Vision Statement: We are the internationally recognized leader in sustainable production, protection and utilization of tropical hardwoods.
Mission

The mission of the Tropical HTIRC is to advance the science of tropical hardwood tree improvement, utilization, conservation genetics and genomics, protection, and regeneration by:

- Developing and disseminating knowledge on improved and elite tropical hardwood tree species and germplasm for sustainable production of forest products;
- Improving tropical hardwood tree lines for restoration, maintenance of genetically diverse ecosystems, and the goods and services that they provide;
- Increasing knowledge and developing systems for nursery production and plantation establishment;
- Increasing knowledge and developing strategies for conservation, restoration, utilization and marketing of tropical hardwood resources;

Organization Description and Characterization

The Tropical Hardwood Tree Improvement and Regeneration Center (Tropical HTIRC) is a collaborative research, development and technology transfer effort. The partnership includes the USDA Forest Service Northern and Pacific Southwest Research Stations, National Seed Laboratory, Region 5 and 6 State and Private Forestry, USDA Natural Resource Conservation Service, University of Hawaii-Manoa College of Tropical Agriculture and Human Resources (UHM-CTAHR), University of Hawaii-Hilo College of Agriculture, Forestry and Natural Resource Management (UHH-CAFNRM), Purdue University Department of Forestry and Natural Resources, State of Hawaii Department of Land and Natural Resources, Department of Hawaiian Home Lands (DHHL), Kamehameha Schools, The Nature Conservancy, Hawaii Agricultural Research Center (HARC), Forest Solutions Inc., and Hawaii Forest Industry Association (HFIA). In addition, through its affiliation with HTIRC based at Purdue University, it is a member in the National Science Foundation Industry/University Cooperative Research Center (NSF I/UCRC) program titled “Center for Advanced Forestry Systems”, a cooperative program with North Carolina State University, University of Georgia, Virginia Tech, University of Washington, University of Maine, University of Florida, University of Idaho, and Oregon State University. The tropical HTIRC is unique and differs from and expands upon the existing HTIRC on the mainland in several key aspects: 1) it has an international focus on tropical hardwoods; 2) it is a true partnership of federal, state, university, industry and landowner groups who contribute financial support and leadership; and 3) it generates basic knowledge and technologies for the genetic improvement, utilization, conservation, restoration, and regeneration of tropical hardwood tree species to support tree nurseries, forest industry, public land management agencies, and private and public landowners.

Tropical HTIRC is a virtual Center located at Institute of Pacific Island Forestry (IPIF) and Purdue University (HTIRC). The broad range of collaborators each bring unique experiences and perspectives to the partnership: (i) HARC has an important history and current program in disease resistance breeding for Acacia koa; (ii) UHM-CTAHR has a
long standing Acacia koa classical tree improvement effort, research experience in developing new knowledge for plantation establishment, and a well established outreach and extension program for communicating results to land owners and managers; (iii) IPIF is a highly respected ecological research and development center with a depth of experience in Acacia koa forest management; (iv) HTIRC is a national USDA Forest Service Center and an expert in temperate hardwood tree improvement, Acacia koa nursery production, hardwood seed technologies, and integrated government, industry, and university research collaboration, (v) DHHL is actively restoring Acacia koa forest habitats and (vi) HFIA represents numerous entities involved in Acacia koa investment, restoration, and utilization.

Operating Environment

The idea for a Tropical HTIRC was conceived in early 2010 out of a desire to invigorate hardwood tree improvement and restoration research efforts in the tropical region of the USA. The birth of the Tropical HTIRC occurred at the same time that the region was experiencing a renewed interest in afforestation and reforestation of tropical species, such as Acacia koa, on lands that had been abandoned from long standing ranching and agricultural production efforts.

The hardwood industry was also concerned about the future quantity and quality of the resource for its lumber and secondary wood products sectors. In addition, due to previous land use, tropical forests have seen significant reduction in the volume of tropical hardwood timber that is harvested annually. Finally, the hardwood industry was concerned that it was not taking advantage of new technologies and research that could improve wood quality, growth, production of merchantable timber, and pest and disease resistance.

The larger community of professional foresters was also concerned about loss of genetic quality in remaining native forests. They felt that trees that are currently being managed for future timber harvest do not have the same desirable traits for straightness, wood quality, and vigor and that past forest harvest practices of continually taking the “best” trees may have resulted in loss of genetic quality of the remaining germplasm.

In addition, ecologists and land managers throughout the region were becoming increasingly concerned with the ability of native ecosystems to withstand threats from invasive species and climate change. Invasive species, including plants, insect pests and diseases, continue to invade Hawaiian forests. These invaders are changing the ecological dynamics of the forest environment and threatening many native plant and animal species with extinction. The ecology of our tropical forests may be further disturbed by climate change. As a result, regeneration of target native tree species is being inhibited and native forests are being transformed into exotic dominated forests of reduced conservation and commercial value. To address these global changes, tree improvement efforts aimed at providing improved stock can provide the conservation community with the tree genetic knowledge and resources for enhanced management of
native tropical forests while simultaneously providing the forest industry with material required for enhancing forest-based economic development.

**International Economic, Social and Cultural Environment**

Forests are important across the tropical Pacific for ecological, economic, social and cultural values. Species such as *Acacia koa* are ecological, economic and cultural keystone species because they play essential roles in the biological functioning of native ecosystems, and through the diverse array of products from koa in the identity of native Hawaiian culture. In the case of *Acacia koa*, this species is clearly Hawaii’s signature forest industry species.

For ecological, economic, social and cultural reasons, there is growing interest in restoring forests to the degraded landscapes of Hawaii and the Pacific. Water quality has been degraded by conversion of forests to agriculture and ranching. A historic reliance on exotic tree species for planting has degraded both ecological and cultural values of the forest resource. While there have been initial planting efforts with both exotic and native species in Hawaii and across the Pacific, these efforts have had limited access to improved native species and so exotic species have been and continue to be selected over native plant species in many circumstances. Thus, the opportunity exists for greatly enhancing the role that quality native hardwood species can play in reforestation efforts in Hawaii and across the Pacific.

Many of Hawaii’s citizens are concerned about food security and food production systems have a long and rich history in the region – for example ranching and the paniolo cowboy culture are revered parts of Hawaii’s history. These social and political forces can conflict with those of the conservation community and the forest industry, but there are important mitigating attributes to an enhanced forest sector. Wood security is also an important regional concern as well as an untapped source of economic development. Ranching in Hawaii has been declining for decades in large part because ranching is marginally viable as a livelihood. Many consumers assign important aesthetic and spiritual values to forests and even individual trees whether they are in an urban, plantation or natural forest setting. Critically, an enhanced forest industry would require only a marginal increase in the amount of land set aside and dedicated to reforestation. Further, many ranchers are exploring forest-based solutions to enhancing economic viability of ranch operations, and several creative restoration efforts are seeking to enhance ecological value of a landscape while producing economic value. In addition to ranching, fallow agricultural land is also available due to the demise of sugar cane production and diversified agriculture will be an important part of the future Hawaiian landscape.

In the conservation realm, there are now several funding mechanisms for conservation plantings, including the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), and Wetland Reserve Program (WRP). These programs, funded primarily by federal appropriations, account for the majority of private, conservation and stewardship forestry
focused hardwood tree planting in Hawaii and across the Pacific. Historically, improved water quality and wildlife habitat, native species restoration and small scale forestry have been the focal areas. In some cases where native species are considered, the genetic characteristics of the trees being planted under these programs are unknown with important questions regarding growth, form, wood quality and survivorship – especially at elevations or in areas where native seed sources are no longer present.

While the Tropical HTIRC will employ tools of modern genetics to understand target tree species, the Center will not support work that directly manipulates plant genomes and leads to creation of genetically modified organisms. We instead will rely on modern genetics to characterize existing, naturally occurring lines, and classical methods for improving these lines – the same methods used by Hawaiians to create 100+ varieties of taro.

**Relationship with Other Organizations**

Productive working relationships with scientists from a variety of institutions will be necessary for the success of the Tropical HTIRC. To this end, the Center is vertically integrated with molecular biology and classical geneticists, tree physiologists, silviculturists, entomologists, pathologists, ecologists, and nursery and regeneration specialists from its partners with the USDA Forest Service (NRS, PSW, Region 5 and Region 6), University of Hawaii, HARC, and Purdue University. Its strength is its ability to perform and communicate the results of basic, applied and developmental research so the basic knowledge that is created will be delivered to industry and private landowners in value-added products. In addition, partnerships with other tropical forestry research institutions in the US and internationally will be developed.

Tropical HTIRC will be one of many institutions performing tropical hardwood research desired by the hardwood industry, nursery operators, government agencies, forest landowners and managers, and the general public. The world has many outstanding scientists who perform valuable basic and applied research on various species, and it will be essential that the whole tropical hardwood scientific community remains viable to meet these research needs.

**Funding**

Annual federal funding appropriations and in-kind support are expected from the USDA Forest Service Northern and Pacific Southwest Research Stations. Funding will be sought in the short-term from the University of Hawaii for personnel, research, and extension efforts. HARC is expected to collaborate through diverse funding streams, including USDA Forest Service Region 5 and 6 funds. Scientists and collaborators within the Tropical HTIRC will apply for federal grants including NSF, NASA, APHIS, DOE, and USDA. In addition, where industry research funds are available, grants and
annual funding allocations will be sought from landowner groups, forest industry, and other hardwood associations.

Finally, funding from the private sector, including individual private citizens, will form an important part of our funding strategy, as has occurred with the Purdue based HTIRC. These opportunities will be pursued continually as they arise.

Strategic Directions

HTIRC has seven strategic directions for 2011-2016:

1. Improve the genetic quality and regeneration techniques of tropical hardwoods, especially Acacia koa, through application of classical breeding and selection, genomics, molecular markers, advanced propagation and seed production technologies, and silviculture.

2. Develop a highly credible tropical hardwood research center that will be an internationally recognized tropical tree improvement and regeneration leader and, thereby, become a leading graduate education and training facility for future scientific leaders in tropical hardwood research throughout the Pacific.

3. Hire and nurture pre-eminent scientists who will build the credibility of the research program, be highly competitive for federal research grants, and the future leaders of the Tropical HTIRC.

4. Establish important, next generation native species trials and nursery production systems (e.g., on the Hawaii Experimental Tropical Forest) for education and training of consultant and industrial foresters, nursery practitioners, conservation biologists, and public and private landowners.

5. Communicate, convey, and market the work of Tropical HTIRC to be perceived as the pre-eminent international center for hardwood research, development and extension.

Objectives

The following are objectives for implementing the strategic directions categorized in terms of programs, facilities, staffing and funding.

Programs

- Develop research and technology transfer (i.e., extension) programs that provide knowledge for the management and maintenance of sustainable, genetically diverse
native forests and highly productive domesticated trees for plantation hardwood crops that provide a wide array of products.

- For *Acacia koa*: develop molecular markers, tissue culture technologies, advanced seed orchard, and seed handling technologies, breeding orchards, and experimental nurseries for production of elite families and cultivars, identification of superior seed trees, and assessment of genetic quality and diversity in natural stands.

- Take leadership in documentation of tropical hardwood research discoveries and dispersal of knowledge by hosting scientific conferences, symposia, workshops and field days, and publish books, proceedings, and brochures that convey this knowledge to a wide array of end users.

- Provide for annual evaluation and other periodic review of Tropical HTIRC programs to insure that the mission and vision remain focused and relevant to stakeholders.

**Facilities**

- Acquire space for research scientists, extension personnel, and staff to house the Tropical HTIRC in a centralized location on the Island of Hawaii.

- Assess need for acquiring properties for the future expansion of seed and breeding orchards and progeny tests.

- Continue to work with forest industry and conservation partners to establish field trials, progeny tests, and demonstration plots for hardwood genetics and silviculture research.

**Staffing**

- At least annually, assess staffing needs to insure that current staff has appropriate support so that they can be productive and meet the expectations for their level of research outputs.

- When positions are vacant, pursue national recruitment for the highest qualified staff and do not fill positions unless the candidates meet the highest standards of excellence that are expected of staff at Tropical HTIRC.

- Evaluate the scientific disciplinary needs of HTIRC and based on that analysis, prepare a long-range staffing plan that will identify deficiencies and provide for their rectification.

- Periodically evaluate membership of the Coordinating and Advisory Committees to insure that important partners and interest groups are represented.

**Funding**
• Develop a separate fundraising arm and identify individuals and groups for solicitation of donations.

• Explore partnership with USDA Agricultural Research Service on use of *Acacia koa* in agroforestry applications.

• Identify basic research topics and develop proposals with research partners that would be competitive for NFS, NASA, DOE, APHIS and USDA competitive grants.

• Identify applied research topics and develop proposals that would be appropriate for submission to leading science funding entities such as NSF, USDA AFRI, NRCS CIG, and USFWS.