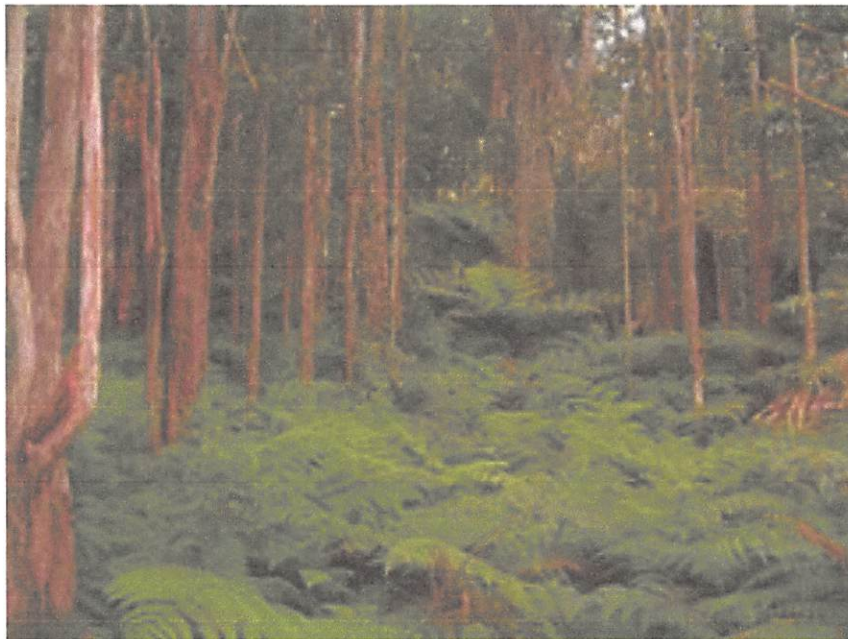


Kapāpala Koa Canoe Forest Youth Educational Plan

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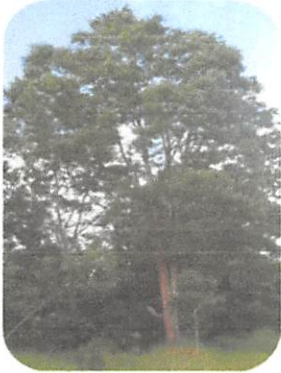
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Kapāpala Koa Canoe Forest. Photo: J.B. Friday.

Introduction



Hawaii's majestic koa (*Acacia koa*) tree is an integral part of our islands' cultural heritage. Koa has a significant role within the native forest ecosystem by providing habitat for endemic birds and insects, and is an essential contributor to maintaining the health of watershed areas. Hawaiians have long valued koa, using the wood for canoes, paddles, bowls and other wooden objects. Overharvesting, damage from ungulates and disease have resulted in a significant decline in koa trees suitable for traditional canoes. This loss provoked anxiety among canoe builders and voyagers as they faced potentially losing a significant part of their culture. In 1989, the State Hawai'i Department of Land and Natural Resources (DLNR) set aside a unique native forest for koa management to address this issue. This area is known as the Kapāpala Koa Canoe Forest Management Area ("Canoe Forest").

The Kapāpala Koa Canoe Forest Youth Education Plan ("the Plan") has been created to spark community engagement with the Canoe Forest. This plan will link to the overall Kapāpala Koa Canoe Forest Management Area Plan by serving as the catalyst for engaging the community in stewardship of the area. The Canoe Forest provides a rare opportunity for youth and the larger community to learn about native forests, as well as traditional forest stewardship models and sustainable living. The planning horizon of the Plan will be for the next five to ten years.

Objectives

The Plan's objectives include,

- To preserve Hawaii's unique natural and cultural inheritance for future generations by fostering knowledge and respect for Hawaii's native forest, in a way that inspires better care of its natural environment by indentifying and integrating relevant traditional Hawaiian forest stewardship models.
- Involve youth through cooperative programs with the Department of Education, University of Hawai'i, and other school and educational institutions, as well as community members including outrigger canoe clubs, forest management entities, and cultural organizations.



- To serve as the catalyst for engaging the community in stewardship of the area therefore building support for a sustainable harvest of koa canoe logs and a management plan for the Canoe Forest.

Description of Area



The Canoe Forest is comprised of 1,257 acres (508.6 hectares) of forest and remnant ranch land. The elevation ranges from 3,640 to 5,100 feet above sea level. In Hawaiian culture this elevation is considered the *wao akua* or “the forest of the gods”. The forest unit is rectangular in shape, approximately 0.93 miles wide and 1.9 miles long with the longer axis running up the slope.

Access to the Canoe Forest is obtained through a Department of Land and Natural Resources (DLNR) gate between the 43 and 44-mile markers on Hwy 11. Four-wheel drive is required to traverse the adjacent ranch lands. Within the forest, there is an unpaved road along the fence perimeter that also traverses the mid-section of the Canoe Forest. The perimeter fence was established in 1995 and consists of cattle and hog wire. Various sections of the fence were constructed to different specifications. Cattle have been removed periodically from the forest; however, cattle still remain within the fenced area. Public access for hunting and recreation in the adjacent forest reserve has been provided throughout the Canoe Forest. Currently, there is a fenced enclosure used to collect data on koa selected for resistance to Koa Wilt, a disease caused by the fungus *Fusarium oxysporum*. The Hawai'i Agricultural Research Center is monitoring the growth and disease resistance of the planted koa.



Figure 1 & 2. An interior gate and access road surrounding the Canoe Forest.



Figure 2. Evidence of cattle within the Canoe Forest.

Figure 3. A section of the perimeter fence.



Figure 4. Koa seedlings within the HARC enclosure.

Figure 5. A koa log infected with Koa Wilt caused by *Fusarium oxysporum*.

Historical Significance



Stories from *kupuna* or elders enrich the significance of the Kapāpala area. Kapāpala ranges from the area now known as Hawai‘i Volcanoes National Park, all the way to Punalu‘u making the area one of the largest *ahupua‘a* or land divisions within the Ka‘ū District. Kapāpala was crown lands and King Kamehameha IV retained the area after the land redistribution act known as the Great Mahele. Kapāpala was then leased for ranching to W.H. Reed and Charles Richardson. In 1876, the Hawaiian Agricultural Company bought out the ranch lands.

Ranching is integral to Kapāpala’s history, with connections to the Hawaiian monarchy. Liliuokalani was known to be a frequent visitor to Kapāpala during the summer months. Liliuokalani and other ali‘i would often come to Kapāpala Ranch and stay at the

Ranch House to attend the cattle branding parties. Liliuokalani's cousin was Mrs. Monsarrat, the ranch manager's wife.

The Halfway House was also located at Kapāpala, serving as a resting place for travelers. Many of these travelers were often journeying from Punalu'u to Volcano House. The Halfway House was also important for traveling cowboys since the House had a water trough and corral. At the Halfway House, four trails branched off for travelers to use. These trails would take them towards Ka'ū, Kona, Waimea, or Hilo.

Significant events that affected the Kapāpala area are recalled in the stories of the *kupuna*. Such events include various natural disasters, the most significant being the earthquake of 1868 that caused a landslide killing numerous people and livestock in the Kapāpala area. The earthquake also caused a devastating tsunami along the Ka'ū coast.

Education Site



The Education Site will serve as the focus point for educational opportunities that will be conducted within the Canoe Forest. Initial site surveys of the Canoe Forest were conducted to identify possible locations for the Education Site and resulted in designating an initial site near Domingo Gate (see *Appendix 2*). Criteria for site selection consisted of travel time to the site, distance and accessibility from road, and potential safety hazards. The site will be prepared with assistance from project partners including the Three Mountain Alliance (TMA) watershed partnership and DLNR staff. Site preparation includes mowing and spraying herbicide to control pasture grasses and weeds.

Additionally, a composting toilet will be installed at the site. Three (20x16) pipe-tarp tents will be purchased for use as a temporary structure during educational events. The tent structures will allow for events to still occur in adverse weather conditions. During overnight events, individual camping tents can be placed underneath the pipe-tarp tents in case of heavy rain. Raised tent platforms will also be added to the site. Interpretative trails of varying length and difficulty will be created near the Education Site. Trails will form a complete loop and will link to existing roads. In subsequent years an out-planting site will be created (once all ungulates are removed) and picnic tables (constructed by the Ka'ū High School Construction Academy) will be added to the site.



Figure 6 & 7. The initial location of the Education Site near Domingo Gate.



Figure 8 & 9. A model of the building containing the composting toilet and a model of the composting toilet for the Education Site.



Figure 10. A model of a tent platform to be constructed at the Education Site.

If funding permits, plans for improving the Education Site include the construction of a permanent *hālau* or meeting house, to be used for educational events especially overnights and others relating to the canoe building process which require covered space. Also, attaching a water catchment system, adding interpretative guides and signs to the interpretative trail, and

installing meteorological instruments for a weather station are planned to improve Education Site facilities.



Figure 10. A design of a permanent hālau for educational events and canoe building.

Educational Opportunities



Educational opportunities will incorporate cultural, historical, and environmental aspects. These opportunities will first engage the youth and then expand to encompass a larger demographic of community members. Engaging a wide range of community members will help meet the goal of community stewardship within the area while also creating informed citizens. *Kupuna* and traditional canoe builders will have the opportunity to help guide the creation of the historical and cultural curricula and will be invited to aid in the implementation. By incorporating *kupuna* and canoe builders, the youth will gain unique perspectives on customs and traditions that are in danger of being lost.

During the first year of the Plan, site-specific interdisciplinary curricula will be developed and implemented. Curricula will be created for easy adaptation to different grade levels, standards, and benchmarks while focusing on historical, cultural, and environmental topics. We will partner with current environmental education efforts happening on island and in Ka‘ū including the ‘Alalā Project (DLNR), ‘Imi Pono no ka ‘Āina (‘Imi Pono), The Nature Conservancy (TNC), The Big Island Invasive Species Committee (BIISC), and HARC. ‘Imi Pono piloted programs will be adapted for use at the Canoe Forest. Curricula developed by the University of Hawai‘i Partnership for Reform through Investigative Science and Math (PRISM) program, the Polynesian Voyaging Society, Project Learning Tree and Hawaii Environmental Educator Alliance will serve as the foundation for various lessons (*Appendix 3*).

Curricula Topics and Educational Opportunities

Topic	Partner/ Guest Speaker	Target Audience	Activities
History of Kapāpala; ties to the Hawaiian Monarchy, importance of ranching, creation of the Canoe Forest	kupuna from Ka'ū	4 th graders from Pahala and Na'alehu Elementary Schools, 20-24 students and 4 staff	Interpretive hikes, "Koa Canoe Log Perspective Poems" where students write a description their senses/ experience if they were a koa in Kapāpala relating to the history they learned from the kupuna
Traditional Canoe Building; perpetuating traditional carving methods to youth through first hand experiences	kupuna, canoe builders	4 th grade Na'alehu and Pahala Social Studies classes, Ka'ū High Construction Academy, Ka'ū High Senior Project class, 20-24 students and 4 staff	"Selecting a Canoe Log Scavenger Hunt," canoe building demonstrations, interpretive hikes
Watershed Science; defining what is a watershed and the importance to our Island	TMA Crew , 'Imi Pono and The Nature Conservancy Staff	6 th grade Na'alehu and Pahala classes, 18-20 students and 3 staff	"The Rain Follows the Forest Demonstration," out plantings, invasive species removal (weed pulling), seed collecting
Forestry Management; addresses forestry techniques, sustainable harvesting, and HARC seedling trials	DOFAW and HARC staff	7 rd grade middle school Science class and Ka'ū High School Construction Academy, 15-18 students and 2 staff	Canoe Log Scavenger Hunt with GPS, measuring koa trees, interpretive hikes, seed collecting, invasive species removal
Invasive Species; addresses the impacts non native species have on native forests	'Imi Pono, Big Island Invasive Species Committee (BIISC) staff	3 rd grade Na'alehu and Pahala classes, 18-20 students and 4 staff	<i>Hawaii's Invasive Animals</i> PRISM curriculum, Axis Deer Cause & Effect Game, interpretive hikes
'Alalā ; addressing how the 'alalā became extinct in the wild, importance of native species in forest ecosystems	DOFAW, 'Imi Pono and the San Diego Zoo-Keauhou Bird Conservation Center staff	Ka'ū High School 9 th grade Plants & Animals class, 16 students & 2 staff	Interpretive hikes, "Web of Life Game" emphasizing the relationship between species , out plantings of native species
Voyaging Navigation; addresses the techniques used by	The Polynesian Voyaging Society, canoe clubs, canoe	Middle & High School Students, 12-15 students	Overnight camp trip at Education Site to learn about stars navigation,

traditional Polynesians to effectively navigate canoes	builders, and kupuna		The Polynesian Voyaging Society's education curriculum
Native Plants; identifying native plants, their traditional Hawaiian uses and the threat to their survival	'Imi Pono and the Hawaii Volcanoes National Park Vegetation Management Staff	6 th grade Na'alehu and Pahala classes, 18-20 students and 3 staff	'Imi Pono "Native Hawaiian Plants & Uses" curriculum, "Native Plants" PRISM curriculum, "Native Plant Bingo" with native plant identification cards, interpretive hikes, out plantings
Arts in the Forest; incorporating music and art with the outdoor environment	previous Hawai'i Nei Artists, kupuna	Ka'ū Middle School Ukulele class, and Ka'ū High Drawing & Painting Class, 20-22 students and 3 staff	Native Plant Art projects, "Plant Stamps," scientific sketching, interpretive hikes to brainstorm ideas for composting songs
Ornithology; identify native forest bird species, their threats and how we can protect them	U.S. Fish & Wildlife Service staff	Ka'ū High School 9 th grade Plants & Animals class, 16 students and 2 staff	'Imi Pono Native Forest Bird curriculum, Native Forest Bird Identification Activity, "The Bird Call Game", interpretive hikes

Participants

The focus of the first year of the Plan will be to target teachers and students within the Ka'ū District where Kapāpala is located. A wide range of students will be involved at the site from elementary through high school, as well as college level (University of Hawai'i – Hilo, and Hawai'i Community College). We can include students and teachers from outside the district as opportunities evolve over time. Our ultimate goal is to provide a site accessible to students and teachers from the entire state so they can have the rare opportunity to learn about sustainable koa forestry, harvest, and management, as well as the history and culture of the area.



Figure 11, 12, & 13. Student participants will range from elementary school through college.

Engaging the larger community

These educational opportunities will be adapted and available to the larger community. Community involvement within the site will be sparked through family days where adults and youth will be able to participate in lessons of various topics. During the first year of the Plan, three family events will take place focusing on historical and cultural topics including canoe carving with traditional builders and *kupuna*. Events including planting, seed collecting, and a navigational workshop will be conducted in following years. A ho'ike, or display, at the Education Site will be scheduled to give students the opportunity to present their work (projects, art, music) about the Canoe Forest and share their experiences with their families and the entire community. Additional volunteer days for community organizations or individual signups will occur in subsequent years. These unique outdoor learning opportunities will help to spark stewardship of the Canoe Forest and provide meaningful experiences for participants of all age levels.

We will also collaborate with the San Diego Zoo- Keauhou Bird Conservation Center (KBCC) located in Volcano, Hawai'i to provide family events focusing on the 'alalā. These events will occur at the Education Site to emphasize the importance of koa on forest bird populations, but also at KBCC giving families a rare experience to tour the captive breeding facilities and witness the 'alalā, extinct from the wild.



Figure 14. 'Alalā in an aviary at The San Diego Zoo- Keauhou Bird Conservation Center (KBCC) in Volcano, Hawaii.

Figure 15. KBCC staff giving students a tour of the captive breeding facilities.

Teacher workshops

In order to inspire and motivate teachers, teacher workshops will be conducted at the site. 'Imi Pono will provide the established framework for these workshops. Previous 'Imi Pono workshops have focused on topics including watershed science, botany, ornithology, entomology, invasive species, and incorporating culture into science education. The overall goal for these workshops has been to foster a familiarity and passion between the teachers and the

outdoor environment, thus they will in turn provide opportunities for their students to experience learning within a “living” classroom.



Figures 16 & 17. Teacher Workshop participants out planting native species and taking part in place based environmental education activities.

College involvement

Another opportunity to involve college students with the site is by hiring interns or student workers through The University of Hawai‘i Pacific Internship Programs for Exploring Science (PIPES) and AmeriCorps. These local college students will gain experience to better prepare them for careers within the resource management field.

Service Projects

Once the ungulates are removed from the Canoe Forest, out-planting activities can be conducted. Service projects will consist of watering and weeding around koa seedlings and planting additional koa seedlings that were propagated by HARC. Participants will also be able to collect seeds of other native species from the area such as maile (*Alyxia oliviformis*), ‘a‘ali‘i (*Dodonaea viscosa*), ‘ākala (*Rubus hawaiensis*) and other common native species. Local schools will have the opportunity to propagate these native plants under guidelines from HARC staff such as in the greenhouses located at Ka‘ū Middle and High School. The propagated species will be planted near the HARC koa planting site.



Figures 18, 19, & 20. Out planting events similar to those that will occur at the Canoe Forest.

Resources and Needs

Actions needed to implement the Plan include conducting site surveys, establishing the Educational Site, developing curricula and implementing the lessons at the site. Resources and needs are discussed below for each action.



○ Site Surveys

- Resources –
 - Labor – TMA, DLNR, community volunteers
 - Equipment including weed whackers, herbicide, backpack sprayers, loppers
 - 4WD vehicles
- Needs –
 - Locate suitable koa trees for canoe log with GPS coordinates
 - Identify invasive species that need to be removed
 - Identify potential species for restoration, planting

○ Educational Site

- Resources –
 - Equipment, supplies, time, and man-power from the TMA crew.
 - Four wheel drive vehicles from DOFAW or TMA
- Needs –
 - Mowing and spraying herbicide to prepare the site
 - Improve access to the Canoe Forest
 - Remove barriers (downed trees)
 - Repair sections of the roads that have been washed out or damaged
 - Obtain gate key
 - The remaining ungulates must be removed and the fence repaired to the necessary ungulate standards.
 - Create and implement a safety plan
 - Obtain a sulfur dioxide monitor to use at the Educational Site

- Obtain a Smartphone to maintain communication while at Site
- Purchase pipe- tarp tent and tent platforms
- Purchase and construct compostable toilet

○ **Developing curricula**

- Resources–
 - Office space provided by The Nature Conservancy
 - Internet access provided by DOFAW and TMA
 - Office supplies provided by TNC and TMA
 - Established education framework from ‘Imi Pono No Ka ‘Āina, the ‘Alalā Project, UH PRISM Project, Polynesian Voyaging Society, Project Learning Tree, Hawai‘i Environmental Education Alliance
- Needs–
 - Hire a coordinator to implement the Plan
 - Hire an assistant to aid in the implementation of the Plan
 - Purchase laptop and printer
 - Purchase Smartphone
 - Funds for mass printing curricula and student workbooks

○ **Implementing lessons**

- Resources–
 - Advice and assistance from ‘Imi Pono staff and other partners
 - Ka‘ū Middle School green house for propagating native plants to be used for out plantings
- Needs–
 - Four- wheel drive vans or large SUV’s to transports visitor to and from the site
 - Funds for rentals if van or large SUV is not available
 - Funds to purchase fuel for vehicles
 - Funds to hire a student hire or intern to help with the implementation of the Plan
 - Funds for substitute teachers for teachers participating in event at Site

- Purchase Supplies
 - GPS Units
 - First aid supplies
 - Backpacks
 - Compasses
 - Water bottles
 - Five gallon water storage Containers



Figures 16, 17, & 18. Examples of a GPS unit, first aid kit, and backpack to be purchased.



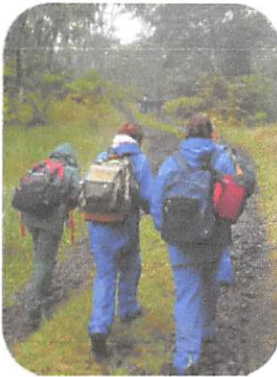
Figures 19, 20, & 21. Examples of a compass, water bottle, and five gallon water container to be purchased.

Measureable Outcomes



The success of the Plan's implementation will be measured by the number of educational opportunities conducted at the site and the number of participants. The quantity of educational opportunities will increase in each subsequent year. Participants will complete pre and post evaluations through written tests and qualitative discussions.

Challenges



There are various challenges that need to be addressed to implement the Plan. These include vehicles needed to access the site for the number of participants, road conditions, changing levels of sulfur dioxide, water, toilet facilities, communication protocols and devices.



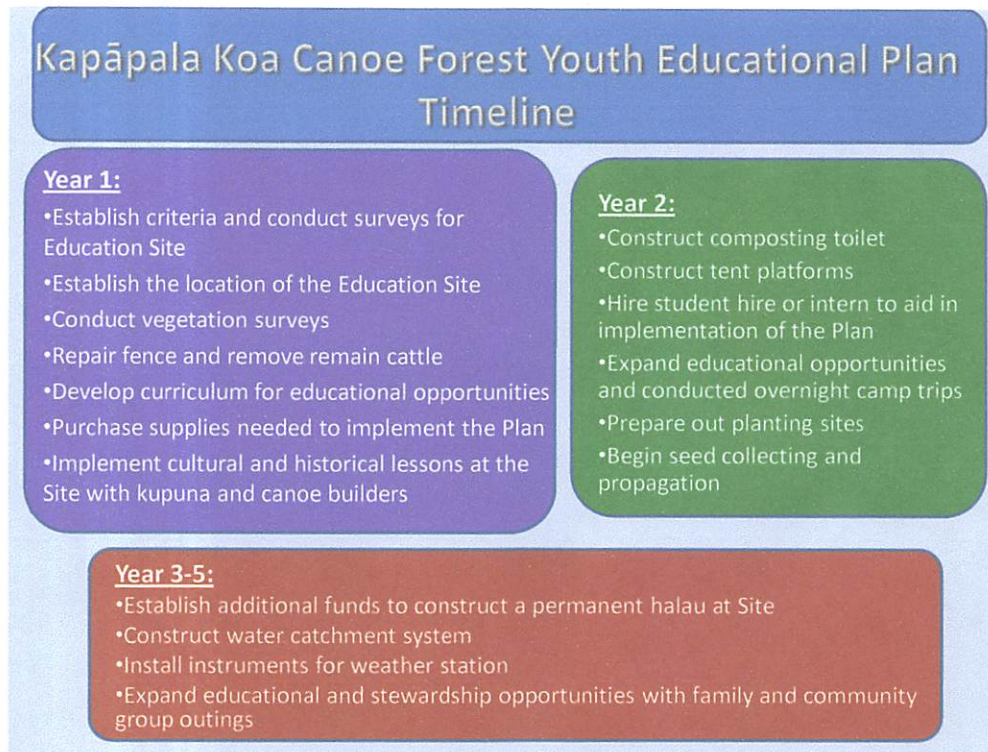
Figure 22 &23. Sections of rough terrain on the roads creates challenges for implementing the Plan.

Conclusion

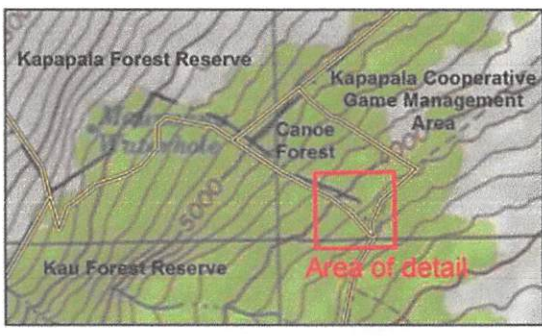
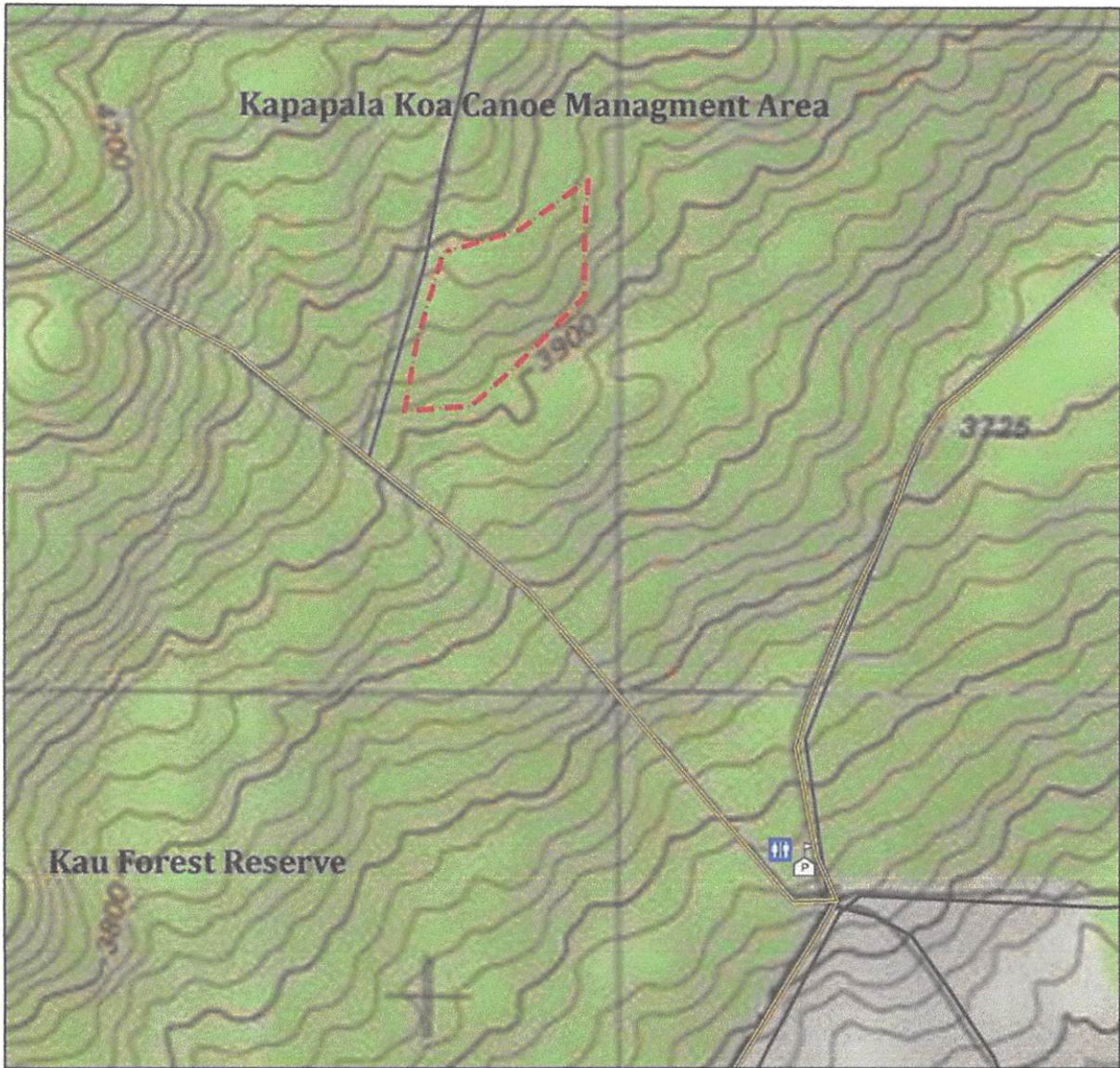


The Kapāpala Koa Canoe Forest Management Area provides a rare opportunity for all types of community members to not only learn about native forests and watershed protection, but also about sustainable harvesting and traditional Hawaiian forest stewardship models. This Kapāpala Koa Canoe Forest Youth Education Plan is critical for involving youth and the community within the Canoe Forest. The Plan will allow unique educational opportunities to take place at the site, thus creating informed citizens that will continue to be engaged in stewardship of the Canoe Forest. The collaborative effort of these unique educational opportunities and informed citizens will then help to build support for sustainable management of the Kapāpala Koa Canoe Forest Management Area.

Appendix 1: The timeline for the Kapāpala Koa Canoe Forest Youth Education Plan



Appendix 2: Map of the Kapāpala Koa Canoe Forest



Appendix 3: Example curriculum to be incorporated from the Polynesians Voyaging Society

Exploring the Night Sky: How to Find the Navigation Stars

On the voyage to Rapanui (September-October 1999), navigators on board Hokule'a presented via their single-side band radio Na Hoku Ho'okele / "The Navigation Stars" about the sky and wayfinding, on Hawaiian KINE 105.1 FM. The broadcasts took place once a week in the evening after sunset.

On the Voyage Home (Tahiti to Hawai'i, January 2000), the broadcasts took place in the early morning before dawn as well as in the evening after sunset. Star observations were at home, or at designated sites, with the assistance of students of navigation.

The following activity, along with the radio broadcasts, allowed participants to explore the night sky and increase their understanding of how non-instrument navigation is done. A star compass and star maps were provided to help listeners find the stars and other celestial bodies mentioned in the radio broadcast as well as understand the navigation information in the daily reports from the canoe, published on the PVS website.

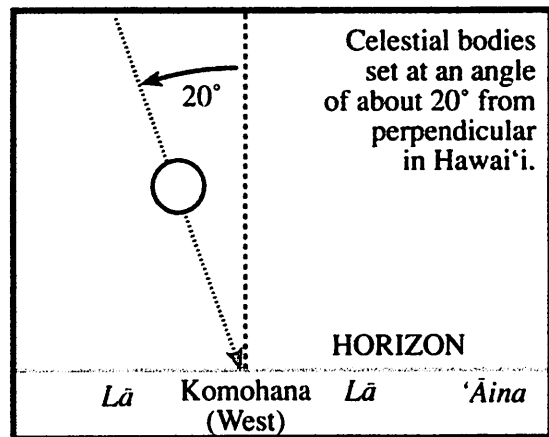
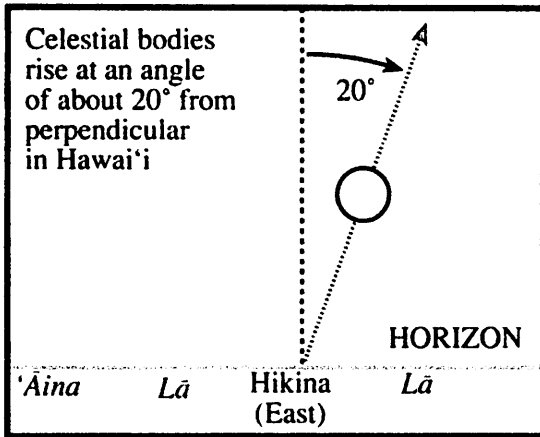
Objectives:

- Identify Cardinal Directions
- Identify Major Stars and Constellation Used in Way finding
- Identify Stars that can be Used to Determine Latitude

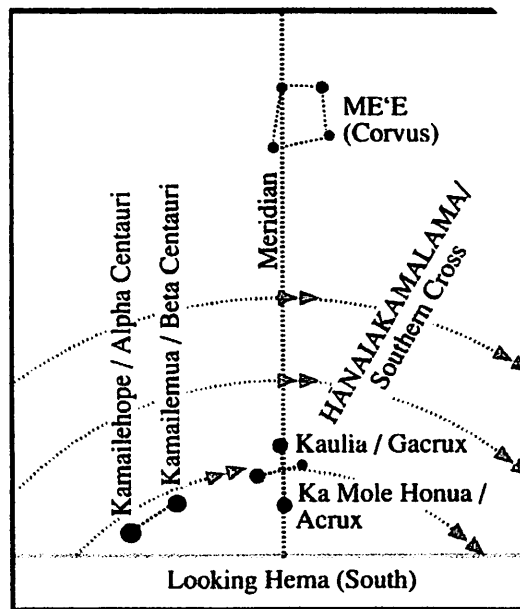
Before the broadcasts, participants did the following:

1. Select an observation site with as clear a view of the circle of the horizon and night sky as possible. The dimmer the lights of an area at night, the better it is for viewing.
2. Determine the four main directions (East, West, North, South) at your observation place. This can be done at sunrise or sunset, or at night. East (Hikina) is toward the rising sun; West (Komohana) is toward the setting sun. Remember that in October the sun is rising one house (11.25°) south of East and setting one house south of West. (See the Star Compass for an explanation of houses and the Hawaiian names for the houses and their English equivalents) In January, the sun is rising two houses (22.5°) south of East and setting two houses south of West. (One or two hand spans along the horizon, with your arm outstretched, may give you 10 or 20 degrees, depending on the size of your hand; each hand differs. The circle of the horizon is divided into 32 houses of 11.25° , or 360° in all.)

Also remember that in Hawai'i, the sun rises at an angle of 20° toward the south from a line perpendicular to the horizon, so you should make your observation as close to sunrise as possible before the sun angles away from its rising point on the horizon. West is directly opposite of East on the horizon. Check your sense of West by watching where the sun sets. The sun is setting from an angle of 20° to the south of a line perpendicular to the horizon.



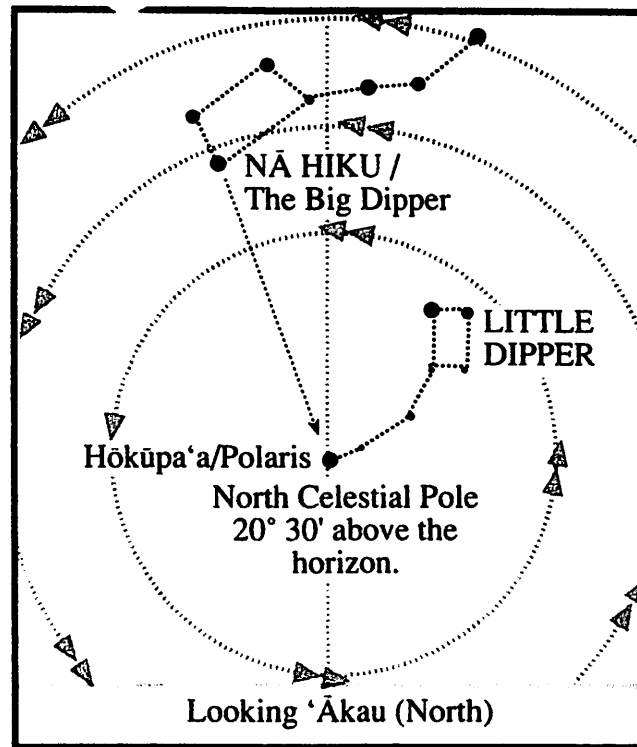
North ('Akau) is 90° away from E and W, directly to the right ('akau) of you when you are facing west; South (Hema) is on the opposite side of the horizon from north, 90° away from E and W, directly to the left (hema) of you when you are facing west. If you were the sun traveling across the sky from East to West, North would be on your right hand side and South on your left. Hence the Hawaiian names for North (right) and South (left). In Hawai'i, Hokupa'a, or Polaris, is stationary directly above due north. Hanaikakamalama, or the Southern Cross, points due south when it is upright.



You may use features of the landscape (like mountain peaks) or buildings to mark the four cardinal directions.

3. Other terms that will help you find celestial bodies in the night sky: The point directly above your head is called the Zenith. An imaginary line that goes from North to South and passes through the Zenith is called the Meridian, which divides the sky in half. The half toward the east is called the Eastern Sky; the half toward the west is called the Western Sky. A celestial body toward East in the evening will appear to travel up the eastern sky to the meridian around midnight, then continue down the western sky and set in the early morning hours.

The North Celestial Pole (NCP) is the end point of an axis around which the sky appears to be turning. The altitude of the NCP above the horizon in the Northern Hemisphere is equal to the latitude of the observer. Thus, NCP appears due north, about 20.5° above the horizon at 20.5° N latitude (the mid-latitude of Hawai'i). Hokupa'a, or Polaris, is very close to the NCP. In Hawai'i, stars around the NCP appear to circle slowly around it, counterclockwise. These stars are called circumpolar. (Actually, the earth is rotating, rather than the sky.)



The South Celestial Pole (SCP) is the other end of the axis around which the sky appears to be turning. The SCP is 20.5° below the horizon at the latitude of Hawai'i (20.5° N), and the stars circling around it clockwise cannot be seen. However, these stars are visible at the latitude of Rapa Nui (at 27° S), where the SCP appears 27° above the horizon and the NCP is 27° below the horizon.

As you listen to navigators talk about navigation and the night sky, you may wish to be outside, or go outside later, to your observation site to identify the celestial bodies mentioned in the broadcast. The navigators will refer to these points and lines at the horizon or in the sky to help you find stars: East, West, North, South, Zenith, Meridian, Eastern Sky, Western Sky, North Celestial Pole, and South Celestial Pole.