HAWAI'I CONSERVATION HORTICULTURE PROJECT

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Malama i Ka Aina

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MISSION STATEMENT

Hawai'i's Conservation Horticulture Project (HCHoP) will be an *active*, *scientific*, *inquiry-based* opportunity, adaptable for K-12 education. The basis for HCHoP will be rooted in the biology of native Hawaiian plants with emphasis on their propagation for conservation purposes. Curricula for this project will be structured according to the Hawai'i State Content and Performance standards.

INTRODUCTION

This document proposes a general framework for the Hawaii Conservation Horticulture Project (HCHoP). The overall intent of HCHoP is to engage K-12 students throughout Hawaii in conservation horticulture and have them develop plant populations suitable for conservation. To achieve this, HCHoP has been developed as a long-term project comprised of modules based on the major disciplines involved in conservation horticulture. Students move through each module, developing basic skills and knowledge first, then apply their knowledge of the concepts involved in each module to conserve plant species. If necessary, start-up modules dealing with botany and ecology may be incorporated into the curriculum.

Only recently taking shape, conservation horticulture is currently defined as the art and science of designing, propagating, and growing plant populations that: (1) are as genetically diverse as possible; (2) are free of harmful pests and disease and; (3) ultimately produce viable, self sustaining, regenerating populations in their natural range. These populations are produced in a timely and cost-effective manner. Because Hawaii is the national leader in terms of endangered and threatened plant species it serves as an excellent system to introduce a project such as HCHoP. Additionally, public agencies at all levels of government and private entities throughout the state are committed to conserving important plant resources. HCHoP will look to partner with such groups to educate Hawaii's students on the significance of plant conservation. However, the most important partnership will be formed between teachers and scientists involved in bringing HCHoP to the classroom.

HCHoP is not only a scientific project, but an educational one as well. To be successful teachers will need to provide their motivation and expertise in education. Likewise, scientists involved in HCHoP will need to provide their enthusiasm and science content knowledge. Together the teacher-scientist partners are expected to develop curricula, assess student understanding, adapt the project as necessary and communicate on all aspects of project development.

GOALS

HCHoP's modules have been established in a stepwise method. The purpose of this approach is to build up a student's level of understanding in concepts of plant biology that form the foundation for species conservation, horticultural techniques and restoration practices. These modules reflect the major fields of study associated with the discipline of conservation horticulture. The following modules represent the sequential process and thinking; plus the inquiry skills and habits of mind a conservation horticulturist would have to realize to successfully conserve a native Hawaiian plant species. Although HCHoP is intended to be a long-term project that synthesizes each module to meet its overall intent, modules can be adapted to stand-alone if necessary.

	CONSERVATION BIOLOGY MODULE	HORTICULTURE MODULE	RESTORATION MODULE
GOALS	K-12 students develop an understanding of the dynamics of conserving native Hawaiian biodiversity	K-12 students develop an understanding of the propagation, production, maintenance and installation of native Hawaiian plants	K-12 students develop an understanding of how to plan, implement and monitor a Hawaiian native plant restoration project

Data collection, Analysis, Interpretation, Reporting Results, Teaching to self and others, Assessment

OBJECTIVES

To meet the goals of HCHoP objectives have been established for each scientific module. The objectives embody concepts involved in conservation horticulture and represent skills needed for applied species conservation. These objectives serve as guidelines that may be incorporated into curricula developed through the teacher-scientist partnership and adapted to different grade levels.

Conservation Biology Module - K-12 students develop an understanding of the threats to Hawaiian plant biodiversity, dynamics of native plant populations and their conservation by:

- Defining bio-diversity
- Categorizing threats to native plants
- Prioritizing at risk species
- Investigating the effects of small population sizes on biological processes
- Studying features of population genetics
- Preparing an action plan for species conservation

Horticulture Module - K-12 students develop an understanding of the propagation, production, maintenance and installation of native Hawaiian plants by:

- Applying knowledge of plant structures and functions
- Designing populations for reintroduction
- Storing and regenerating seed
- Breaking dormancy of seed
- Propagating plants by seed and vegetative structures
- Experimenting with different conditions for propagation
- Considering plant nutrition
- Developing integrated pest management systems
- Using various methods and structures to propagate plants

Restoration Module - K-12 students develop an understanding of how to plan, implement and monitor a Hawaiian native plant restoration project by:

- Selecting appropriate sites for re-introduction
- Determining size of out-planting
- Deciding on age and size structure for out-planting

- Preparing site for out-planting
- Conducting out-planting
- Monitoring out-planting
- Managing population after planting

Understanding and Reporting Data: K-12 students develop an understanding of the scientific method, how to safely do science, assessment of work and presentation of work to diverse groups by:

- Developing hypotheses based on observations and newly acquired knowledge
- Designing experiments to test hypotheses
- Collecting and analyzing data
- Creating reports of scientific studies
- Presenting findings
- Teaching other students about conservation horticulture

Potential Start-Up Modules

Botany Module - K-12 students develop an understanding of basic functions, structure and classifications of plants by:

- Describing plant structures in botanical terms
- Identifying functions of plant structures and how they work as a system
- Classifying plants according to similar characteristics
- Observing life cycles of plants
- Communicating in botanical language

Ecology Module - K-12 students develop an understanding of the interaction between plants and their environment by:

- Investigating assemblages of plants
- Identifying inter-relationships between native fauna and flora
- Examining dispersal mechanisms of plants
- Noticing succession of plant types in native ecosystems
- Recognizing biotic and abiotic factors of ecosystem
- Classifying ecosystems based on plant assemblage

ALIGNING HCHOP WITH STATE STANDARDS

DOMAIN I: How Humans Think While Understanding The Natural World		
Strand	**Content Standard**	**HCHoP**
Science As Inquiry	1. *Doing Scientific Inquiry.* Students demonstrate the skills necessary to engage in scientific inquiry	1. Through the teacher-scientist partnership, curricula will be designed to allow for reasoning and questioning. The science partner will model the scientific method.
Habits of Mind	2. *Living The Values, Attitudes, And Commitments Of The Inquiring Mind*. Students apply the values, attitudes and commitments characteristic of an inquiring mind.	2. Through the teacher-scientist partnership curricula will be developed that recognizes various learning styles thus allowing application of values, attitudes and commitments characteristic of inquiring minds from different perspectives.
	3. *Using Unifying Concepts and Themes*. Students use concepts and themes such as system, change, scale, and model to unify the disciplines and help them understand and explain the natural world.	3. Students will explore plants as systems of cells and tissues and ecosystems that are changing. They will have the opportunity to study plant interactions on different scales and may develop testable models of plant populations.
Safety	4. *Doing Safety*. Students demonstrate the importance of safety by applying safety skills in all activities.	4. The science partner will brief teacher(s) and students on safety in the field, greenhouse and laboratory. Likewise the science partner will model safety at all times.
Science and Technology in Society	5. *Relating the Nature Of Technology and Science*. Students use the problem-solving process to address current issues involving human adaptation in the environment.	5. Plant conservation is of paramount concern in Hawaii. Students will ultimately be responsible for applying science and technology to develop a population suitable for restoration.

ALIGNING HCHOP WITH STATE STANDARDS

DOMAIN II: What We Know Today About The World Around Us		
Strand	**Content Standard**	**HCHoP**
Historical Perspective	1. *Understanding Scientific Inquiry and the Character of Scientific Knowledge*. Students explain the process of how scientific knowledge is generated by scientific inquiry and are able to critique a scientific investigation.	1. Understanding and reporting data. Use of scientific method.
	2. *Interdependence of Science, Technology and Society*. Students analyze and evaluate the interdependence of science, technology and society.	2. Students apply module knowledge and horticultural technology to conserve species.
	3. *Malama I Ka Aina: Sustainability*. Students make decisions needed to sustain life on Earth now and for future generations by considering the limited resources and fragile environmental conditions.	3. Students must decide on species to work with, and how to produce propagules.
Organisms and Development	4. *Unity and Diversity*. Students examine the unity and diversity of organisms and how they can be compared scientifically.	4. Understanding biodiversity, how plants & environment interact.
	5. *Interdependence*. Students describe, analyze, and give examples of how organisms are dependent on one another and their environment.	5. Discussing threats to plants, how they interact w/ environment
	6. *Cycles of Matter and Energy Flow*. Students trace the cycling of matter and the flow of energy through systems of living things.	6. Through studying plant functions, structures and nutrition.
	7. *Biological Evolution*. Students examine evidence for the evolution of life on Earth and assess arguments for natural selection as a scientific explanation of biological evolution.	7. By examining dispersal mechanisms, comparing Hawaiian & mainland spp.
	8. *Heredity*. Students describe how variations in biological traits are passed on to successive generations.	8. Investigating population biology and breeding.
	9. *Cells, tissues and organs*. Students explain the structure, functions, and reproduction of living cells.	9. Discussing plant parts used in propagation.
	10. *Human development*. Students explain the important aspects of human development from fertilization to death and compare it with other organisms.	10. Comparing life cycle of plants. Causes of decline in populations.
Understanding Ourselves and the World Around Us	11. *Wellness*. Students appraise the relationships between their bodily functions and their physical and mental well being.	11. Study how humans rely on environment for well being.
	12. *Learning and Human Behavior*. Students explain what influences learning and human behavior.	12. What students learn from natural processes