The Tropical HTIRC mission is to advance the science and application of tree improvement, management, and protection to improve tropical hardwood forests, with emphasis on the Hawaiian Islands.
Aloha Kākou!

To help promote communications, we will produce Tropical HTIRC Annual Reports that highlight each year’s progress and developments. In 2018, we made several changes to our Tropical HTIRC Steering / Advisory Committee, which provides guidance on the strategic directions of the center, prioritization of research themes, and staffing. Rick Lopez (Director of the USDA Forest Service Institute of Pacific Islands Forestry) and James Leary (Assistant Specialist for Invasive Plant Management Science, University of Hawai‘i at Mānoa) have each resigned their positions and relocated to the mainland. Rick is now Director of Partnerships and Collaboration with the Forest Service in Vallejo, CA. James is now faculty at the Center for Aquatic and Invasive Plants at the University of Florida. We have added Susan Cordell (Director, US Forest Service Institute of Pacific Islands Forestry), Nicholas Comerford (Dean, College of Tropical Agriculture and Human Resources at the University of Hawai‘i at Mānoa), and Diane Haase (USDA Forest Service Western Nursery Specialist, including Hawai‘i) Mahalo to everyone for your guidance!
We also made several changes to our staffing. Bradley Kaufmann completed his position as Tropical HTIRC project coordinator / propagation specialist in September 2018 to pursue his dream of starting an operational native plant nursery on Hawai‘i Island. We will stay connected through his business, HydroPono LLC, and pursue opportunities for collaboration.

We were excited to welcome a large crop of new graduate students and scientists to Tropical HTIRC in 2018, with others coming in 2019!

New graduate students include Achyut Adhikari (MS, University of Hawai‘i at Mānoa), Lilian Ayala Jacobo (MS, Purdue University), Rebekah Ohara (PhD, Purdue University), and Emily Thyroff (PhD, University of Hawai‘i at Mānoa). Aziz Embrahimi, Indira Paudel, and Anna Sugiyama each began post-doctoral scientist positions at Purdue University in 2018, and Adel Youkhana continues his post-doctoral scientist position at University of Hawai‘i at Mānoa. Additionally, we are pleased that in 2019, Kyle Rose (formerly Kyle Earnshaw) will begin a position as Research Scientist with Tropical HTIRC during summer. Kyle completed his PhD with Tropical HTIRC in 2017 and will help to manage our ongoing field trials, and pursue new independent research.

Aloha E Komo Mai!
We are in the midst of our 2017-2021 Tropical HTIRC strategic plan, which outlines priorities for research, extension, and education in tropical hardwoods (especially for *Acacia koa*). By closely engaging our stakeholders, we aim to contribute substantively to conserving and restoring Hawai’i’s native forests. With guidance from the Steering / Advisory Committee and stakeholders, we are undertaking a variety of projects designed to meet our strategic objectives. Several of these are featured below including: progeny testing, cold hardiness, population ecophysiology, seed stratification, clonal propagation, seed library, plantation thinning, and community-managed forests. Additionally, Tropical HTIRC and partners are continuing or initiating projects in koa wilt resistance (HARC, University of Hawai’i), ‘ōhi’a disease resistance (USDA Agriculture Research Service, University of Hawai’i, USDA Institute of Pacific Islands Forestry), and sandalwood (DOFAW, Forest Solutions). We will feature developments from these projects in future Tropical HTIRC annual reports!
Field tour to a private landowners’ koa plantations during the 2018 Tropical HTIRC annual advisory committee meeting.

Extension and outreach are critical to the Tropical HTIRC mission. We host field days, workshops, and symposia; and produce publications that are relevant to managers. To aid in our extension/outreach efforts and better connect with partners or stakeholders, we are striving to improve our communication strategy. We are in final stages of completely revising our website (www.trophtirc.org), and we will keep this updated with research progress, news, events, and publications. The new annual reports will be posted and archived on the website. We may also expand our “Executive Committee” to include a greater representation of Steering / Advisory Committee members and stakeholders. Of course, we will continue to hold our Tropical HTIRC annual advisory committee meetings and field tours. We have active projects with most of our partners, and we will continue to use these collaborations as one of the most effective ways to keep closely connected – looking forward to seeing you in the forests of Hawai’i!!

Douglass F. Jacobs
Director, Tropical HTIRC
New Tropical HTIRC Staff
We added several new graduate students and staff during 2018. And several others are joining in 2019. Welcome and Aloha!

Achyut Raj Adhikari is a MS graduate student at the Department of Tropical Plant and Soil Sciences at the University of Hawai’i at Mānoa. He is pursuing his Masters in plant science. His graduate research project involves breeding koa for disease resistance. For his project, he will be studying the performance of greenhouse grown seedlings from different maternal lines on their ability to resist koa wilt.

Achyut received his BS in Agriculture from the Tribhuvan University, Nepal, in 2014. He worked in plant breeding, plant genotype conservation, and horticulture for three years in Nepal. Achyut has interests in breeding for biotic and abiotic stress management in plants.

Lilian Ayala Jacobo is a MS graduate student in the Department of Forestry and Natural Resources at Purdue University. She is studying the frost tolerance of koa seedlings for populations from different elevations, as well as the heritability estimates of different traits of interest of koa families located in a progeny trial on the windward slope of Mauna Kea, Hawai’i.

Lilian received her BS in Forestry from the National University of Asunción, Paraguay, in 2012. She worked as a technical and consultant forestry assistant for a year and in the forestry program of the National Institute of Agricultural Research in Paraguay for 3.5 years. Lilian has interests in forest regeneration, tree improvement, and conservation of forest genetic resources.
Dr. Aziz Embrahimi is a post-doctoral scientist in plant genetics at Purdue University, studying genes related to cold tolerance in koa. Aziz's interest is in landscape genetics, phylogeny and evolution of tree species, especially Juglans, and he has utilized genetics, genomics, and bioinformatics tools to address questions in that area of research.

Aziz has been working on stress tolerance across Acacia koa populations; from physiology to genomics. The specific goals of his project are: 1) Evaluating cold tolerance of koa populations of different elevations based on physiological characteristics and RNA analysis of gene expression using qPCR; 2) Genotyping koa populations represented across an elevational cline with nuclear and chloroplast markers to evaluate the primary level of genetic diversity.

Rebekah Ohara is a PhD student in the Forestry and Natural Resources Department at Purdue University focusing on the pathways and opportunities for community-managed forests in Hawai’i.

Rebekah received her B.A. in Anthropology in 2009 from Humboldt State University (HSU), and in 2013 she completed her M.A. in Social Science at HSU’s Environment and Community Program, focusing on the social and ecological considerations of tropical forest conservation in Ecuador. For two semesters, Rebekah served as a Teacher’s Assistant and Field Guide for HSU’s Primate Field School at the Organization for Tropical Studies in Costa Rica. Mrs. Ohara is the Director of Programs for the Akaka Foundation for Tropical Forests.
Dr. Indira Paudel is a post-doctoral scholar in the Department of Forestry and Natural Sciences at Purdue University. She is working on the response of hardwood species to climate change, focusing on effects of precipitation and temperature variability. In addition, she is studying the ecophysiology of *Acacia koa* in response to resource variation across elevational gradients in Hawai‘i.

Indira is a native of Nepal. Before she joined Purdue, she completed her graduate studies from Hebrew University of Jerusalem, and her first post-doc fellow training from the Weizmann Institute of Science, Israel.

Dr. Anna Sugiyama is a post-doctoral scientist in the Department of Forestry and Natural Resources at Purdue University. She received her PhD from University of Georgia, where her dissertation research focused on effects of forest fragmentation on regeneration of animal-dispersed tree species in southern Costa Rica. Before coming to Purdue, she held postdoctoral positions at UCLA, FFPRI in Japan, and Yale, where she did most of her field work in Panama. At Purdue, Anna’s work is on application of intraspecific variation in functional traits for forest restoration in the Hawaiian endemic tree species *Acacia koa*.
New Staff Starting in 2019

Dr. Kyle Rose is a research scientist with Tropical HTIRC (summer appointment) and an Assistant Professor of Forestry at New Mexico Highlands University in Las Vegas, New Mexico. Kyle was a Peace Corps Volunteer in Honduras before receiving his MS from Michigan Technological University and PhD from Purdue University.

In Hawai‘i, Kyle studies developmental heteroblasty and plasticity of koa and how silviculture can be used to manipulate this plasticity to promote increased survival and performance of koa on harsh and favorable sites. He is also interested in income generation through the development of silvicultural systems for afforestation of abandoned pasture land and rehabilitation of degraded native forests. Ultimately, he hopes that his work provides solutions for forest management while balancing the complex social, ecological, and economic decision space of Hawai‘i. He is also leading projects related to clonal propagation of koa and will be involved in sandalwood projects.

Emily Thyroff is a PhD student at the University of Hawai‘i at Mānoa, originally from western New York. She earned a BS in biology from James Madison University during which she lived at a research station in the Australian rainforest studying forest ecology. She was a natural resource technician in Utah and West Virginia working on stream habitat and non-timber forest product projects before landing at Purdue University earning a MS in forest biology.

Starting in August 2019, Emily will be working on tropical forest restoration and regeneration of native tree seedlings. She is still defining her research topic and proposal; however, she plans on answering fundamental and applied questions relating to plant ecophysiology, soil interaction, and management practices.
1. Improve the genetic quality of tropical hardwoods, especially Acacia koa, through use and refinement of traditional methods and development of novel tree improvement techniques.

2. Develop advanced nursery propagation and seed production technologies to improve the field establishment success of tropical hardwood reforestation / restoration and allow for efficient production of genetically improved trees.

3. Establish a system of native species research and demonstration trials (e.g., on the Hawai'i Experimental Tropical Forest) for education and training of consultant and industrial foresters, nursery practitioners, conservation biologists, and public and private landowners in silviculture and regeneration techniques.

4. Educate future leaders in tree improvement, management, and protection of tropical hardwood forests.

5. Engage our stakeholders and address their needs by communicating research findings and management recommendations.
Tropical HTIRC Program Structure / Road Map

We aim to address these themes in an interconnected way. Our focus has been on Acacia koa, but this framework can be expanded to other species (e.g., ‘Ōhi’a).
Tropical HTIRC Projects
Progress in 2018

Progeny Tests

Lilian Ayala Jacobo is studying the genetic gain of *Acacia koa* (koa) families in progeny trials on Hawai‘i Island as part of her MS thesis research. The objective of this project is to establish seed orchards with desirable traits (e.g., growth, form, pest resistance) by evaluating and ranking koa families to determine the heritability estimates of desired traits for future tree improvement. Koa plantations were established in 2015 at three sites along the windward slope of Mauna Kea (managed by the Department of Hawaiian Homelands): HARC B 6,800’; Koa buffer 6,570’; and Hopuwai 6,280’. The experimental design was a randomized complete block design, with 20 families represented by two individuals per block in each of six blocks (N = 12 individuals per family per site). To evaluate tree performance and rank families, growth and survival of these koa families were measured at all three sites during 2015 and 2016, and also at 2019 for the HARC B site. Variables recorded included height to living crown, total height, basal diameter, crown diameter in N-S and E-W directions, survival, rust infection, and psyllid infection. Statistical analyses and estimates of heritability for desired traits from all measurements at the HARC B site will be conducted in 2019.
This project will contribute to current and future seed production of existing and new seed orchards that will supply improved seed to landowners for decades. While the Koa buffer and Hopuwai sites had cattle damage that compromised their long-term utility for data analysis, we have relocated the trees at each and most trees have recovered. Because the same families were represented across all three sites, these sites can still be rogued of inferior families and serve as future seed orchards for forestry and restoration projects. There are potentially >110,000 acres available for koa reforestation on Hawai‘i Island alone!
Cold Tolerance

At high elevation sites in Hawai‘i, exposure of planted seedlings to winter frost may reduce survival and result in failed restoration projects. Our objectives in this project are to determine 1) the degree to which koa develops cold hardiness as a mechanism to tolerate frost, 2) whether populations of koa from higher elevations show greater cold tolerance than koa populations from lower elevations, and 3) the extent to which exposure to environmental conditions to induce hardening may affect cold tolerance.

As part of her MS thesis research, Lilian Ayala Jacobo germinated seeds collected from 13 Acacia koa populations along an elevational gradient (603 to 2050 m = 1978’ to 6725’) on the island of Hawai‘i. Four-month-old seedlings from these populations were divided into two groups that were either cold acclimated (i.e., exposed to reduced photoperiod and lower temperature) in growth chambers or remained in the greenhouse. Electrolyte leakage, which quantifies the amount of tissue damage as a measure of the proportion of cell solutes lost due to freezing damage at a range of temperatures, was used to assess frost tolerance. Five test temperatures, consisting of one control temperature + four below-freezing temperatures (-5, -10, -15 and -20°C), were selected based on the expected hardiness of the samples. Upon reaching each freeze test temperature, samples of leaflets were maintained in the freezer for 60 minutes, removed and placed in a refrigerator for thawing for 24 hours, and then placed at room temperature for 18 hours for complete thawing. Initial electroconductivity was then measured and the samples were placed in a refrigerator at ~4°C overnight. The following day, samples were autoclaved (which achieves 100% electrolyte leakage) in samples at 120°C for 20 minutes and then allowed to cool at room temperature. Once the vials were cooled, electroconductivity was measured again to determine total electrolytes. Electrolyte leakage of samples from each test temperature was expressed as a percentage of total electrolytes, which provides a measurement of the interpolated temperature at which 50% of the tissue is killed (LT50). Statistical analyses will be carried out to determine whether seedlings of populations from higher elevations show higher cold tolerance than populations from lower elevations, and how this may interact with cold acclimation. Preliminary results show an overall higher damage for non-acclimated seedlings than acclimated seedlings for most populations at the two lowest test temperatures.

Dr. Aziz Ebrahimi, a post-doctoral scientist, will repeat this study using a whole plant freeze test, which corresponds more closely than electrolyte leakage to field conditions. Additionally, he will use RNA sequence data to help develop probes for characterizing the expression of genes related to cold tolerance and the development of cold hardiness. Differences in gene expression may then be related to differences in genome sequence, so that the genetic basis for observed physiological differences can be determined. A comprehensive characterization of the allelic differences among koa populations at genes of interest will enable rapid
assessment of the cold tolerance of any population and, possibly, the identification of rare genes that can be used to improve the survival of koa at high altitudes where it formerly thrived.

Sampling locations of koa populations for cold tolerance testing (top left). Cold acclimation of seedlings in growth chambers (top right). Electrolyte leakage testing of koa foliage (bottom right).
Population Ecophysiology

Dr. Anna Sugiyama studied intraspecific variation of *Acacia koa* as part of her post-doctoral research. Specifically, she is testing for (1) intraspecific tradeoffs in functional traits, (2) local adaptation and phenotypic plasticity, (3) whether adult traits can predict seedling performance. In 2018, leaf samples were collected from 40 trees and with help from researchers at the USDA Forest Service Institute of Pacific Islands Forestry, leaf size/area data were obtained. Seeds from 17 of those trees were collected and seeds from another 21 trees from the Tropical HTIRC seed library were added to the study. Seedlings were germinated from these seeds and moved to growth chambers under three conditions; “low elevation”, “high elevation”, and “future climate change scenario” to determine local adaptation and phenotypic plasticity. In 2019, she will continue to monitor seedlings for development (especially abnormality) and performance (growth and survival) and then conduct tests for cold, heat, and drought tolerance.

As part of her post-doctoral research, Dr. Indira Paudel examined interactions of koa seedlings collected from three elevations (1017’, 4002’, and 6463’) with varying levels of light and nitrogen in wet and dry soils. She hypothesized complex interactions between resources, and that seedlings will perform better when growing in environments best matched to their seed source environments. Light (full sunlight vs 25% of full sunlight) and nitrogen (standard dose vs. control) treatments were randomized across seed sources in wet (75% of field capacity) and dry (30% of field capacity) conditions for three months. Leaf water potential (LWP), leaf physiology, nitrogen concentration, followed by total plant dry matter and shoot/root ratios, and shoot non-structural carbohydrate (NSC) were quantified. Preliminary results indicate that LWP was more negative for high elevation sources in wet conditions, while the opposite trends were observed in dry conditions. Photosynthesis increased with increasing elevations both in wet and dry conditions. Low light significantly increased LWP, and its intensity was higher in low elevation sources, especially in wet environments. There is a complex interaction between light, nitrogen and water for all elevation seed sources, but high elevation seedlings appeared to be more stress tolerant than low elevation sources, while mid elevation seedlings buffered some of these stresses. Restoration strategies may benefit from considering the adaptability and stress tolerance associated with seed source environments.
Greenhouse light treatments (top). Growth chambers to simulate varying environmental conditions (right).
Seed Scarification

Seeds sorted by families for scarification treatment.

Seeds of many legumes, including Acacia koa, require that seeds are scarified (treatment to damage the seed coat to allow water uptake) in order to germinate. Manual nicking is a reliable method to scarify koa seeds, but it is inefficient for treatment of thousands of seeds. An alternative strategy to scarify koa seeds is to use hot water. Hot water treatment is a broadly used scarification method that is relatively cheap, quick, and safe, but the optimum conditions for hot water treatment are often unknown. Overly benign conditions would be less effective whereas overly severe conditions would potentially damage or kill the seeds. Previously reported instructions for scarifying koa seeds using hot water express a fair bit of uncertainty, which may result from large variation in its seed morphology across koa’s wide range of environments. Understanding optimum scarification conditions would improve efficiency in restoration and nursery practices, as well as reduce costs and labor.

As part of her post-doctoral research, Dr. Anna Sugiyama is testing whether optimum scarification conditions for koa seed would differ by families (seed source trees), and if optimum conditions can be predicted by variables such as elevation. Seeds from different families along an elevational gradient were tested under different water temperatures and exposure times after
pre-trials. Post-treatment measurements included the number of imbibed (absorbed water) seeds, the number of seeds that germinated, and the number of seedlings that showed abnormal development (potentially due to damage by hot water). Preliminary results indicate that the traditional scarification method of treating seeds with 90°C water for 1-3 minutes was ineffective for koa seeds from most families, often resulting in less than 50% imbibition. Effectiveness of any given scarification condition greatly varied among families, but overall, seeds from families in low elevations tend to require more severe scarification conditions. In 2019, we will continue monitoring seedling development after these different scarification treatments in order to make recommendations for optimum scarification conditions that would maximize imbibition and germination, while at the same time minimizing seedling abnormality.
Clonal Propagation

Successful tree improvement programs rely on the ability to screen, select, and breed for specific traits. Vegetative propagation, usually in the form of rooting or grafting, can be used to rapidly select for important attributes such as disease resistance, tree form, and wood quality. In the case of Acacia koa (koa), past efforts to develop clonal propagation techniques have proven difficult. Grafting of koa has either met with complete failure or was only suited to very small root and scion stocks.

New collaborations with Jim McKenna (US Forest Service Tree Breeder, Hardwood Tree Improvement and Regeneration Center) have resulted in some promising success for koa grafting. During early-2018, Bradley Kaufmann was able to successfully graft koa at the University of Hawai’i Komohana Research and Extension Center. A formal grafting study led by Kyle Rose and Owen Burney began in July 2018 at the New Mexico State University John T. Harrington Forestry Research Center in Mora, NM. This study built on a pilot koa grafting study with Jim McKenna conducted at Purdue University in 2016. These methods stipulate that all leaves from the scion and rootstock are removed, the number of buds on the scion is limited to three, the grafting union is joined using Buddy Tape (Aglis Corp.), the entire scion is wrapped in Parafilm, and the newly grafted koa is covered lightly in tin foil for the first week after grafting. For this study, we wanted to 1) verify and quantify the koa grafting techniques from the 2016 pilot study; 2) test whether the use of a mechanical top grater (A.M. Leonard Inc.) could maintain the performance of an expert grater employing a whip and tongue graft technique; and 3) test whether these techniques were applicable to contrasting ecotypes (wet vs. dry).

Preliminary results suggest no maturity (true leaves only vs. phyllodes) effect, no size effect, no interactions between factors, no effect of grafting method, and no effect of source. The mechanical grafting method has averaged a 55% success rate, while the whip and tongue method has averaged a 60% success rate, where these results are not significantly different. The dry site population, from Kona Hema Nature Preserve on the Island of Hawai’i, and wet site population, from Umikoa on the Island of Hawai’i, averaged 57% and 58% success, respectively, with no significant difference between the two populations. These results suggest that the graft type and population source are not as important as the treatment of the grafted seedling and the post-graft environment. We will continue to follow this study in 2019 and disseminate the results.
Koa grafting study installation at the John T. Harrington Forestry Research (top left). Graft union (top right). Successfully grafted koa at UH Komohana (bottom right).
Seed library

Koa shows a tremendous degree of adaptive variation across the highly heterogenous environments comprising its native range in Hawai‘i. With climate change and the likelihood of increased drought in the future, it is important to better understand the genetic variation in tolerance to environmental stresses among koa populations. For instance, in Kyle Rose’s PhD research, he found that local sources of koa on a dry western site on Hawai‘i Island had better survival than more mesic populations. This knowledge is directly relevant to informing the degree to which seed sources can be moved during reforestation efforts and the potential to use assisted migration to account for future climatic conditions.

Thus, we have been building a Tropical HTIRC koa seed library for the past 6 years, collecting from a wide range of sites across koa’s range. This seed library will provide a resource to support ecophysiological studies of adaptation (drought, cold tolerance, etc.). During 2018, we used many of these populations to support such studies and so we will continue to build the seed library. This could present a great opportunity for collaboration among Tropical HTIRC partners!!
Thinning

Koa grows fast, and many plantations or naturally regenerated stands receive little to no follow-up management. An important management practice in young koa stands is density reduction (thinning), which alleviates inter-tree competition that reduces tree growth and canopy development, promotes seed production, and reduces susceptibility of trees to insect and disease problems. Koa often has inherently poor stem form, and so thinning also provides an opportunity to select individual trees with good form when a management goal is timber production. Thinng is equally important, however, to promote koa stand development for conservation or wildlife habitat.

In 2006, 360 Acacia koa seedlings were outplanted on the Pu‘u Wa‘awa‘a cinder cone at the Hawai‘i Experimental Tropical Forest on Hawai‘i Island. These seedlings were originally part of a nursery fertilization and stock size experiment that resulted in significant differences in seedling performance early in the outplanting phase. The stand was planted at a relatively high density (2 m x 2 m) and by year 10, the trees showed strong inter-tree competition and crowded canopy development.

In May of 2018, Owen Burney (New Mexico State University), JB Friday (University of Hawai‘i at Mānoa) and others implemented a thinning prescription based on two basic tree categories. One focused on releasing those dominant individuals with desirable commercial characteristics (i.e., straight form and large diameter). The other emphasized development of bird habitat (i.e., multi-stemmed, multi-branches, and large diameter/crown). A total of 14 trees per group were measured for a range of characteristics that included diameter, height, and crown area (measured via drone photos). These trees will be measured over time to determine thinning responses relative to two control trees from each group that were not released.

This project will provide important information on response of planted trees to thinning treatments and serve as a demonstrate site to share the value of thinning treatments with restoration project managers and the public. We also expect to see significantly more seed production in these stands once the canopies are released, and so the plots will subsequently serve as an efficient seed source for collections of locally adapted koa seed for restoration at Pu‘u Wa‘awa‘a. Finally, reducing the koa canopy will allow more opportunities to underplant other native species.
Experimental map of the thinning trial at Pu‘u Wa‘awa‘a showing trees designated as target “crop” or “wildlife” trees and surrounding trees designated for thinning to release target trees (top left). An example of target “crop” tree (blue flag) and “wildlife” tree (yellow flag) prior to thinning (top right). Drone view of the recently thinned koa stand (bottom).
Community Managed Forests

There is a growing interdisciplinary movement to integrate place-based knowledge and local practices into resource management in Hawai‘i through community-based approaches. This research explores the underlying conditions for successful implementation of community-managed forests (CMF) in Hawai‘i, with a focus on how specific land ownership arrangements and assemblage of actors influence the collaborative resource management process and outcomes. By understanding what variables tend to result in successful outcomes, mixed methods in social science can support and inform community-based forest management. This research is being conducted by Rebekah Ohara as part of her PhD studies at Purdue University in the Forestry and Natural Resources Department, under the direction of her co-advisors Dr. Douglas Jacobs and Dr. Zhao Ma and her committee members, Dr. Laura Zanotti and Dr. Christian Giardina.

Community-based Natural Resource Management (CBNRM) research highlights the importance of local circumstances including social, cultural, political, ecological, institutional, and economic contexts as determinants of success of collaborative management efforts (Berkes, 2007; Waylen, Fischer, McGowan, Thirgood, & Milner-Gulland, 2010). There is a robust literature base on best practices for successful CBNRM and common-pool resource management; however, there are few models to follow that share Hawaii’s particular historical, cultural, and land tenure contexts. While there are examples of collaboratively managed marine systems in Hawai‘i, contemporary examples of community-managed forests (CMF) in Hawai‘i are rare or just emerging, and are therefore not represented in the literature.

This research will explore the underlying conditions for the successful implementation of community-managed forests in Hawai‘i.
of community-based forests in Hawai‘i, addressing Hawaii’s distinctive historical, cultural, and land tenure context that is missing in contemporary community forestry literature. The central research question of this work is: What are the pathways and opportunities for the development and successful implementation of community-managed forests in Hawai‘i? This research will explore the following research questions:

Question 1: What are likely key indicators of success in community-based natural resource management and community-managed forests in Hawai‘i?

Question 2: How can the lessons learned from international and national collaboratively managed forests and CBNRM in Hawaiian marine systems be applied to the development of community-managed forests in Hawai‘i?

Question 3: What are the opportunities for the development of community-managed forests on the Island of Hawai‘i?

Question 4: How is community-based natural resource management emerging in Hawai‘i?

The purpose of this research is to: (i) improve understanding of important indicators of success (and how to apply them) to CBNRM and CMF specific to Hawaii’s land tenure, Indigenous culture, and colonial contexts; (ii) articulate pathways and opportunities for the development of community-managed forest projects in Hawai‘i; and to (iii) support community-based efforts to establish and manage forests in Hawai‘i, which have the potential to support healthy ecosystems, increase sustainable economic opportunities, and support Hawaiian cultural practice by improving community access to land for stewardship and cultural practice.

These themes will be explored through a triangulation of existing literature and theory with data from semi-structured interviews. This research will integrate: a systematic literature review that will include national and international community-based management and common-pool resources literature, with a focus on examples that share similar land tenure, Indigenous culture, and colonial contexts with Hawai‘i; literature review and semi-structured interviews with Hawai‘i-based resource managers, cultural practitioners, and landowners to explore local perceptions of current gathering and stewardship opportunities, to gather insight into factors perceived to be important indicators of success for CBNRM in Hawai‘i, and to explore the current climate surrounding CBNRM in Hawai‘i; and, (Chapter 3) a case study of an emerging community-managed forest program on state-managed land in Hawai‘i that integrates lessons from chapters one and two. This research is theoretically grounded in and guided by existing CMF research, common-pool resource (CPR) literature, and the Institutional Analysis and Development (IAD) framework.

References:


New Greenhouse!

Thanks to the leadership of Dr. Susan Miyasaka and staff, the forestry greenhouse at the University of Hawai‘i Komohana Research and Extension Center was completely renovated in 2018. This will provide a dedicated greenhouse facility for Tropical HTIRC nursery and propagation research!
We aim to ensure that research results are communicated to landowners, forester managers, and the scientific community; and that newly developed technologies are applied to real-life situations. Our extension / outreach program consists of regular field days, workshops, symposia, and production of publications relevant to managers. Ideally, we design research projects in direct collaboration with managers to best meet their needs.

Hawai’i Native Plants Grower’s Meeting in Waimea during January 2018 (top).

Discussing methods to implement operational thinning treatments in scarified natural regeneration of koa with the staff of the Nature Conservancy at Kona Hema on Hawai’i Island during August 2018 (right).
Mahalo to Our Partners!