource managers use the same approaches to make good decisions about protecting native plants and animals?

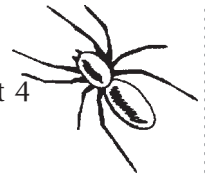


Assessment Tools

- Participation and conduct in small groups
- Participation in class discussion
- Student Page “Now You Know . . .”
- Journal entries



ʻĀhinahina (*Haleakalā silversword*) in bloom
(Photo: R. C. Zink, Haleakalā National Park)



What Would You Decide?

Take a trip more than thirty years back in time. The year is 1968. The superintendent of Haleakalā National Park has a tough decision to make.

Park staff members have become concerned about the damage that insects appear to be doing to ‘āhinahina, the Haleakalā silversword (*Argyroxiphium sandwicense* subsp. *macrocephalum*), one of the best-known plants in the park. Recent reports from an entomologist (a person who studies insects) and a park naturalist suggest that insects may be damaging the plants so that almost no seeds are produced.

‘Āhinahina was once so common in the summit area that many hillsides shimmered with the silvery plants, reminding visitors of winter or moonlit landscapes. In the late 1800s and early 1900s, visitors to the summit of Haleakalā would often collect the silverswords as souvenirs, uproot them for the fun of seeing the round plants bounce and roll down the cinder slopes, or dig them up for sale as garden plants.

Over the years, human vandalism along with browsing by domestic cattle and feral goats (free-roaming animals descended from domesticated goats that escaped or were turned loose) had reduced silversword numbers to a fraction of their former abundance. By the 1940s these problems were brought under control by the national park, but populations of this unique plant were not rebuilding as quickly as expected. Some populations even continued to decline.

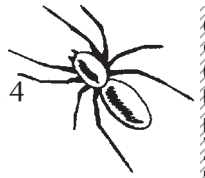
Now, with the news that insects appeared to be damaging the silverswords by eating the flowers and seeds, the superintendent is in a dilemma. Part of his job is to protect the native plants and animals found in the park. The silversword has become an important symbol of the park, recognized around the world. He wants to do everything in his power to make sure the ‘āhinahina survive.

There is a “pesticide” (substance toxic to pest insects or plants used to control their populations) that seems as though it could be effective on a range of insect species. This pesticide was used in the early 1960s on bushes around the observatories near the summit to control large concentrations of insects that sometimes interfered with the operation of the observatories. The insecticide appeared to be effective at killing insects on the vegetation and keeping them away for three to four months after each application.

Some people on the park staff say the superintendent should start a program for spraying the silverswords with this pesticide. They say this pesticide has a good chance of taking the pressure of insect predation off the silverswords and increasing their chances of reproducing.



Danny and a silversword
(Photo: Haleakalā National Park)



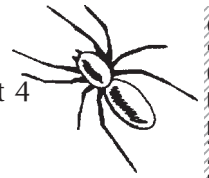
Other people on the park staff think the silverswords should not be sprayed. The silversword ecosystem includes several endemic insects (found only in Hawai‘i or only on Haleakalā) including flies, bees, moths, planthoppers, and beetles. These staff members believe there is too much risk of harming the native insect species that evolved along with the silversword.

Still other park staff members believe there needs to be more research before any decision is made. They point out that little is known about which insects are doing the most damage to *‘āhinahina*, what effect the pesticide would have on different insect species, and whether spraying would be effective at all. Furthermore, they say, there’s not enough evidence to prove that insect predation is actually decreasing the silverswords’ ability to reproduce.

Your Group’s Assignment

What do YOU think the superintendent should do?

- 1) Discuss with your group what you think the right decision would be and why.
- 2) Come to agreement on a course of action.
- 3) Be prepared to explain your reasoning when your group presents its decision to the rest of the class.



Now You Know . . .

Beginning in the 1970s, there was more attention given to research about *‘āhinahina* and their habitat. Researchers, mostly based at the University of Hawai‘i and at the park, have added greatly to our knowledge about these magnificent plants. Here is some of what’s been learned about silverswords and insects since 1968.

- In 1973, botanist Herbert K. Kobayashi completed an extensive study of silversword ecology in the Haleakalā summit basin. Part of his research focused on the relationship between *‘āhinahina* and insects that have been observed causing damage to the plants. In his report, he points out three considerations that counter the commonly held view that insects are a main cause of declining silversword populations:

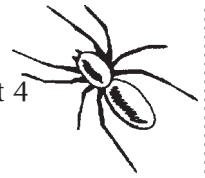
- 1) The insects that have been observed to do the most damage are larvae of insects specifically associated with the Haleakalā silversword. In other words, like several other insect species, they depend on *‘āhinahina* for their survival. These insects evolved over a long period of time together with the silversword, and would run out of food if their larvae damaged the silverswords so badly that they could not reproduce.
- 2) In 1969 and 1971, Kobayashi examined hundreds of *‘āhinahina* flowers and found none with seeds completely destroyed by insects. Even the most heavily damaged populations had some viable (capable of germination) seeds available for dispersal. Viable seeds survive because the insects do not eat the entire flower.
- 3) Large, dense populations suffer the most insect damage, while smaller isolated populations are the least damaged. Despite appar-

ently heavy insect infestations, large populations of *‘āhinahina* have remained on the cinder cones and lava flows for at least 100 years, so high infestation does not necessarily lead to a drop in number. Even if a larger population were to be drastically reduced, the smaller, more isolated populations may then serve to re-establish larger populations.

- In the mid-1980s, University of Hawai‘i botanists Gerald Carr and Elizabeth Powell teamed up with Donald Kyhos from the University of California to learn that silverswords cannot produce fertile seeds without cross-pollinating with other plants. *‘Āhinahina*, which flower only once after many years of growth, depend on insect pollinators in order to reproduce.

- According to Lloyd Loope and Art Medeiros, both researchers at Haleakalā National Park, the greatest threat to *‘āhinahina* now appears to be the potential loss of its insect pollinators. These endemic insects may be threatened by the non-native Argentine ant, which has established itself in small and growing areas of silversword habitat. Park researchers and resource managers are working to control the spread of this invader.

- In his 1973 report on silversword ecology, Herbert Kobayashi expressed concern about trampling as a source of damage to young silversword plants. The *keiki* *‘āhinahina* are small and not always easily seen by hikers. And the cinders the plants grow in are easily displaced by trampling feet. As more people visit Haleakalā, Kobayashi warned that trampling would probably become a more important source of damage to silverswords. Researchers also need to be careful about damaging young *‘āhinahina*, especially when they are walking off-trail.



- The insecticide proposed for use on silversword insects in the 1960s was DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane). DDT was also used around the observatories in 1964. DDT grew to be a popular insecticide largely because it was so effective against the mosquito that spreads malaria and the louse that carries typhus. It seemed to be an ideal pesticide because it was cheap and because laboratory tests showed that it was relatively nontoxic to mammals.



Today, visitors are encouraged to stay away from the silverswords to avoid trampling keiki plants and damaging shallow roots. (Photo: Haleakalā National Park)

In 1962, Rachel Carson’s book, *Silent Spring*, was published. In it, Carson looked at modern agriculture and its dependence on chemical insecticides. DDT was one of those insecticides. At the time, DDT was routinely sprayed on beans, peanuts, tomatoes, and other crops. Carson laid out a compelling collection of evidence about the environmental and human health problems associated with DDT. She pointed to studies that correlated fish and bird mortality with DDT. Where it was used against Dutch elm disease, for example, DDT killed earthworms that fed on fallen leaves, as well as robins that fed on the earthworms. Falcons and other birds of prey contaminated with DDT produced thin-shelled eggs that hatched before fully maturing.

Silent Spring helped spark an uproar among U.S. citizens concerned about health and the environment. It is often identified as the beginning of the modern environmental movement. In 1972, the federal government bowed to public pressure and ordered a ban on DDT in the United States.

‘Āhinahina on the Rebound

(Census of silverswords from Ka Moa o Pele cinder cone)

| Year | Number of Plants |
|------|------------------|
| 1935 | 1470 |
| 1962 | 1248 |
| 1971 | 3990 |
| 1981 | 6405 |
| 1991 | 6019 |

Your Assignment

Based on everything you’ve learned during this activity, write a one-to-two-page paper in which you:

- 1) Briefly describe your group’s response to the “What Would You Decide?” scenario; and
- 2) Explain whether and how the information in this student page changes your thinking about what the superintendent in that scenario should do.

