The Future of ‘Ōhi’a

Science Performance Assessment

Middle School

Task Table of Contents

- About this Task
- Standards Emphasis
- PADI Design Principles Emphasis
- Student Task Worksheet
- Teacher Facilitation Guidance
- Feedback and Scoring Guidance

About This Task

Task Name	The Future of ‘Ōhi’a	**Grade Level or Course**	Middle School Life Science
Phenomenon	‘Ōhi’a forests are ecologically and culturally significant in Hawaii, but they are currently threatened by an invasive and lethal fungus.	**What instruction or experiences should learners have before completing this task?**	Students should have learned about positive and negative relationships and be able to track the effects of these relationships through a complex ecosystem model.
Time Required & Materials	**Time:** ~90 minutes **Materials:** • Printed Task Worksheets • Computer and Projector for playing Protecting Hawaii’s Native Forests		
Considerations and Adaptation Suggestion(s)	• The ecosystem models in the student task worksheet have colored arrows to illustrate positive and negative relationships. Consider printing class sets of these ecosystem models in color and laminating them or protecting them in plastic sleeves for future use. If color printing is not an option, consider giving students the task digitally or allowing them to access digital versions of the ecosystem models. • The phenomenon affecting 'Ōhi'a trees may be very personal to students. Consider investing extra time in discussions to give space for students to share their connections, experiences, stories, etc. • If using this task in Hawai’i, consider incorporating extension and action opportunities like visiting an 'Ōhi'a forest, inviting a guest speaker, developing student-led action projects, etc.		

This task was developed during PADI 2024-2025 by Calvin Atkins and Katie Van Horne.
This work is licensed under CC BY-NC 4.0.

Standards Emphasis

Assessment is a balancing act involving multiple tradeoffs. No one task can do everything, and often good design carefully considers what *not* to assess. The targeted NGSS Performance Expectation and supporting dimensions are shown below. The parts of the standard not addressed in the task are ~~struck through~~. Each item in the task may target one or more of the dimensions - not every item has to assess every dimension. What matters is that the task as a whole addresses all three dimensions.

NGSS Performance Expectations

- **MS-LS2-4:** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
  Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

- **MS-LS2-5:** Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
  Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models. ~~Develop~~ and use a model to describe phenomena.	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. **LS4.D: Biodiversity and Humans** Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.	**Stability and Change** Small changes in one part of a system might cause large changes in another part.

PADI Design Principles Emphasis

The PADI design principles are present in varying ways and to different degrees across these teacher-created science performance tasks. The design principles highlighted for each task represent those that are intentionally emphasized in the task. Educators utilizing these tasks may develop their own interpretations of the application of the design principles, and modifications to the tasks could naturally influence the extent to which each principle manifests.

The PADI Design Principles are:
Student Voice & Agency. Task or activity ensures that the students can make choices within and have agency over some aspects of the learning and assessment experience.

Relationships. Task or activity provides opportunities for students to make connections with others both within and beyond the classroom.

Identity and Inclusion. Task or activity ensures that each student can bring a sense of joy and pride around their identity and individuality to the task. Students should feel safe to be vulnerable and should feel supported by their classroom community (teachers and students).

Groundedness. Task or activity ensures that students can complete the task in their current environment using their current context to apply real-world knowledge to the place where they live. All participants should have awareness of self, others, and surroundings. Task or activity should prioritize presence over productivity. Students should feel like they can answer the question: “Where are my feet planted? What can I do from here?”

This task foregrounds:

- **Groundedness** and **Relationships** by applying their developing science ideas to an authentic issue facing communities in Hawai’i through collaborative and individual sensemaking opportunities. These PADI design principles could be further supported by extending beyond the task with extension and action opportunities like visiting an 'Ōhi'a forest, inviting a guest speaker, developing student-led action projects, etc.

Teacher Facilitation Guidance

1. **Review the Task.** Complete the performance assessment acting as a student in your classroom. Think about the unit you have taught/are teaching. Where might your learners need additional support? What additional activities might you need to do before the Performance Assessment? What adjustments do you need to make to the assessment (e.g., a classroom discussion of the phenomenon) before you send students to complete the task.

2. **Orient to the Transfer Task Routine.** Refer to the "During–" and "After the Transfer Task Implementation" guidance in the "Transfer Task Routine" document on how to support students in their experience. Consider what additional support your students may need as they work to apply science ideas they have developed to a new scenario.

3. **Introduce the Phenomenon.** Distribute the task worksheet and have students read the first two paragraphs individually. Show the video "Protecting Hawaii's Native Forests".
    - Ohia forests provide many services for humans and other living things, as a class discuss this quote from the video: *It should never be an argument between Ai... which is the food and the sustenance, Aina, which is the relationship, and wai. One is not more important than the other. There has to be a good balance.*
    - Listen for students to share ideas about:
        i. the role of the forest in humans being able to access food, clean, water, and places for enjoyment
        ii. the importance of being connected to the forests
        iii. how other living things matter in this ecosystem

4. **Complete the Task.** Have students complete the task individually.

5. **Reflect on the Task.** Consider facilitating a whole class discussion after the task so students can share their reflections from Part 3.

Student Task Worksheet

A student version of the task worksheet is linked here.

Feedback and Scoring Guidance

Sample student responses are shown below in purple text or in purple diagrams. In some cases different elements of a response are identified with a + symbol. These + elements are not meant to be all inclusive, but are suggestions for different ideas your students might include.

The following scoring guidance can help you identify different elements that students should (or could) include in their responses.

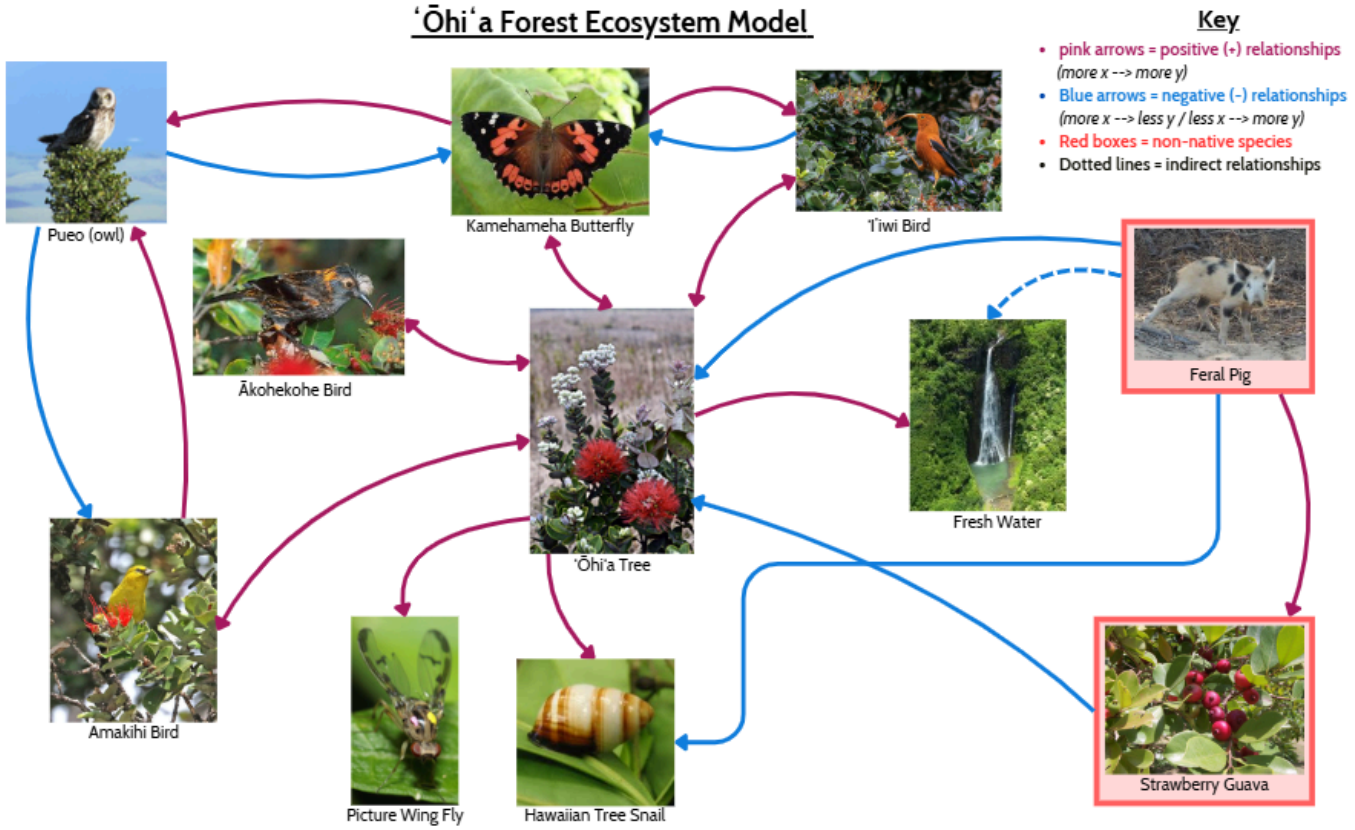
- If several of the elements marked with a + are missing from a student's response, this may indicate that the student has not mastered the science ideas or that the student may be struggling

to bring those ideas together in a written explanation or model. Additional probing of their thinking can provide insight about whether the student is struggling with a science practice or science idea, or both.

- If all or almost all of the elements marked with a + are present in a student's response, this may indicate that the student has mastered the science ideas and is able to use them in a written explanation or explanatory model.
- If the elements marked with a ++ are present in a student's response, this indicates that the student is bringing a deeper understanding of the science ideas or a deeper engagement with the practice to their response. Students should not be penalized if ideas marked with a ++ are not present in their response.

Part 1: 'Ōhi'a, Pigs, and the Ecosystem

Review the ecosystem model below that shows some of the interactions in an ʻŌhiʻa forest ecosystem. Pink arrows represent positive relationships (more of x → more of y) and blue lines are negative relationships (more of x → less of y). Dotted lines illustrate indirect relationships.



1. Based on the ecosystem model and the video we watched in class, explain how 'Ōhi'a forests sustain biodiversity and can be an indicator for health for an entire ecosystem.

+ The 'Ōhi'a trees have positive relationships with all of the native animals in the ecosystems. When the number of 'Ōhi'a trees goes up, the number of the native animals goes up. The model shows:
    + The 'Ōhi'a trees have two way positive relationships with the birds and butterfly in the ecosystem
    + More 'Ōhi'a trees means more resources for the picture wing fly and hawaiian tree snail.

+ When there are more 'Ōhi'a trees there is also more fresh water which is important for humans and other organisms.

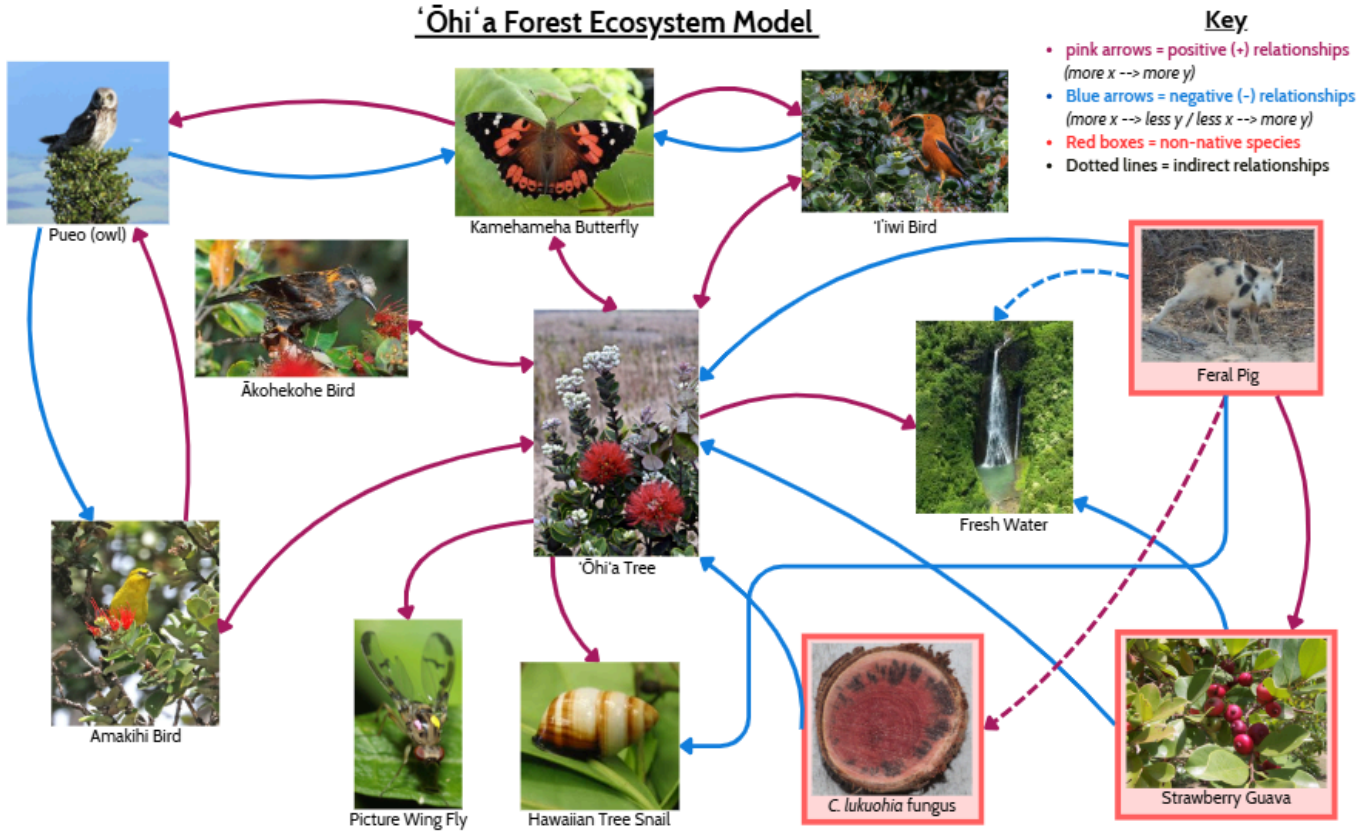
2. Pigs are non-native to Hawaii and have been on the islands for nearly 1,000 years. Using the ecosystem model, write an explanation to describe the impact of the feral pigs on the ecosystem.

Student claim should include similar components to this example claim:
Claim - Pigs in the forest cause a decrease in fresh water resources from a forest through indirect means (erosion, fecal contamination) and because they increase the strawberry guava which decreases the number of 'Ōhi'a and the 'Ōhi'a have a direct positive relationship on fresh water. In addition, the presence of pigs decreases 'Ōhi'a (via Strawberry guava) which decreases the number of organisms that have positive relationships with 'Ōhi'a (e.g., butterfly, bird)

Evidence from the model could include:
+ Pigs indirectly have a negative impact on fresh water
+ Pigs have a direct negative impact on the 'Ōhi'a trees because they break their bark
+ Pigs are positive for the strawberry guava plants
+ More strawberry guava plants means fewer 'Ōhi'a trees

Part 2: Rapid Ohia Death

ROD was first detected on Hawai'i in 2014 and has since killed around one million trees across the Hawaiian islands.

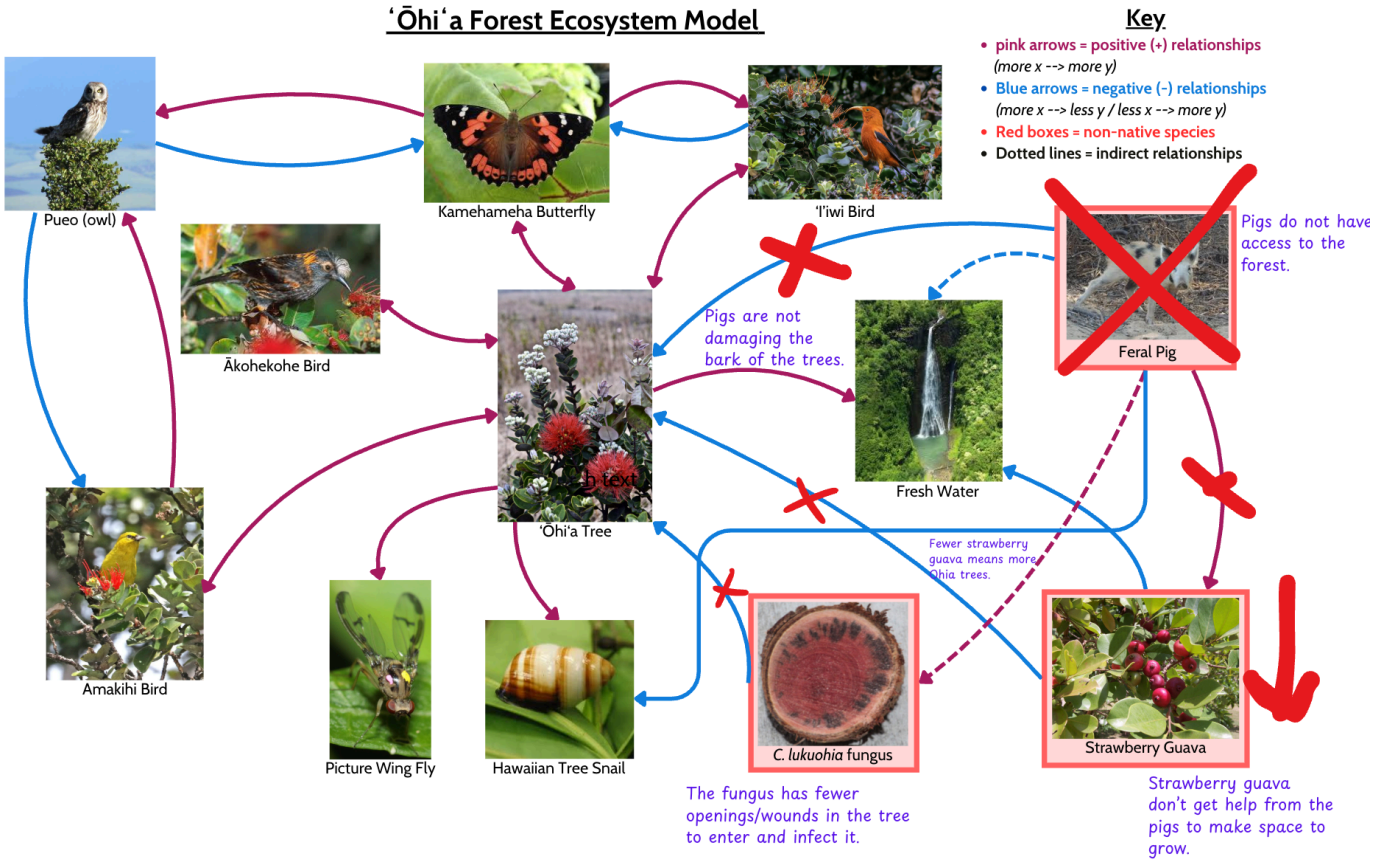


3. Given the ecosystem model and what you heard in the video, explain why ROD was able to kill so many trees so quickly.

+ Before the the fungus was introduced, the pigs had impacted the ecosystem making it less healthy
+ When the fungus was introduced, it was able to get into the trees because of the wounds on the trees from the pigs.
+ The pigs and other hooved animals had already been damaging the trees for a long time so there were a lot of places in the trees for the fungus to enter which allowed the pigs and insects and wind to move the fungus around from tree to tree and infect them quickly.

4. The video shows that the solution to fence off certain forests to prevent pigs and other hooved animals from entering has allowed the forests to recover. Annotate the ecosystem model above to show why this solution is working so far.

Here is an example of what to look for in student responses:



5. Reflect.
   a. What is one thing you are still thinking about from watching this video and completing this task?
   b. What is one question you still have?

Accept all student responses. Use student responses to gauge how they experienced this task, what additional support they might need if given the opportunity to revise, and any discussions or future lessons you can facilitate based on their additional questions.