

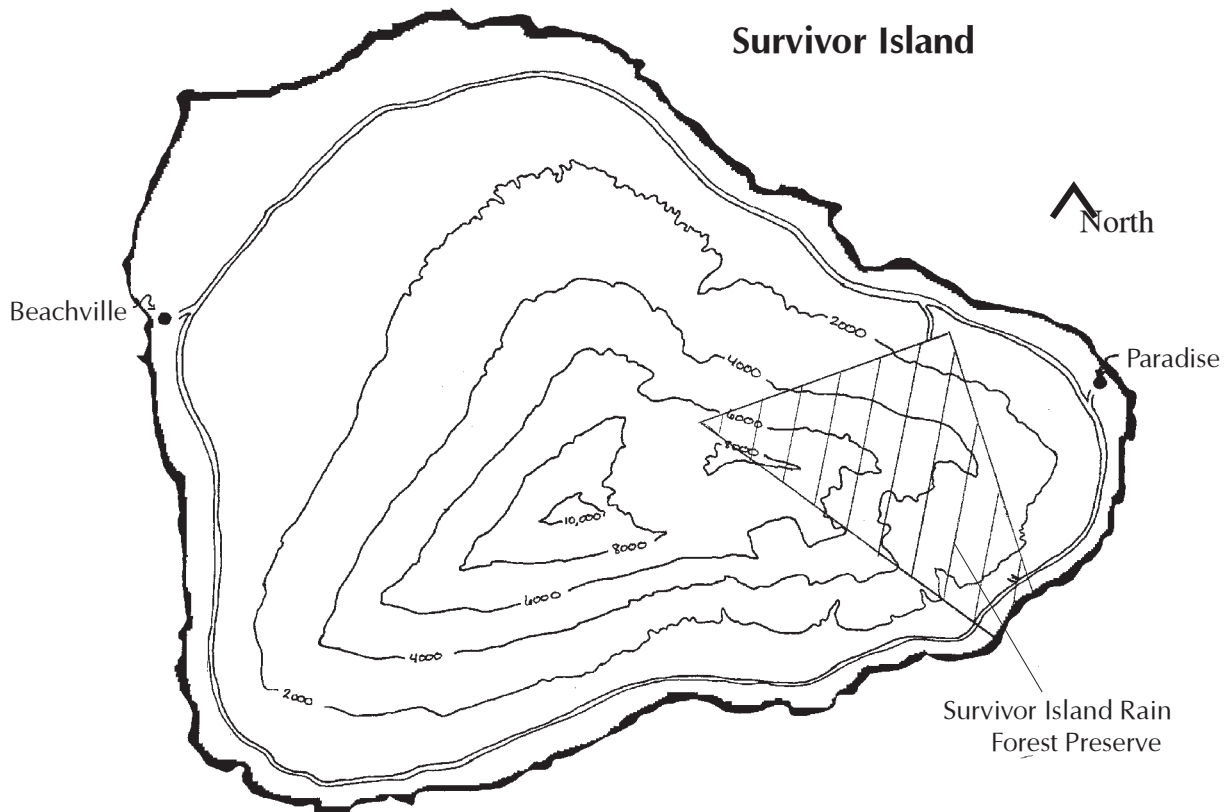


Survivor Island Background

Survivor Island is a small island in the tropical north Pacific, where the trade winds blow from the northeast, just as they do on Maui. There are two small cities on the island, Beachville and Paradise. There are other small communities along the main road that rings the island, although few people live along the rugged, dry southern coast.

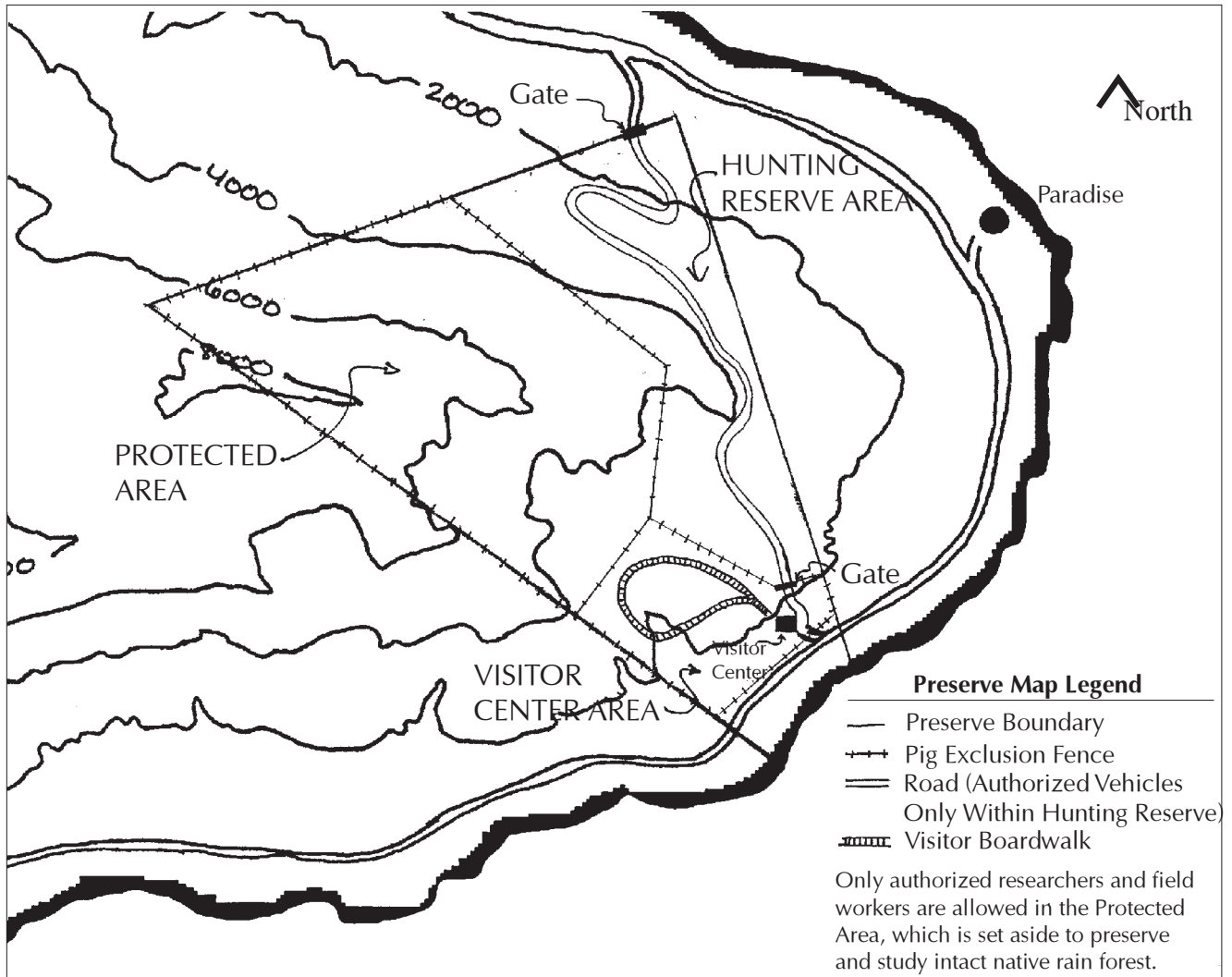
In the rain forest on the eastern end of Survivor Island, near the town of Paradise, island residents have established the Survivor Island Rain Forest Preserve. The preserve is divided into three main areas:

- The Visitor Center Area, where preserve visitors can learn about the native rain forest and the preserve and take a walk through native rain forest along a boardwalk that volunteers built.
- The Hunting Reserve Area, where pig hunting on foot is allowed. Only work vehicles authorized by the preserve are allowed in this area.
- The Protected Area, which is set aside to preserve and study the intact native rain forest. Researchers must obtain permission from preserve managers to work in this area, and in general, the only other people allowed into the area are crews working to eradicate or control invasive plants, inspect the fences surrounding this area, monitor for signs of pigs that sometimes get through the fences, and remove intruding pigs.





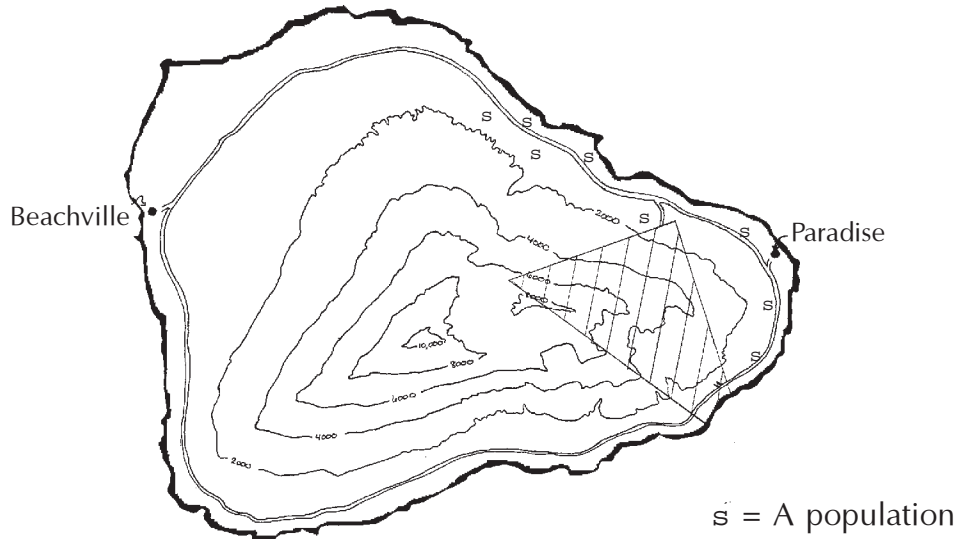
Survivor Island Rain Forest Preserve





Invasive Species Information Sheet

Clidemia



Distribution Notes

- Scattered plants have been found and removed from the Visitor Center Area of the preserve.
- Clidemia is common roadside plant along the windward highway.

Control Strategies

New populations

- Small seedlings: Pull by hand
- Larger plants: Remove and bag seed heads and inject herbicide under the bark or cut the plant and treat the cut stump with herbicide

Larger, established populations

- More research is needed on effective herbicides to be sprayed on the foliage of larger populations. These herbicides could also be sprayed on dense mats of seedlings.

Biological control

- Two partially successful biological control agents have been released, and the results are being monitored. Other insects are being screened.

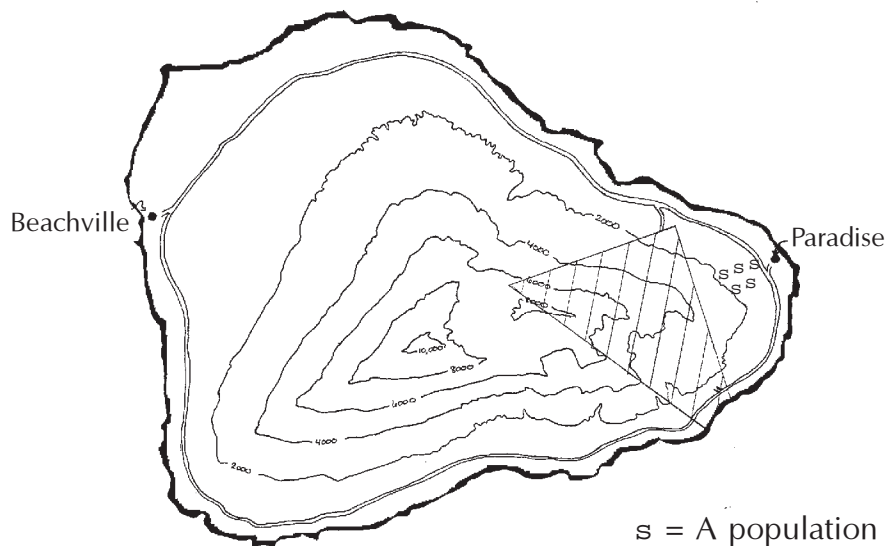
Inspection and retreatment

- New populations need to be reinspected yearly, with retreatment as necessary.



Invasive Species Information Sheet

Miconia



Distribution Notes

- There is a large infestation outside preserve boundaries up to about 600 meters (1968 feet) elevation. This infestation is believed to have originated at a botanical garden near the town on the eastern tip of the island.
- No plants have been discovered within the preserve yet.

Control Strategies

New populations

- Seedlings and saplings under about three meters (ten feet) tall: Uproot manually, dry completely, and allow to decompose in the contaminated area

Larger, established populations

- Fruiting trees: Limit seed production with helicopter spraying of herbicides (Dye is added so the pilot can see where the herbicide is going and identify treated plants. This treatment is expensive and requires careful planning to avoid spraying native vegetation.)
- Larger trees: Cut down and immediately apply herbicide to the cut stump
- To prevent the dispersal of tiny seeds that look like soil particles, change clothes and shoes and wash all machinery and other equipment before departing infested areas.

Biological control

- Methods of biological control being investigated include several insects and plant diseases

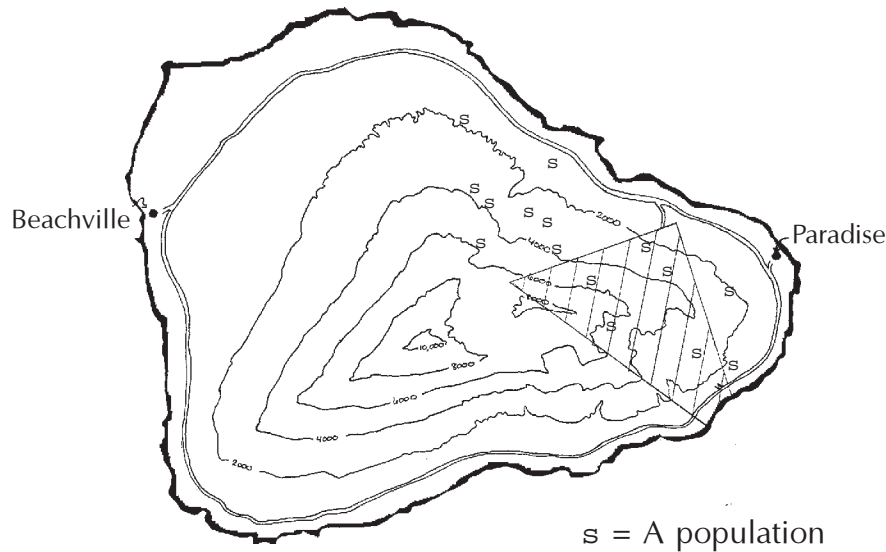
Inspection and retreatment

- Repeated surveys and treatment are necessary because trees are easily missed by ground crews and aerial surveys during the initial attempt.



Invasive Species Information Sheet

Kāhili Ginger



Distribution Notes

- Large populations have become established in the rain forest both within and outside the preserve.
- A few small populations that have not yet reached reproductive maturity have been found inside the fenced Protected Area.

Control Strategies

New populations

- Seedlings: Pull by hand
- Larger plants: Cut vegetation from the rhizome and apply herbicide to the cut surface of the rhizome

Larger, established populations

- Contain the periphery of large populations, using the techniques above to gradually reduce its size
- Search out new, small satellite populations and destroy

Biological control

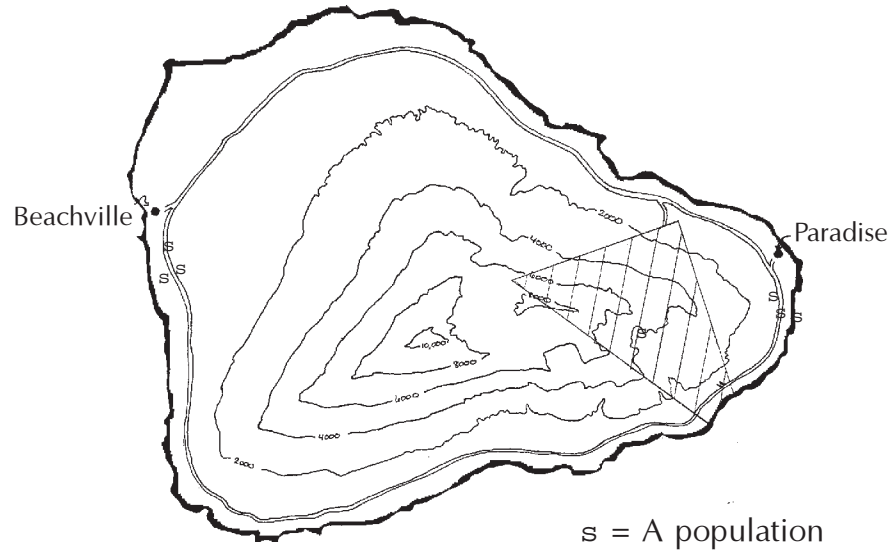
- A bacterium has been used for about five years to control large infestations in a protected area of a neighboring island. This bacterium was an agricultural pest that was attacking ginger crops and has been modified to attack only *kāhili* ginger.

Inspection and retreatment

- Infested areas need to be reinspected yearly and retreated if necessary.



Invasive Species Information Sheet Australian Tree Fern



Distribution Notes

- One small population has been found at around 1400 meters (4592 feet) within the fenced Protected Area.
- Australian tree fern is used extensively for landscaping in and near both of the main towns on the island.

Control Strategies

New populations

- Cut the main growth stem of all plants into small pieces

Larger, established populations

- Contain the periphery of large populations, using the technique above to gradually reduce its size
- Search out new, small satellite populations and destroy them

Biological control

- No known effective biological control agent

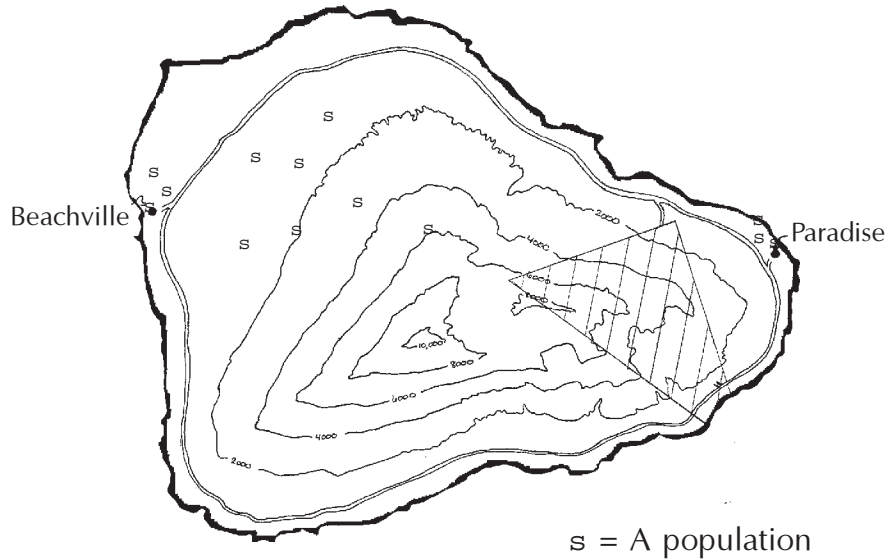
Inspection and retreatment

- Infested areas need to be inspected yearly and retreated if necessary.
- Retreatment intervals need to be refined to prevent plants from reaching reproductive maturity.



Invasive Species Information Sheet

Pampas Grass



Distribution Notes

- No populations have been discovered in the preserve.
- Scattered populations have been found on the leeward slopes of the island.
- Pampas grass is used extensively for landscaping in and near both of the major towns on the island.

Control Strategies

New populations

- Small plants, low-density populations, or where planted ornamentally: Dig plants out by hand

Larger, established populations

- Large, well-established plants or high-density populations: Treat with herbicides
- Avoid seed dispersal by bagging and cutting off flowering plumes and seed heads and wear dedicated footwear and other gear
- Experiment with using heavy plastic tarps to kill previously cut plants and prevent the subsequent establishment of seedlings (This method would be useful only on a small-scale basis.)
- Use helicopter spraying of herbicides in sensitive high-elevation areas (Dye is added so the pilot can see where the herbicide is going and identify treated plants. This approach is expensive, but with careful planning, minimizes the disturbance to surrounding native vegetation.)

Biological control

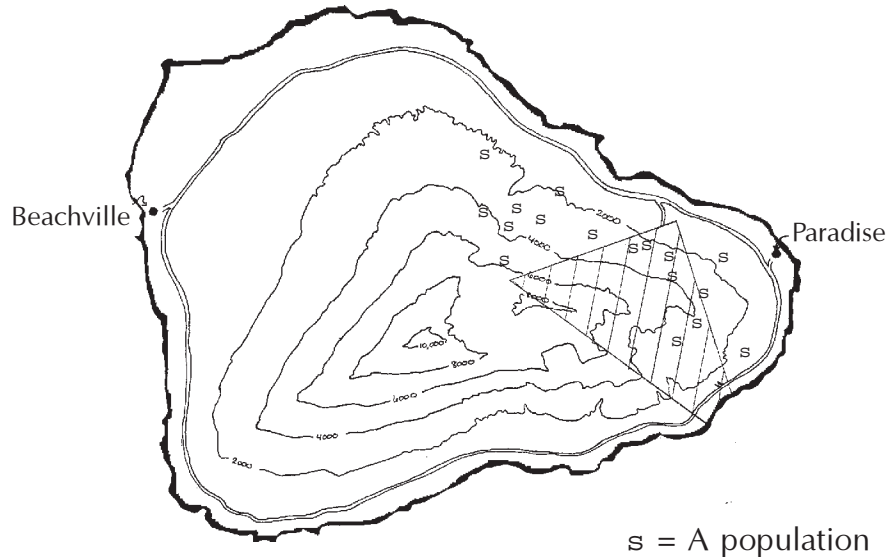
- Has never been used successfully for any grass species worldwide

Inspection and retreatment

- Aerial reconnaissance is used to find pampas grass in high-elevation roadless areas.



Invasive Species Information Sheet Strawberry Guava



Distribution Notes

- Extensive populations are found in the Hunting Reserve Area of the preserve and in the rain forest outside the preserve.
- After the Protected Area was fenced, the handful of small populations known to exist within the protected area were removed using manual removal and chemical control.

Control Strategies

New populations

- Pull very small plants and apply herbicide to larger plants

Larger, established populations

- Feral pig management is a necessary first step because huge quantities of seed are dispersed by feral pigs during the fall fruiting season.
- Pig control must be followed by manual removal of plants or control with herbicide.

Biological control

- Because of the extent of the infestation, biological control is probably the only method that will work on a large scale. Two insects currently being studied have considerable potential. However, because the common guava is grown commercially here, biological control agents must be species-specific to the strawberry guava, which makes the prospects slim.

Inspection and retreatment

- Reinfestation is low in pig-free, intact forests, but areas still need to be occasionally inspected.



Invasive Plant Action Sheet

Your group is in charge of controlling invasive plants within the Survivor Island Rain Forest Preserve. Each year, you develop an Invasive Plant Action Plan based on current information about invasive plants in the preserve, as well as the existing budget. Over the course of the year, you may modify your plan if new information comes in or if the budget changes.

In this activity, your group will work together to identify key elements of your Invasive Plant Action Plan, following instructions given. Use information from:

- Student Page “Invasive Plants in Hawai‘i” (Activity #2)
- Student Page “Survivor Island Background”

Action you may take in your plan may include, but is not limited to:

- Sending out field crews to search for new populations, either in specific areas or throughout the whole preserve;
- Trapping, killing, or excluding animals that disperse invasive plants;
- Manually removing invasive plants (e.g., by cutting or uprooting);
- Using herbicides to kill or control populations of invasive plants;
- Using biological controls;
- Inspecting previously treated areas and retreating with herbicides or manual removal if necessary;
- Researching specific aspects of invasive plant biology or control methods; and
- Educating the public to help prevent the spread of invasive plants.

Your plan may include action that takes place within or outside the boundaries of the preserve.



Phase 1: Initial Planning

In past years, your group has developed a list of the six invasive plant species that pose the greatest threat to the native rain forest within your preserve. This year's budget allows you to carry out a **total of ten control or prevention actions**. You must take **at least one action on each listed species**. Indicate your priority actions in the following table, being as specific as you can.

Species	Action #1	Action #2	Action #3	Action #4	Rationale
Clidemia					
Miconia					
<i>Kāhili</i> Ginger					
Australian Tree Fern					
Pampas Grass					
Strawberry Guava					



Questions

- 1) Are any of your proposals likely to be objectionable to Survivor Island residents or preserve visitors? If so, list them here and describe the likely objections.

- 2) If you got a grant that allowed you to add two more actions to your plan, what would they be and why?

Phase 2: Miconia Discovered

A month after your group makes its original plan, visiting researchers discover a large population of miconia in a little-visited part of the preserve's Protected Area. They estimate that the plants are about two years old.

You learn that, in Tahiti, miconia was introduced in 1937 as an ornamental plant and now covers over two-thirds of the island, having taken over the native forest. Between 40 and 50 of the 107 plant species endemic to Tahiti are on the verge of extinction solely due to the miconia invasion. Once miconia becomes established in an area, it is exceedingly difficult to eradicate, especially after the plants reach reproductive maturity. A single miconia tree can produce eight million seeds each year, and the fruits they're contained in are highly attractive to birds, which can rapidly spread them to other areas. Some of the researchers suggest that the miconia threat is so great that your group should divert almost all of its invasive species management efforts to try to control this newly discovered population.

You haven't spent much of the money in your budget yet, so your group convenes another time to rearrange priorities based on this new information. For each new action that you want to take to address the newly discovered miconia problem, you remove one action from your Phase One plan.

Fill in the table on the following page to show how you would change your plan and why.



Revised Action Plan

Species	Actions Added or Removed	Rationale
Miconia		
Clidemia		
<i>Kāhili</i> Ginger		
Australian Tree Fern		
Pampas Grass		
Strawberry Guava		