



UNIVERSITY of HAWAII®
WINDWARD
COMMUNITY COLLEGE

Plants in the Hawaiian Environment Bot 130

3 Credits (CRN 63505)

WWW Course

C19 and DB

INSTRUCTOR: Teena Michael PhD
OFFICE: Hale Palanakila 142
OFFICE HOURS In-person meeting by appointment!

Zoom Meeting:

Topic: Plants In Hawaiian Environment

Time: This is a recurring meeting Meet anytime

Join Zoom Meeting

<https://hawaii.zoom.us/j/92161963287>

Meeting ID: 921 6196 3287

Passcode: Ebony

TELEPHONE: (808) 236-9114

EMAIL Best Contact: teena@hawaii.edu

EFFECTIVE DATE: Fall 2022

WINDWARD COMMUNITY COLLEGE MISSION STATEMENT

'O keia ka wā kūpono e ho'onui ai ka 'ike me ka ho'omaopopo i kō Hawai'i mau ho'oilina waiwai. Aia nō ho'i ma ke Kulanui Kaiāulu o ke Ko'olau nā papahana hou o nā 'ike 'akeakamai a me nā hana no'eau. Me ke kuleana ko'iko'i e ho'ohiki ke Kulanui e kāko'o a e ho'okumu i ala e hiki kē kōkua i ka ho'onui 'ike a nā kānaka maoli. Na mākou nō e ho'olako, kāko'o a paipai i nā Ko'olau a kō O'ahu a'e me nā hana no'eau ākea, ka ho'ona'auao 'oihana a me ka ho'onui 'ike ma ke kaiāulu — hō'a'ano a e ho'oulu i nā haumāna i ka po'okela.

Windward Community College offers innovative programs in the arts and sciences and opportunities to gain knowledge and understanding of Hawai'i and its unique heritage. With a special commitment to support the access and educational needs of Native Hawaiians, we provide the Ko'olau region of O'ahu and beyond with liberal arts, career and lifelong learning in a supportive and challenging environment — inspiring students to excellence.

CATALOG and COURSE INFORMATION

Course Description: Introduction to the ecology and evolution of plant communities and species of Hawaiian ecosystems; ecological interactions; observations, identification and systematics of native and introduced flora. Lecture DB (3 hours lecture WWW with separate 1 unit laboratory)

Requirements the course satisfies:

AT WCC: (<http://windward.hawaii.edu/Courses/BOT130/>)

- [Associate in Arts - Biological Sciences \(DB\)](#)
- CA Agripharmatech: Ethnopharmacognosy (Elective)
(http://windward.hawaii.edu/Academics/Agripharmatech_CA/)

Course Content:

Concepts or Topics

- Discuss groups of plants associated with coastal and dry to wet forest habitats in Hawaii; learn about various locations throughout the islands where relicts of these plant communities are still preserved
- Learn about basic plant anatomy including functions of structures and their adaptive ecological evolution
- Ecology and evolution of ecosystems: involving the role of volcanism, dispersal, plant-animal interactions and variations of rainfall (climate)
- Discuss techniques used to investigate prehistoric plant communities and the role of humans and the organisms they introduced in altering the landscape (in both the past and present-day)

Skills or Competencies

1. Given background knowledge of a plant specimen's origin, growth habit and other defining characteristics, *be able to identify its scientific and Hawaiian names.*
2. Use basic taxonomic characters to *differentiate between related species and genera.*
3. Be able to identify locations in the Hawaiian Islands where various native plant communities are still relatively intact.
4. Understand the role of the Pacific trade winds in shaping the distribution of plant communities in Hawaii.

Course Communication: Announcements will be posted in Laulima and you can view them under announcements and you will also receive them by email. Email me with questions and concerns and I will communicate with you by email as well.

Course Learning Objectives:

Following successful completion of this course, the learner will be able to:

- CLO1) Explain the geological history of the Islands and natural history of plants in Hawaii.
- CLO2) Discuss the arrival, establishment, major evolutionary trends and adaptive radiation of some of the surviving native species.
- CLO3) Compare ecology of Hawaiian ecosystems including natural and human-mediated changes, plant succession, and interaction between native and introduced species of plants.
- CLO4) Describe cultural significance of select native Hawaiian plants.

Note: Weekly LO's are posted that support the CLO's above.

Course Format and Pacing

The range of activities and assignments provided for you to learn and understand the material in this course are listed below under Grades. Instructional resources are available in the Instructional Materials and Activities section of our weekly modules. *Directions for each activity or task are provided in the Assignment section of our weekly modules.*

Materials and Resources

Textbook (provided as PDFs):

Carlquist, S.J. 1970 - 1980 editions. Hawaii: A Natural History. Pacific Tropical Botanical Garden. This book is out of print! *PDF copies of specific chapters will be provided in the weekly modules. Please note: I encourage you to search the Internet for used editions.

The pages and chapters are important *resources* that specifically address topics and information including details on Hawaiian plants, Hawaiian ecosystems and problems that Hawaiian plants faced/face due to island existence, ecology and evolution.

Other Resources (not required):

Bohm, B. A., 2004. Hawai'i's Native Plants. Mutual Publishing.

Greenfield, B. S. 2007. Inside the Body; Fantastic Images from Beneath the Skin. Firefly Books.

Gustafson, R., Herbst, D. and P. Rundel. 2014. Hawaiian Plant Life: Vegetation and Flora. Hawaii. University of Hawaii Press.

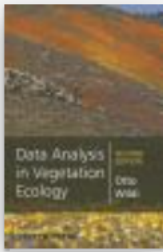
Lincoln, N. K. 2009. Amy Greenwell Garden Ethnobotanical Guide To Native Hawaiian Plants.

Mueller-Dombois, D., Bridges, K. W., Island Ecosystems; Biological Organization in Selected Hawaiian Communities. 1981. Hutchinson Ross Publishing Company.

Mueller-Dombois, D., Jacobi, J., Boehmer H. and J. Price. 2012. 'Ōhi'a Lehua Rainforest; Born Among Hawaiian Volcanoes, Evolved in Isolation. Hawaii. University of Hawaii Press.

Palmer, D. D., Hawai'i's Ferns and Fern Allies. 2003. University of Hawaii Press.

Sohmer, S.H. and R. Gustafson. 1987 or 1996. Plants and Flowers of Hawaii. Plants and Flowers of Hawaii. University of Hawaii Press.



BOOK

Data Analysis in Vegetation Ecology

Wildi, Otto.

2013

[Available Online >](#)

Online free access UH Library:

<https://uhawaii->

[manoa.primo.exlibrisgroup.com/discovery/fulldisplay?docid=alma9910792583305681&context=L&vid=01UHAWAII_MANOA:MANOA&lang=en&search_scope=DiscoveryNetwork&adaptor=Local%20Search%20Engine&tab=AllUH&query=any,contains,Vegetation%20Analysis&offset=0](https://uhawaii-manoa.primo.exlibrisgroup.com/discovery/fulldisplay?docid=alma9910792583305681&context=L&vid=01UHAWAII_MANOA:MANOA&lang=en&search_scope=DiscoveryNetwork&adaptor=Local%20Search%20Engine&tab=AllUH&query=any,contains,Vegetation%20Analysis&offset=0)
Traditional Hawaiian Uses Resources (not comprehensive)

Abbott, I.A. Lā'au Hawai'i; traditional Hawaiian Uses of Plants

Chun, M. N. translator. Native Hawaiian Medicine v1. 1994. (Original publication 1922) First People's Productions. *In both Hawaiian and english languages.

Pukui, M. K., Elbert, S. H., Mookini, E. T., Place Names of Hawaii. 1974. University of Hawaii Press.

Wagner, W. L., Herbst, D. R., Sohmer, S.H. Manual of the Flowering Plants of Hawai'i Volumes 1 and 2.

Websites (important site but not a comprehensive list!)

[Hawaiian Native Plants UH Botany](#)

Excellent source of Hawaiian plant (including spore plants and seed plants = flowering plants) for scientific names, Hawaiian names and images.

[Hui Kū Maoli Ola Native Plant Site](#)

Excellent source of Hawaiian plant names and access to *planting/growing information* as well as some cultural uses. Site can be searched by Hawaiian name or scientific name. This link opens to information about the nursery (in Kāne'ohe) and [click on Native plants](#) to access the plant(s) you are interested in.

[Bishop Museum Ethnobotanical Database](#) site contains more in-depth information on the plants in context of their past and present cultural significance. You need to know the Hawaiian name of the plant to access information. You can learn the Hawaiian name from the first site, Hawaiian Native Plants UH Botany.

The [Department of Land and Natural Resources site](#) is a gem for finding out more about Hawaiian ecosystems and species in them.

The [Honolulu Magazine](#) site features select Hawaiian plants with brief stories and images. Enjoy!

This general site is not technical and general information of interest and pictures of plants that are not necessarily native (eg. plumeria is not native). [Wildlife of Hawaii](#) will take you to ~23 native plants and you can see them by clicking on the names. Each of these plants are important and may be a good place to start. [Plant families with native and non-native examples](#) are accessible via this link as a reference only for our course. Appreciate that plants are grouped by specific, shared characteristics that constitute basics for families. Knowing this concept can give you a sense of organization for the Hawaiian plant diversity, without having to formally study the families in our class.

Of the many Botanical Gardens on O'ahu, [Ho'omaluhia Botanical Garden](#) has a specific Hawaiian plant area that has a small collection of labeled plants including a large collection of native palms. I encourage you to go out and explore this site in Kāne'ohe and/or the larger [Koko Head Botanical Garden](#) on the east side. Note that admission is free for both gardens and that this last garden has an extensive Hawaiian plant section—guides to the gardens-within the garden are in a black mailbox as you go in and I encourage you to follow the left direction of the loop and also enjoy the palm garden (the Hawaiian palms will be in the Hawaiian section) and African plants as well.

Also—in appreciation for the critical roles that pollinators play for Hawaiian flowering plants—(pollen contains sperm so essential for sex and making of seeds then fruit to disperse seeds) I include some information on bees here:

Plants for Pollinators in Hawaii

<https://cms.ctahr.hawaii.edu/pollinators/BeePlants>

*Note—we do have native bees...(Hawaiian yellow-faced bees are important pollinators of native Hawaiian plants and trees and many are endangered) for example:

<https://phys.org/news/2016-09-feds-hawaii-bee-species-endangered.html>

https://dlnr.hawaii.gov/ecosystems/files/2013/07/HylaeusProposal_DoDLegacy.pdf

POLLINATORS in Hawaii NOT (necessarily) NATIVES

<http://kohalacenter.org/docs/resources/hpsi/PollinatorsInHawaii.pdf>

Grades

Reflections	50
Worksheets	100
Assignments	40
Quizzes	50
Project	35
Growing Natives	100
Exam 1	100
Exam Final	100
	575 POINTS

Note:

The *diversity of the assignments* is to support the diversity of our class in terms of how we learn, how we will use this experience and information. Each activity supports other activities and doing well on exams. Changes will be announced ahead of time

Grading

Grading is based on the percentage of total points earned. Final Grades will be assigned as follows:

A 90 - 100% B 80 - 89% C 70 - 79% D 60 - 69% F 0 - 59%

Grading criteria are in the directions for each assignment. Due dates are specified in the course checklist and must be adhered to for full credit. Work will be accepted until the end of the last day of each week (Sunday night 11:55 pm) OR as stated on the Laulima week. Withdrawals within the first 10 days of class will be listed as a W.

An I (incomplete) grade is given at the Instructor's Discretion when you are unable to complete a small part of the course because of circumstances beyond your control. It is YOUR responsibility to make up incomplete work with a minimum level (or better) of achievement. Failure to satisfactorily make up incomplete work within the appropriate time period will result in a grade change from "I" to the contingency grade identified by the instructor (see catalog).

How do you get feedback? I will post grades/comments within two days of your submissions. We can interact by email, via Laulima and/or "virtually" in Zoom. I will respond to emails within 24 hours of receiving them.

How do you achieve an A grade? Develop RECALL (the ability to remember facts/vocabulary/names), THINK CRITICALLY (what does this fact/concept/organism/situation/ecosystem mean to 'me'/Hawaii/the world?) and seek to UNDERSTAND. Rubrics are provided to guide us into how to do this in the categories listed below.

DISABILITIES ACCOMMODATIONS

If you have a physical, sensory, health, cognitive, or mental health disability that could limit your ability to fully participate in this class, you are encouraged to contact the Accessibility Counselor to discuss reasonable accommodations that will help you succeed in this class. Roy Inouye can be reached at (808) 235-7448, royinouy@hawaii.edu, or you may stop by Hale Kāko'o 106 for more information.

SEX DISCRIMINATION AND GENDER-BASED VIOLENCE RESOURCES

(TITLE IX)

Windward Community College is committed to providing a learning, working, and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking.

If you or someone you know is experiencing any of these, WCC has staff and resources to support and assist you. To report an incident of sex discrimination or gender-based violence, as well as receive information and support, please contact one of the following:

UH Confidential Advocate
Phone: (808) 348-0663
Email: Advocate@hawaii.edu

Karla K. Silva-Park, Title IX
CoordinatorPhone: (808) 235-
7468
Email:
karlas@hawaii.edu
Office: Hale Kāko‘o
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As a member of the University faculty, I am required to immediately report any incident of sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and I cannot guarantee confidentiality, you will still have options about how your case will be handled. My goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

For more information regarding sex discrimination and gender-based violence, the University's Title IX resources and the University's Policy, Interim EP 1.204, go to manoa.hawaii.edu/titleix/

Nondiscrimination and Affirmative Action

The University of Hawaii is committed to a policy of non-discrimination on the basis of race, sex, age, religion, color, national origin, ancestry, disability, marital status, arrest and court record, sexual orientation, or veteran status in all of its programs, policies, procedures, or practices. This policy covers admission and access to, participation, treatment and employment in university program and activities.

ALTERNATE CONTACT INFORMATION

If you are unable to contact the instructor, have questions that your instructor cannot answer, or for any other issues, please contact the Academic Affairs Office:

- Location: Alaka'i 121
- Phone: (808) 235-742

Course Calendar

Week 1, 22 -28 August Introduction to Plants and Environments and Class!



Topics:

- In this week we define three major areas of study with the intention of pointing out both the distinct studies for our course and hopefully lay the ground work for seeing connections...
- We address the questions: What are the three major baskets of information to fill/study in our course?
 - What are characters that we use to identify plants?
 - What are the basics of Botany? What are the basics of Evolution? And what is HAWAII as a collection of past and present resources that give rise to—influence at least—the evolution and diversity of Hawaiian plants?
 - We start to look at the geology of how the Hawaiian islands were formed as a basis for understanding the Hawaiian environments relative to Hawaiian plants.
 - How is Hawaii, as a collection of diverse environments and plants with cultural significance—vulnerable?
 - Questions to keep in mind:
 - What is the Hawaiian environment?
 - What are abiotic and biotic aspects of the environment(s)?
 - How were the Hawaiian island formed?
 - And—how does *form* relate to *function* in general and in plants?

[Hawaiian Botanist Steve Perlman](#) pioneered rappelling down high cliffs in the 1970s to save the *Brighamia insignis* - a rare Hawaiian plant commonly known as the Alula.

"We know the Amazon is losing all these species," he said. "But Hawaii is losing species. There's an extinction crisis going on here, and we've already had over 100 species go extinct."

From WEEK 1 Module as an example of what you will find and DO!

Assignments:

- Forum Introduce yourself
- Reflection - Introduction to Class, Botany, Evolution and Hawaii Lecture Video 1
- Reflection - How Did Life Emerge? Video 2

Reading reference:

- Carlquist chapter 1 pp. 1-63

**Week 2, 29/August - 4/September: Botany of Hawaiian Plants,
Geology and Botany**



Topics:

- This week we continue working with the geology of the Hawaiian islands and learn basics of botany.

Assignments:

- Reflection - Botany Video 4
- Worksheet - How the Earth Was Made Video 3

Reading reference:

- Carlquist chapter 1 pp. 1-63

Note! The specific assignments for the balance of our class will be posted in the weekly modules!

Week 3, 5-11 September *What is the Hawaiian environment?*

Geology of the Hawaiian Islands

What are the basics of EVOLUTION? And what is HAWAII as a collection of past and present resources that give rise to—influence at least—the evolution and diversity of Hawaiian plants?



Topics:

- This week we build on information from geology and plants to extend and address questions including: What are the basics of EVOLUTION? And what is HAWAII as a collection of past and present resources that give rise to—influence at least—the evolution and diversity of Hawaiian plants?

- How does/might Hawaiian culture relate to Hawaiian plants and ecosystems?

Reading reference:

- Carlquist chapter 1 pp. 1-63



Week 4, 12 - 18 September Climate of Hawaiian Island, Ecology and Evolution.

Topics:

- This week we include *climate* along with *geology* as abiotic aspects of environments that—in the ‘present time’ (which is the time frame of *ecology*), influence and perhaps determine the distribution of plants and other organisms in communities—and are factors as *selective pressures* that are central to *evolution* over long time frames (in general).

Reading reference:

- Carlquist chapter 2 pp. 63-80

Week 5, 19 – 25 September: What are Hawaiian biological phenomena?

Topics:

This week we will focus on dispersal to island environments and include a focus on spore plants (e.g. ferns and moa) and seed plant which are flowering plants in our case since *there are no gymnosperms that are native to Hawaii!*

- Why is the life cycle of a plant and why is it important?
- Shown here are spore forming structures on the undersides of Uluhe fern leaves (= fronds)...what happens in these structures and how this relates to ecosystems—to conservation—will be discussed! What we see is not all that there is...



Reading reference:

- Carlquist chapters 3, 4 pp. 81-122

Week 6, 26 September – 2 October

Topics:

This week we will further consider dispersal as loss of dispersability, and competitiveness in Hawaiian plants.

- *What are Hawaiian biological phenomena?*
- What are *problems* of island existence?
- What are adaptations (*solutions*) to island existence and environments?

Reading reference:

- Carlquist chapters 3, 4 pp. 81-122

Week 7, 3 - 9 October

Exam 1! Details will be announced and regard all assignments as study guides for the Exam(s).

Topics:

This week we will continue the study of adaptations to island environments with specific plant examples/stories.

Reading reference:

- Carlquist chapters 3, 4 pp. 81-122

Week 8, 10 – 16 October

Topics:

Following Exam 1 we will discuss adaptations including arborescence, loss of dispersability & competitiveness in native plants, and include student presentations and *plant identification!

Reading reference:

- Carlquist chapters 5, 6 pp. 122-256, 163-179

Week 9, 17-23 October

Topics:

This week we will include student presentation on Hawaiian plants, and introduce ecology and ecosystems, communities and geographic zones

Reading reference:

- Carlquist chapters 14 - 19



Week 10, 24-30 October

Topics:

This week we will extend our focus on Hawaiian plants and their adaptations in ecosystems introduce ecology and ecosystems, communities and geographic zones.

- Central questions to keep in mind:
 - What are examples of Hawaiian plants from each ecosystem?
 - How do those plants 'mirror' (or show us) the *environmental conditions of the ecosystem(s) in their adaptations?*
 - Relative to ecosystems--*where are the connections?*
 - If one wants to respect/conservate native plants--how might one do this?
 - What is/are KINOLAU?

Reading reference:

- Carlquist chapters 14 – 19

Week 11, 31 October-6 November

Topics:

This week we will focus on coastal ecosystems and native plants. Keep basics of botany, Hawaii and ecology/evolution in mind as we proceed through ecosystems from the coast to alpine (with many in between). From coastal ecosystem we will go to dry forest.

Reading reference:

- Carlquist chapters 14, 15 pp. 267-300

Nohu flower from Sandy Beach—low lying, silvery leaves—beetle pollinated.



Week 12, 7 - 13 November

Topics:

This week we will progress from the ecosystems closest to the coast to lowland ecosystems to rainforests. I encourage you to look for connections and transitions.

Reading reference:

- Carlquist chapters 16, 17 pp. 300 – 345, 18, 19 pp. 347 - 374

Week 13, 14 - 20 November

Topics:

This week we will continue on our way away from the ocean and gain altitude until we reach the alpine and bog ecosystems.

Reading reference:

- Carlquist chapters 18, 19 pp. 345 - 374

Week 14, 21 - 27 November

Topics:

Our considerations of the basics of plants, Hawaii, ecology and evolution extend through the ecosystems and this week we will focus on alteration of native Hawaiian vegetation via land development and introduced animals (for example) which will lead us to consider conservation.

Week 15, 28 November - 4 December

Topics:

- This week we focus on one ecosystem in particular--that of the 'Ōhi'a forest. We bring information in from a discovery by Dieter Mueller Dombois PhD (one of my professors) that 'Ōhi'a trees live and die in a natural "cohort" cycle. And 'Ōhi'a is the keystone species for the Hawaiian forest. This has significance at many levels including respect for Hawaiian culture.
- Central questions include:
 - What is succession? What is cohort succession?
 - How does the 'Ōhi'a tree establish and grow?
 - What is special about the Hawaiian forest?
 - What is or might be a role of activism in protecting the Hawaiian forest and other ecosystems?

The 'Ōhi'a flower is part of a collection of flowers termed "inflorescence". We see here the many boy parts (stamens) surrounding the female parts (pistil),



Week 16, 5 - 8 December

Topics:

This week we 'complete' our class with student presentations and final preparation!

FINAL 14 December.