hui o ko'olaupoko

Plant Propagation

&

Care Manual

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Hui o Koʻolaupoko Description

Throughout the Koʻolaupoko moku (Makapuʻu to Kualoa), land-based pollution is a leading threat to ocean and stream health. Urban and agriculture runoff, habitat alterations such as streams lined with concrete, loss of natural areas, trash and introduction of non-native plants and animals all contribute to poor water quality and loss of healthy ecosystems. Impacts from these include the decline of coral reef health, contaminated fish, beach litter, and closed beaches due to polluted water.

Hui o Koʻolaupoko (HOK) is a local non-profit organization whose mission is to protect ocean health by restoring the ʻaina: mauka to makai. This is accomplished through partnerships with stakeholders including interested citizens, non-governmental organizations, government, educational institutions and businesses while using and focusing on sound ecological principles, community input, and cultural heritage.

HOK proactively implements projects in Koʻolaupoko that address land-based pollution and watershed health as they impact water quality and the receiving waters of Waimānalo, Kailua and Kāneʻohe Bay. Hui o Koʻolaupoko focuses organizational efforts in three main program areas:
· Watershed/ahupuaʻa restoration and monitoring.
· Natural resource coordination/stakeholder involvement.
· Scientific data and information dissemination.
Project areas include, but are not limited to: polluted runoff, erosion control, invasive species removal, habitat restoration/protection and water quality monitoring.

In an effort to engage the community and stakeholders in active participation of natural resource management, HOK also coordinates monthly opportunities for volunteering such as stream clean-ups, active restoration through erosion control and native plantings and water quality monitoring. Participants are educated on the health of the watershed, sources of pollutants and opportunities to take individual action to improve watershed health and ocean protection. We also conduct community outreach and education through public presentations to community groups and natural resource management coordination with public agencies.

Native Plant Foster Parent Program was started in the summer of 2010 to facilitate propagation of Hawaiian plant species which are vital tools for improving water quality. Program volunteers foster native plants in exchange for education on plant care, propagation, and natural pest control techniques. In return, program volunteers receive a portion of the mature plants for landscaping at their home. In 2010, 11 foster parent groups raised nearly 300 plants. These groups include elementary schools, families and individuals. The foster program is beneficial to current and future project/demonstration areas and outplanting sites such as Kaha Garden and the Ka‘elepulu retro-fit to expand the variety of species and to replace damaged, aged, or diseased plants.

What Is A Native Plant?

A native Hawaiian plant is a plant that existed in Hawai`i before humans arrived. Native plants came to Hawai`i by three methods:
WIND: Jet streams blew tiny seeds or spores through the air currents
WATER: Seeds or vegetative plant parts drifted on the ocean currents
WINGS: Seeds were either in the stomachs or adhered to the body of birds that flew to and landed on the Hawaiian Islands.

Native plants are either indigenous (occurring naturally in Hawai`i and other locations) or endemic (found only in the Hawaiian Islands). Naupaka is an example of an indigenous plant while our State flower, the yellow hibiscus, Máo Hau Hele (*Hibiscus brackenridgei*) is endemic. About 90% of Hawai`i’s native plants are endemic and are some of the most endangered plants in the world.

Other plants commonly associated with the Hawaiian islands or Hawaiian culture such as Sweet Potato (U’ala), Ti, Coconut (Niu), Sugarcane (Ko), and Taro (Kalo) are considered “Polynesian introductions” or “canoe plants” because they were transported to the Hawaiian Islands by the first settlers from the southern Pacific . Terms such as “alien” or “introduced” are often used to refer to plants that were introduced to Hawai`i post western contact and have become common such as Pine trees, shower trees, and monkey pod. However, some of these “alien” plant species have become a major threat to native ecosystems, these serious pest plants are called “invasive”. Some of the most common invasive plants are the Australian Tree Fern (*Cyathea cooperi)* which closely resembles the native tree fern Hapu’u, Christmas Berry (*Schinus terebinthifolia),* Octopus Tree (Schefflera actinophylla), Koster’s Curse (*Clidemia hirta*), Strawberry Guava (*Psidium cattleianum*), and Lantana (*Lantana camara*).

Why Choose Native Plants?

In general, native Hawaiian plants, when planted in the correct habitat, will be able to grow with less irrigation, less chemical pest control, and be able to handle drought conditions better than most common, introduced plant species.

Many native plants such as ‘A’ali’i, ‘Ūlei, ‘Ākia, Pōhinahina and Naio have adapted to grow in a broad range of elevations and can be found in dry coastal climates to moist mountainous regions. Once outplanted natives have become established in the ground they can survive quite well with the water provided naturally during rain events or manual watering during times of drought.

Native plants can also provide significant ecological benefits such as reducing soil erosion, stream bank stabilization, and phytoremediation (the uptake of pollutants through a plants root system). ‘Ae‘ae is a water loving native species that grows along stream and marsh edges and forms mats across the water surface. This growth characteristic reduces the impact of water along the banks therefore reducing erosion. Groundcover plants such as Pōhinahina and ‘Ilie‘e grow along the ground and re-root at each branch helping to hold hillsides and soil in place. ‘Ahu ‘awa is also often used as erosion control along hillsides and streams because of its fast and growing deep root system and tolerance to both drought and flood. Recent studies have shown that ‘Ahu ‘awa may also be a beneficial native plant for phytoremediation.

Most importantly, cultivating and preserving Hawai`i’s native plants fosters an understanding, appreciation, and respect for Hawaiian history and culture. Growing these plants can give the grower a greater sense of place and ownership over their unique island state while perpetuating the knowledge and increasing biodiversity for future generations to enjoy.

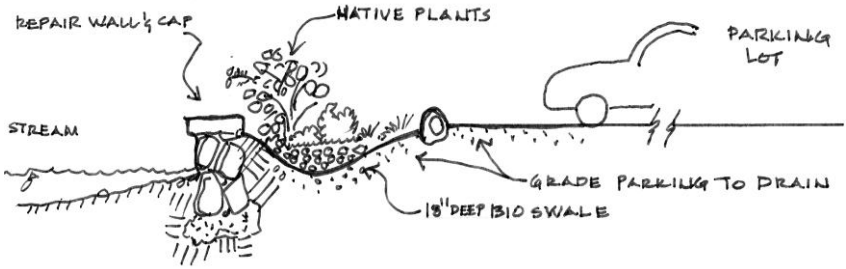
Kaha Garden was developed in 2007 by Hui o Koʻolaupoko as an example of how homeowners can use native and indigenous landscaping to improve water quality. The project replaced grass and invasive species along 150 yards of stream bank with native Hawaiian plants which are used to stabilize soil, reduce runoff and facilitate natural filtration and infiltration of water. All plant species in the garden can be found naturally in dry coastal areas throughout the Hawaiian Islands and can thrive with only the water provided by rain events and occasional summer watering. Visitors can walk the garden pathways to see how plantings might appear in their own backyard. The project also included the installation of interpretative signs and the development of a website about Kaha Garden (http://kahagardens.com), designed by local elementary school students, to further explain the benefits of native landscaping and other best management practices.

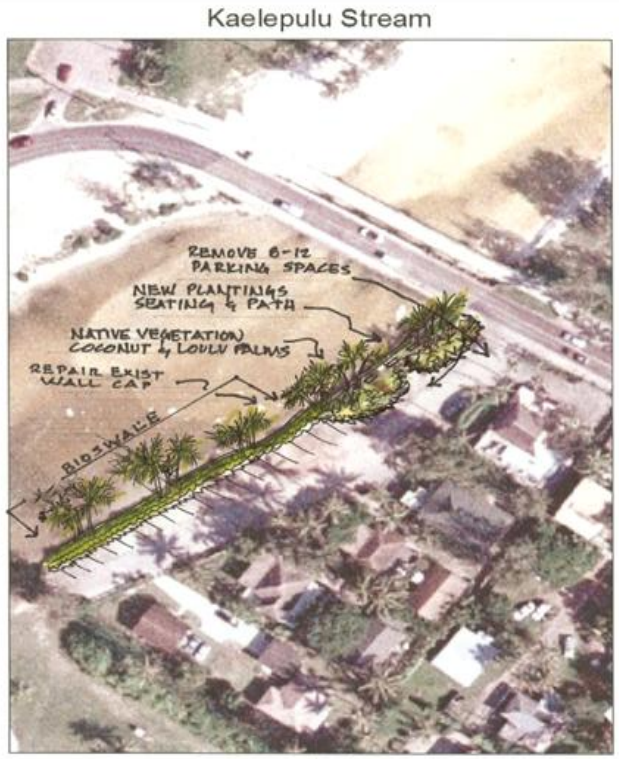
Hui o Koʻolaupoko has also instituted extensive local programs to educate visitors and students on the benefits of native landscaping and best management practices. The effort has resulted in heavy grassroots community involvement, noted by over 3,000 volunteer hours at the garden in 2009 and 2010. Kaha Garden is maintained solely by community volunteers who are taught to identify the native plants, learn their growing patterns and how to describe their historic and cultural uses so that when park users request additional information on plants, volunteers are then able to assist them in selecting the proper plant for their home and where to purchase it.

Find out more about how to get involved in the maintenance of Kaha Garden at Hui o Koʻolaupoko's website www.huihawaii.org.

Ka‘elepulu retro-fit (Popoia Garden)

This project, slated for construction in late 2011, will improve 24,000 sq. ft. of an existing parking lot owned by the City and County of Honolulu Parks Department adjacent to Ka‘elepulu Stream in Kailua to improve the quality of storm water runoff. Pervious concrete will be installed in the parking stalls to initially capture storm water runoff and allow for infiltration. Additionally, the project will improve 361 feet of riparian habitat through the installation of a vegetated bio-swale to capture excess storm water from the parking area and allow for infiltration back into the ground before excess water overflows into Ka‘elepulu Stream.





Kaha Garden and the Ka‘elepulu Retro-fit are great examples of “green” landscaping and construction on large scale public properties. These sites show that the knowledge to design and implement these types of projects does exist in Hawai`i. The fundamental principles focus on the use of appropriate native plants, polluted runoff control, water infiltration, and ultimately improved water quality. All of these project goals are equally applicable on a smaller scale such as…YOUR BACKYARD!

Besides planting native species, here are some projects you can implement at home to help Hui o Ko‘olaupoko on our mission protect ocean health by restoring the ‘aina: mauka to makai.

Rain Barrel Water Catchment

Rain Barrel Water Catchments are effective at conserving water outdoors as well as reducing water bills. Rain barrels collect rainwater from roof downspouts and store the water in large plastic drums for later use. The water can be used for outdoor purposes such as watering your lawn, garden and potted plants or even to wash your car or refill a swimming pool. Harvesting systems can vary from the simple use of barrels aided by the force of gravity to deliver the water, to more advanced systems using cisterns, pumps, and flow controls. The Hawai‘i Board of Water Supply offers classes and supplies to construct your own rain barrel. More information can be found at their website http://www.hbws.org

Rain Garden

Rain gardens are used to capture excess water and pollutants, such as storm runoff from rooftops, driveways, sidewalks, parking lots, and streets, from reaching streams and oceans. Rain gardens are depressions and are flat-bottomed. The purpose of these rain gardens is to mimic natural forest and meadow conditions to act as an infiltration system from hard surfaces. They are beneficial because they reduce flooding by absorbing rain water; they filter oil, grease and other toxic materials before polluting water bodies; they allow groundwater aquifers to be recharged because of more pervious surfaces; and they provide habitat for wildlife.

HOK has developed a Rain Garden Co-op where we help facilitate the installation of rain garden on private property with the use of volunteers. The hope is once a landowner has a rain garden installed on their property, they will volunteer their new knowledge and service to the next homeowner for a rain garden build.

Hawaiian Name: ‘A‘ali’i
Scientific Name: *Dodonaea viscosa*
Common Family Name: Soapberry

General Description: Indigenous. Occurs from sea level to high mountains. Grows as a shrub or tree, 1 to 30 feet tall. Will grow more tree-like if given more shade and moisture. Leaves are ovate with pointy tips. Small greenish to red flowers form in clusters at the branch tips and are unisexual. Seed capsules are paper-thin, and are tan to dark red. ‘A’ali’i is good in landscaping as a strong hedge or small tree.

Ecological Benefit: Resistant to drought and wind.

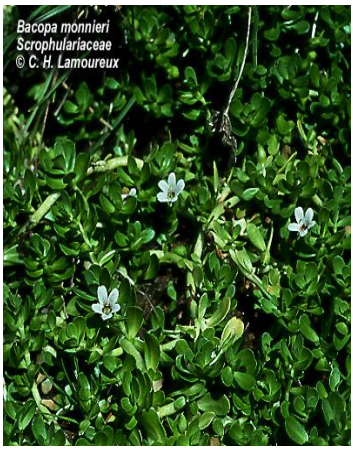
Cultural Significance: The sticky, varnish-like covering on the leaves was used for medicine by early Hawaiians. Seed capsules have been used in lei making and to make red dye. The dense, golden-brown hardwood was used for timber, weapons, and tools.

Propagation techniques by Seeds: First, collect capsules when they are dry and tan or reddish and shedding from the plant. Keep dry in a paper bag. To separate seeds from the capsules, carefully rub the fruits together. Seeds can be stored at room temperature for up to eight years.
When ready to sow, soak seeds in tap water for twenty-four hours. The viable seeds will sink; discard any floating seeds. Surface sow the small seeds onto a mix of 3 parts perlite to 1 part potting mix or fine black cinder. Water them in and then water every other day; keep moist. Germination of all viable seeds can occur in two weeks to six months.

Care and Outplanting: When four true leaves develop, transplant into 2-inch pots with a well-draining mix. Move into full sun to help harden them off and prepare them for outplanting. Foliar feed (see Glossary) monthly if needed. They will be ready for outplanting in about six months to a year. Choose a site in the full to partial sun (they will grow taller in the shade). Create a well-draining outplanting site by adding cinder or other coarse materials. Prune at a young age to acquire desired shape.

Common Pests: Sucking insects such as ants, scales, mealybugs, thrips, and aphids will feed on the plant juices (see Pest ID & Control section).

Hawaiian Name: ʻAeʻae
Scientific Name: *Bacopa Monnieri*
Common Family Name: Figwort, Water hyssop



General Description: Indigenous. ʻAeʻae is a creeping, perennial herb. Grows in thick mats on or near marshes or streams. Leaves are small, succulent, spatula shaped and light green. Flowers are pale blue to white. When using this plant as ground cover, make sure you give it lots of room to roam and plenty of water. It has a tendency to take over an area if the soil is healthy and kept moist.

Ecological Benefit: It easily roots at the nodes, stabilizing soil and deterring erosion. Grows across water surfaces creating foraging habitat for native marsh birds such as the ʻAlaeʻula.

Propagation Techniques by Cuttings: Collect herbaceous stem and keep moist. Remove lower leaves, and cut stems into 5-inch pieces, placing bottom end under 0.5-inch of a mixture of 3 parts perlite to 1 part potting mix and water them in. Do not allow mix to dry out; water them every other day. They will develop roots in one to two months. Transplant one to three rooted cuttings per 4-inch pot into a well-draining mix; water them in. Keep in shaded area for two weeks, and then move into full to partial sun to help harden them off. They will be ready for outplanting in five to six months. Large dug up clumps can be transplanted directly into the ground, keep moist until roots become well established.

Care and Outplanting: ʻAeʻae makes a great ground or stream bank cover, doing best when planted where their roots can stay wet. Choose a site in full to partial sun with moist soil. Water in and whenever it is dry until they are well established. Trim back if they get out of control. Foliar feed cuttings monthly if needed.

Common Pests: Slugs; sucking insects such as ants, scales, mealybugs, thrips, and aphids will feed on the plant juices.

Hawaiian Name: ‘Ahu ‘awa
Scientific Name: *Mariscus javanicus*
Common Family Name: Sedge

General Description: Indigenous. A perennial sedge which has a grass-like appearance. Leaves are long, narrow, and wider at the base. Flowers develop on long, extended ‘spikes’.

Ecological Benefit: Fast and downward growing root systems stabilize soil and slow erosion on hillsides and stream banks. May aid in phytoremediation of soils and water.

Cultural Significance: Hawaiians used the fibers as a strainer for ‘awa (herbal drink).

Propagation Techniques by Seeds: Collect dry seeds when they turn brown or cut them off from the spikes. Let air-dry at room temperature. Remove seed coating by rubbing fruits together to dislodge seeds. Seeds can be stored for up to eight years. Surface sow seeds onto a dry mix of 3 parts perlite to 1 part potting mix, then water seeds in. Keep in covered area and water every other day. Germination will occur in two weeks to three months.

Propagation Techniques by Cuttings: Dig up under sedge clumps to expose underground stems and then cut off the sections or clumps. Cut leaves in half and keep moist until ready to pot. Pot clumps into 3 parts perlite to 1 part potting mix. New foliage will appear in one to two months.

Care and Outplanting: Transplant propagated seedlings into 2-4-inch pots. Use a well-draining mix amended with cinder. Keep seedlings in a protected area for about a month, and then gradually move into more sun. Repot into 6-inch to 1-gallon pots in three to six months. Choose an outplanting site favorable to its native habitat. It is found commonly in lo’i, marshes, stream banks and coastal sites. Water plants in at first, then water only in times of prolonged drought. Seeds that fall to the ground disperse and germinate readily.

Common Pests: Ants live at base of clumps and farm mealybugs, scales and aphids. Thrips can cause leaves to silver.

Hawaiian Name: ʻĀkia
Scientific Name: *Wikstroemia uva-ursi*

General Description: Endemic to Hawaiʻi. Occurs in dry forests as a low-growing sub shrub. Leaves are dark green or gray-green and shiny with tiny, yellow, fragrant flowers. Fruit is red when ripe. In landscaping, it is.

Ecological Benefit: Most commonly used as a ground cover or short hedge. Drought and wind tolerant.

Cultural Significance: Ancient Hawaiians made a pulp of the roots and stems to act as a fish poison in tide pools. It was medicinally used as a laxative.

Propagation techniques by Seeds: Collect mature fruit when it is dark red, soft, and pulls easily from the plant. Separate the pulp from the seeds by gently squeezing between two fingers. Soak seeds for twenty-four hours, the heavier (viable) seeds will sink to the bottom of the bowl, discard floating seeds. Sow the seeds in a mix of 3 parts perlite to 1 part potting mix. Water them in and then water every other day. Germination of all viable seeds will occur in three weeks to five months.

Propagation techniques by Cuttings: Collect semi-hardwood tip cuttings about 4-5-inches long. Remove 0.25-inch ring of bark off the bottom of the cuttings, dip the end into rooting powder No. 8 or higher. Insert into a moistened mix of 3 parts perlite to 1 part potting mix. They should root in about three to five months.

Care and Outplanting: Prune young plants to promote branching. The plant will be ready for outplanting in six months to a year, when it has outgrown a 1-2- gallon pot. Plant in well-drained soil and water them until they are well established and then during drought.

Common Pests: Sucking insects such as ants, scales, mealybugs, thrips, and aphids will feed on the plant juices.

Hawaiian Name: ʻĀweoweo
Scientific Name: *Chenopodium oahuense*
Common Family Names: Goosefoot, pigweed, lamb's quarters

General Description: Endemic to Hawai`i. Found in dry, coastal areas as a shrub or 12 to 15 foot trees in higher, dry elevations. Leaves are triangular and covered in silvery hairs. Flowers are small and densely clustered on branch ends. This plant propagates so easily from seeds that it can potentially become weedy.

Ecological Benefit: Highly drought resistant

Propagation techniques by Seeds: Collect fruits when dry, brown, and seeding from branches. Keep dry in paper bag until ready to be cleaned. Seeds can be stored in a refrigerator. Surface sow seeds onto a dry mix of 3 parts perlite to 1 part potting mix, and then water in. Water every day in a covered area. Germination will occur within two weeks to three months.

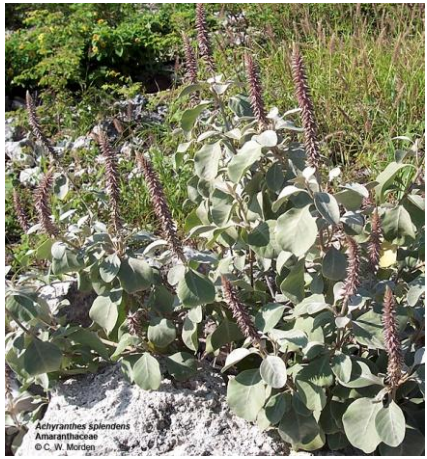
Propagation techniques by Cuttings: Collect soft to semi-hardwood cuttings about 3-4-inches long. Insert at least one node into a moistened mix of 3 parts perlite to 1 part potting mix. Roots in about two months, then pot into 2-4-inch pots using well-draining soil mix.

Care and Outplanting: Transplant into 2-4-inch pots after at least 4 true leaves develop. Keep seedlings in shade for two to three weeks, then gradually move them into full sun to harden them off.

It will be ready for outplanting in six to eight months. Outplant into well-drained soil. It likes full sun to partial shade. Water in at first, then water during prolonged drought.

Common Pests: Ants

Hawaiian Name: Hinahina ewa
Scientific Name: *Achyranthes splendens*
Common Family Name: Amaranth



General Description: Rare and endangered Hawaiian endemic. Found in dry lowland regions to dry forests. Small shrub ranging in height from 2 to 6 feet tall. Leaves are a grey-green color. Flowers are arranged in a spike which protrudes from the end of each branch.

Ecological Benefit: Salt and drought tolerant. The small, silver hairs on the leaves help reflect sunlight and reduce the amount of moisture lost through the plant's leaves.

Propagation Techniques by Seeds: Collect small seeds from branch ends. Keep dry; moisture can cause dry fruits to mold or rot and lose viability. To prepare them, soak in tap water for twenty-four hours. Sprinkle small seeds onto mix, and then add 0.25-inch layer of mix on top of seeds. Seeds can be stored for up to eight years. Germination occurs in two weeks to five months.

Propagation Techniques by Cuttings: Make cuttings 3- to 7- inches long with at least 3 nodes. Remove lower foliage and retain top leaves. Cut leaves in half if more than 2-inches long. Use rooting powder No. 3. Cuttings will root in two to three months, after which transplant them into a well-draining mix.

Care and Outplanting: Transplant seedlings into a well-draining mix after four to six true leaves appear.

These are relatively fast-growing plants and will be ready for outplanting in six to eight months. Choose a site in full sun.

Common Pests: Aphids and root mealybugs

Hawaiian Name: ʻIlieʻe
Scientific Name: *Plumbago zeylanica*
Common Family Name: Plumbago or Leadwort

General Description: Indigenous. Found in arid, open land, sand dunes and shrub lands. Leaves are oval with a pointed tip and flowers can be white, blue, or purple.

Ecological Benefit: This low-growing and sprawling shrub roots at each node along the ground which makes it ideal for stabilizing soil erosion.

Cultural Significance: Hawaiians used the juice from the roots for medicinal purposes as well as to make a black dye for tattooing. Flowers were eaten as a tonic.

Propagation Techniques by Seeds: Collect the long sticky capsules when they are brown and shedding from stems. Separate brownish seeds from capsules by rubbing fruits together so that seeds are dislodged. Soak in tap water for one hour then sow into a mix of 3 parts perlite to 1 part potting mix and cover with 0.5-inch of mix and water in. Keep in covered area water when soil dries out. Germination of viable seeds will occur in about one to four months.

Propagation Techniques by Cuttings: Collect semi-hardwood cuttings from mature stems. Cut into 4-5-inch pieces with at least three nodes each. Remove all but newest leaves. Use rooting powder No. 1 for green stems and No. 3 for woodier stems. Stick into a mix of 3 parts perlite to 1 part vermiculite. Water lightly and be careful not to wash off the rooting powder. Plants should root in two to four months.

Care and Outplanting: Wait until at least four true leaves develop for before transplanting seedlings into a well-draining mix. Keep seedlings in shade for a few weeks then move into more sun. Repot in about three months. Plants need to be hardened off in full sun to prepare for outplanting in about six months. ʻIlieʻe will tolerate partial shade to full sun. Trim back if it starts to grow too close to other plants.

Common Pests: Ants, slugs, Chinese rose beetles.

Hawaiian Name: Kuluʻī

Scientific Name: *Nototrichium humile*

Common Family Name: Amaranth

General Description: Endangered, Hawaiian endemic. Found in dry lowland regions to dry forests of the Wai'anae Mountains as a shrub. Juvenile leaves have sparse hairs which are lost with age.

Ecological Benefit: Drought tolerant

Propagation Techniques by Seeds: When plant is mature, collect small dry seeds from branch ends. Keep seeds dry. To remove seed coverings, carefully rub fruits against a strainer set inside a bowl to dislodge seeds. Sprinkle small seeds onto a mix, and then add 0.25-inch layer of mix on top. Germination will occur in two weeks to five months. Transplant once 4 to 6 true leaves appear, into well-draining mix.

Propagation Techniques by Cuttings: Use semi-hardwood or softwood cuttings. No rooting powder treatment needed. Cuttings will root in two to three months. Transplant into a well-draining mix.

Care and Outplanting: Relatively fast-growing plants. They will be ready for outplanting in six to eight months. Choose a site in full sun as they naturally occur in dry open habitats.

Common Pests: Aphids and root mealybugs.

Hawaiian Name: Maiapilo
Scientific Name: *Capparis sandwichiana*
Common Family Name: Caper, Caper bush

General Description: Endemic to Hawai`i. Low growing, coastal shrub found on rocky ledges. Leaves are grey-green in color. Flowers are very fragrant with four white petals. Flowers open at night and turn pink with age. When ripe, the fruits are long, orange and foul smelling.

Ecological Benefit: This low growing, spreading shrub grows easily on rock and coral ledges. It is highly salt tolerant.

Propagation Techniques by Seeds: Collect fruits when orange and soft. Separate pulp from reddish-brown seeds by rubbing fruits against strainer in a bowl of water. Pour off floating pulp and pour remaining water and seeds onto a paper towel. Let seeds air dry for a day before sowing. Seeds can be stored for up to six years in a refrigerator. For faster germination, soak seeds in tap water for three to five days. Sow onto a mix of 3 parts perlite to 1 part potting mix in a shallow flat and add 0.5-inch of mix on top Water every other day and keep in a covered dry area. Germination will occur between two weeks and three months. Wait until seedlings have at least four true leaves before transplanting into 2-4-inch pots with well-draining soil.

Care and Outplanting: Outplant when plant has outgrown a 4-6-inch pot. Choose a site in full sun with well-draining soil; amend with cinder or small gravel. Water in at first, then water weekly for a month. Use 8-8-8 NPK fertilizer if needed. Give this plant approximately 6-feet to grow. Tolerates pruning well.

Common Pests: Ants. Coffee twig borers attack stems. Cut off affected stems and discard. Rats feed on seeds and seedlings, use traps to control. Powdery mildew appears as white spots on leaves and is a result of too much water. Reduce watering or treat with fungicide as a last resort.

Hawaiian Name: Maʻo
Scientific Name: *Gossypium tomentosum*
Common Family Name: Mallow, Hawaiian Cotton

General Description: Endemic to Hawai`i. Found in arid, rocky coastal plains up to about 120m elevation as a low growing shrub. Leaves are three to five lobed and covered in soft white hairs. Flowers are large, solitary, and bright yellow. Seeds are covered in brown hairs which is why this plant is referred to as the Hawaiian cotton.

Ecological Benefit: Highly resistant to disease and drought. Salt and wind tolerant. Forms bushes or tall hedges.

Cultural Significance: Hawaiians made a green dye for kapa (bark cloth).

Propagation Techniques by Seeds: Collect seed capsules when dry, brown, and splitting along seams. Remove fuzzy seeds from capsules by hand. Seeds can be kept dry for up to six years at room temperature. Soak seeds in tap water for twenty-four hours. Use 3 parts perlite to 1 part potting mix in shallow flats; cover seeds with an additional inch of mix. Water seeds in and keep in a covered area; water twice a week or when it is dry. Germination can occur between three weeks to two months.

Care and Outplanting: When four to six true leaves develop, transplant into 2-4-inch pots using a well-draining mix such as a mix made up of 3 parts black cinder to 1 part potting mix with a small amount of 8-8-8 NPK fertilizer. Repot when plants are twice as tall as pots. Move into full sun to help harden them off for outplanting in about six months. Choose a site in full sun with well-draining soil and water in times of drought. Apply 8-8-8 NPK fertilizer if necessary.

Common Pests: Whiteflies. Ants and sucking insects can infest this plant. Red spider mites (spray with horticultural oil). Powdery mildew appears as whitish powder on leaves and spreads rapidly when plants are kept wet

from over watering. Prune off affected leaves and discard to prevent spreading. Reduce watering.

Hawaiian Name: Maʻo Hau Hele
Scientific Name: *Hibiscus Brackenridgei*
Common Family Name: Mallow

General Description: Endangered, Hawaiian endemic. Occurs in shrub lands and dry forests as a shrub to tall tree. Flowers 4-6-inches in diameter, are yellow and open for only one day

Ecological Benefit: Pest and drought tolerant

Cultural Significance: Hawai`i's state flower. Medicinally, the blossoms of the Hibiscus were used as a gentle cathartic for infants.

Propagation Techniques by Seeds: Collect brown seed capsules when mature and starting to split open. Keep dry and store at room temperature until ready to propagate. Soak seeds in tap water for twelve to twenty-four hours; viable seeds will sink. Sow onto a mix of 3 parts perlite to 1 part potting mix, cover seeds with 0.5-inch of additional mix, and water in. Keep soil moist and watch for slugs, which will eat seedlings. Germination will occur from five days to three months.

Propagation Techniques by Cuttings: Cut woody stems from central or basal shoots. Cuttings should be 5-12-inches long with at least three nodes. Remove all but the newest leaf growth to ensure cuttings will retain moisture. Do not allow new cuttings to dry out or be exposed to full sun prior to rooting. Use rooting powder Nos. 3-8. Insert cuttings with at least one to two nodes under the mix. Cuttings will root in three to five months. Other propagation techniques include air layering and grafting.

Care and Outplanting:
Transplanting seedlings when four true leaves develop or when they become twice as tall as pots they are growing in. Keep seedlings shaded, slowly moving them into a sunnier area to harden them off. Outplant after six months to one year. Choose a site in partial to full sun, out of strong winds and with well-draining soil. Water weekly.

Common Pests: Chinese rose beetles eat leaves but cause little damage to overall plant health. Whiteflies, ants and aphids are also common pests.

Hawaiian Name: Naio
Scientific Name: *Myoporum sandwicense*
Common Family Name: Myoporum, Bastard sandalwood

General Description:
Indigenous, found on most Hawaiian Islands. Found in coastal to dry forest zones. Naio grows as a multi-branched, low shrub or tree, depending on habitat. Leaves are dark green, alternate and cluster at branch ends, flowers are white, ripe fruits are white to purple.

Ecological Benefit: The low-growing variety acts as a good groundcover of hillsides and bare areas. Drought tolerant.

Cultural Significance: Hawaiians used larger trunk and branches as hale posts and smaller materials served as thatching poles.

Propagation Techniques by Seeds: Collect fruits when soft and whitish or purplish in color. Massage fruits by hand, separating pulp from seeds until all the pulp is gone. Soak seeds in tap water for five days viable seeds will eventually sink. Sow onto a mix of 3 parts perlite to 1 part potting mix, the cover seeds with 0.5-inch of additional mix, then water in. Keep in covered area until they start to sprout, then move into partial sun. Do not allow soil to dry out. Water every other day. Germination can occur from one to six months.

Care and Outplanting: Wait until four to six true leaves develop, then transplant into 2-4-inch pots with well-draining mix and small amounts of 8-8-8 NPK fertilizer. Every four to six months repot into larger pots and add new media. Move into full sun to harden them off for outplanting.

Naio will be ready for outplanting in six months to a year, when they have outgrown a 1-2-gallon pot. Choose a site in full sun and out of direct strong winds. Create a well draining site by amending the planting hole and soil by adding cinder or other amendments. Water in your plants, then water monthly and monitor for proper drainage and moisture, watering in times of prolonged drought. Use small amounts of 8-8-8 or 14-14-14 NPK fertilizers, foliar feed every couple of months.

Common Pests: Ants, scales, mealybugs, and aphids.
Hawaiian Name: Nanea
Scientific Name: *Vigna marina*
Common Family Name: Legume or Pea, Beach pea

General Description: Indigenous, found on most main Hawaiian Islands. Perennial, climbing vine found in coastal and dryland habitats. Stem is herbaceous and twisting, often woody at the base, leaves are in clusters of three, and flowers are yellow with an upper petal and a lower 'keel' petal. It can become weedy in the landscape. The production of so many seeds will result in "volunteers" germinating in surrounding area.

Ecological Benefit: A crawling vine to cover eroding hillsides. It can become weedy and climb onto nearby plants if not pruned.

Propagation Techniques by Seeds: Collect pods when brown and dry. Seeds can be stored dry at room temperature or in refrigerator for a few years. Soak seeds in tap water for twenty-four hours to speed up germination, or scarify seeds. Plant seeds in tall, individual 2- to 3-inch pots or together in 6- to 8-inch pots. Place seeds onto a mix of 3 parts perlite to 1 part potting mix, then cover seeds with 0.5-inch of additional potting mix. Water seeds in, then water every other day. Do not keep potting mix soaking wet because seeds will rot. If scarified, viable seeds will sprout in about five days. If seeds are soaked, germination will take one to two months.

Propagation Techniques by Cuttings: Cuttings should be taken from woodier portion of vine. Remove leaves and green tips of cuttings. Apply rooting powders Nos. 3-8. Use a cutting mix.

Care and Outplanting: Transplant seedlings into 4-inch pots, using well-draining sandy soil mix. This fast-growing vine requires repotting every three to six months into larger pots. Move vines into full sun to harden them off for outplanting.

Choose a site that is in full sun in sandy well-draining soil. Choose a site where the vine can grow along the ground with plenty of room to spread.

Water vines in and then weekly if weather is dry. Fertilize every six months or foliar feed monthly for more flowers.

Common Pests: Ants, seed weevils.
Hawaiian Name: Naupaka
Scientific Name: *Scaevola sericea*
Common Family Name: Goodenia

General Description: Indigenous. There are 300 species throughout the pacific. Common coastal plant. Woody, low-growing perennial herb. Easily recognized by "half" flower, white pulpy fruit and leaves clustering at branch ends. Fruits are easily dispersed by ocean currents.

Ecological Benefit: Excellent windbreak, salt tolerant.

Cultural Significance: Folklore of the half flower: separated lovers. The pulp of the leaves are said to ease sting of man-o-war or jellyfish.

Propagation Techniques by Seeds: Collect ripe fruit when it is soft white. To clean seeds, separate seeds from pulp (one seed per fruit) by first soaking seeds in a bowl of water to soften pulp. Massage fruits by hand, separating seeds from pulp. To prepare seeds for sowing, soak in water for twenty-four to thirty-six hours. Sow them onto a mix made up of 3 parts perlite to 1 part potting mix. Keep seed flats in partial sun. Germination occurs in about two months to one year.

Propagation Techniques by Cuttings: Collect softwood tip or semi-hardwood cuttings and cut them at about 7-inch intervals; remove all of the lower foliage and cut the top foliage in half. They can be outplanted right into the sand to root, or stick them in a rooting bed with a mix made up of 3 parts perlite to 1 part vermiculite and root powder Nos. 3 or 1. Cuttings will root in about two to three months. When rooted, transplant into 2-4-inch pots. Use a well-draining mix.

Care and Outplanting: They are ready to be transplanted when at least four to six leaves have developed. Transplant into 2-4-inch pots. Use a well-draining, drier mix. Seedlings should be moved in a week after potting to full sun to harden off. Foliar feed plants monthly, or apply and 8-8-8 NPK fertilizer every six months. Repot plants into larger pots when plants grow twice as tall as pots.

It will be ready for outplanting in about six months. Choose a site that is dry and in full sun.

Common Pests: Ants, mites.
Hawaiian Name: ‘Ohai
Scientific Name: *Sesbania tomentosa*
Common Family Name: Legume or Pea

General Description: Hawaiian endemic. In the legume family. Found in dry coastal areas and old lava flows up to about 2000 feet elevation. Low-growing shrub with silky, silvery hairs on leaves, flowers are pink and slightly fragrant.

Ecological Benefit: Drought and salt tolerant.

Propagation Techniques by Seeds: Collect pods when they are mature, brown in color, and dry. To clean, separate seeds from pods. Seeds can be stored at room temperature or refrigeration for ten or more years. Scarify seeds for fast germination, or soak in tap water for twenty-four hours. Plant in shallow mix made of 3 parts perlite to 1 part potting mix then sprinkle 0.25-inch of additional mix on top of seeds. Water in, then water weekly and keep in covered area. Germination will occur in a week if scarified first. It will take two weeks to six months if soaked first. Make sure mix is well-draining.

Care and Outplanting: After germination, transplant into 4-inch pots and keep in shade for a week before moving into full sun.

Seedlings will be ready for outplanting in three to six months, or when they have outgrown a 4-inch pot for low shrubs, or a 1-gallon pot for small trees. Plant in full sun with very well-draining soil, amended, as directed. Fertilize every six months or foliar feed monthly.

Common Pests: Ants, red spider mites, root-knot nematodes, seed weevils, black twig borers.

Hawaiian Name: Pōhinahina
Scientific Name: *Vitex rotundifolia*
Common Family Name: Verbena, Chaste tree, Beach vitex

General Description: Indigenous. Found in coastal regions. Grows as a low shrub or groundcover. Grey-green leaves, clusters of purplish flowers, fruits green to black. Can withstand heavy pruning. Cuttings root easily.

Ecological Benefit: Crawling vine that can cover eroding hillsides or bare spots. Roots at each node. Is easily shaped into hedges.

Cultural Significance: Used medicinally.

Propagation Techniques by Seeds: Collect fruit. Remove seed coat by massaging them against a wire strainer. Soak in water for twenty-four hours. Viable seeds are corky and tend to float. Sow seeds onto a mix of 3 parts perlite to 1 part potting mix, and then cover with an additional 0.25-inch of mix and water in. Keep in covered area and water every other day. All viable seeds will germinate in one to six months.

Propagation Techniques by Cuttings (faster than seeds): Collect semi-hardwood cuttings that are 4-5-inches long from main stems that root at the nodes along the ground. Remove all but newest leaves. Insert the cut bottom end of each stem into rooting powders No. 1 or 3, then into moistened mix made up of 3 parts perlite to 1 part vermiculite. Lightly water the cuttings in and be careful not to wash off the rooting powders. Keep in covered area, watering every other day. They should form roots in two to four months.

Care and Outplanting: Wait until four true leaves form before transplanting. Use a well-draining mix amended with 2 parts perlite or 2 parts black cinder to 1 part potting mix. Keep in shade for two weeks and then move into full sun. Will be ready for outplanting when it has outgrown a 6-inch to 1-gallon pot. Choose a site with full sun and well-draining soil. Allow lots of room for plant to spread out. Water in initially and then only water during prolonged periods of drought.

Common Pests: Spittle bugs. Ants and their associated pests (scales, mealybugs, thrips, and aphids).

Hawaiian Name: ʻŪlei
Scientific Name: *Osteomeles anthyllidifolia*
Common Family Name: Rose

General Description: Indigenous, found on most of the main Hawaiian Islands. Found from sea level to about 4000 feet elevation. ʻUlei is a small evergreen tree at higher elevation or a low shrub at sea level. Leaves are dark green with tiny silvery hairs underneath. Flowers are small, white and five-petaled, fruits are light purple to white.

Ecological Benefit: Crawling vine that can cover hillsides or bare spots to reduce erosion. Is easily shaped into hedges by pruning.

Cultural Significance: Hawaiians used the flexible stems to make scoop net handles. Flowers and fruits were used in lei pua. The tough wood was used to make fishing spears and musical instruments.

Propagation Techniques by Seeds: Collect pulpy fruits when they are soft and whitish in color. Massage fruits by hand, separating pulp from seeds. Soak seeds in tap water for twenty-four hours. After soaking, sow into a mix of 3 parts perlite to 1 part potting mix. Cover seeds with 0.5-inch of mix, then water in. Keep flats in covered, shaded area. Germination of all viable seeds will occur in one to four months.

Propagation Techniques by Cuttings: Collect softwood to semi-hardwood cuttings in spring or early summer, when plant is not in bloom and it is not seeding. Apply rooting powder Nos. 1-3 at cut stem ends. Pot into a mix of 3 parts perlite to 1 part potting mix. Your cuttings should develop roots in three to five months.

Care and Outplanting: Wait until two to four true leaves develop; before transplanting. Keep in partial sun. Repot when they become twice as tall as their pots. Move into full sun to help harden them off for outplanting. Plants will be ready for outplanting in about six months to a year, when they have outgrown a 4-inch or 1-gallon pot. Choose a site in full to partial sun with well-draining soil. Water weekly until roots are established.

Common Pests: Ants and their associated pests (mealybugs, scales, and aphids).

Tools & Tips

Seedlings: Germination and Care
Follow recommended procedures specific to each plant for germination and be patient as not all seeds will sprout at the same time. To water seeds and seedlings fill solid base of seedling trays half way with water instead of watering the soil from above to prevent damage to sprouts from water droplets. If left out in an uncovered area, leave lid on to prevent rainwater droplets from damaging sprouts. Clear plastic take-out containers also make great terrariums and seedling trays.

Plastic utensils for are great for labeling plants. Plant type and date started are helpful in knowing when a plant may need to be transplanted, need fertilizer or to monitor growth. Plastic utensils are also useful for removing sprouts from seedling trays when ready for transplanting.

What to do when plants outgrow their pots
Plants are generally ready to be transplanted or outplanted when roots are visible from the drainage holes at the base of the pot or seedling have developed two to four true leaves. Gently remove the plant by squeezing the sides of the pot to loosen the soil. Seedlings and smaller plants need to be treated with care so as not to damage their tiny roots. Seedling can be removed from 1-inch seedling trays using a spoon or other utensil. For larger plants, place one hand over the top of the pot with the stem between your fingers and flip the pot upside down. As you remove the plant from its pot check the soil for any pests and treat as recommended.

Amend the base of the new pot or outplanting site with a layer of cinder to facilitate drainage. Then, add a base layer of soil for the plant to sit on so that the soil level will be ½- to 1-inch below the rim of the pot. Place and position the plant in the ground or new pot and fill in the sides with soil. Be careful to pack soil firmly around the plants so as not to leave any air pockets which invite pests and fungus.

If plants are root bound or rotting roots are seen at the base of the plant, gently remove dead roots by hand and loosen soil. This can also be done by soaking the soil and root ball in a bucket of water to loosen soil or separate roots.

Fertilizing
First fertilize plants when transplanted from seedling tray to 4-inch pot. Use vermicast from worm bins, composted chicken manure or other natural fertilizers before relying on store bought NPK fertilizers. If using store bought fertilizers, follow all dosage instructions on product labels or even cut them in half.

Pest Control
Native plants can be sensitive to unnatural elements and may have adverse reactions to Horticultural oils, neem or insecticidal soaps if sprayed during the head of the day, this is called phytotoxicity. Be sure to spray in the morning or later in the day when it is cooler. Plants can also be rinsed off with the hose 30 minutes to 1 hour after a pest control method has been used to reduce the chance of phytotoxicity.

Pest management and plant health products discussed can be found throughout Ko'olaupoko at Koʻolau Farmers in Kailua and Kaneohe and also at Longs or any department store garden section. Dr. Bronner's Peppermint oil can be found in Kailua at Down to Earth or most health food stores.

Soap sprays
Use Ivory Liquid® or Simple Green® liquid soap. Mix 1 part soap to 10 parts water. Apply with a liquid spray applicator.
When using Dr. Bronner's peppermint soap as horticultural oil, mix 1-2 tablespoons in 1-liter of water in a spray applicator.

Neem oil is natural oil derived from the neem tree of Africa. Follow all directions on product label for mixing and application.

While the above mentioned natural pest controls have little or no adverse environmental effects they can be less effective than chemical pesticides. Therefore, consistency is the key. Check healthy plants weekly for signs of pests and be sure to check the undersides of leaves. If a pest infestation is noticed spray immediately and re-spray daily until live pests are not present.

Pest Identification & Control

For all pest control measures, consistency is key. Daily spraying will be needed when using soap and neem sprays and in heavy infestations removal of all but the newest leaves may be required to eliminate pest habitat & eggs. Soap sprays and other natural methods should always be a first resort over pesticides.

Aphids carry diseases from plant to plant and cause foliage to shrivel and wrinkle. Aphids are tiny insects that are dark green, yellow or black in color. They commonly feed on new growth. Manage aphids by applying neem oil, soap spray, or horticultural oil.

Ants form mutualistic relationships with sucking insects (such as aphids, scales, and mealybugs). Ants protect these insects from their natural predators and in return they feed on the honeydew these insects produce. If ants become a major problem or are found to be living and forming colonies in the soil at the base of the plant or in the pot, use boric acid baits: 3 cups water, 1 cup white sugar, 4-5 teaspoons boric acid or borax. Use plastic containers with lids to dispense ant bait. Poke 2 to 4 holes in the side near the lid, large enough for ants to enter. Fill half of container with bait mix and make sure lid is on tight. Place containers near ant holes. It will take a few weeks to a few months for the ants to succumb to the boric acid. Change ant baits once a month or when they are empty. An alternative to boric acid baits is a citrus spray found at local garden stores.

Mealybugs, in large populations, can cause a plant to shed its leave and become stunted or die. They appear as small cotton puffs in the joints, the underside of leaves, and in the roots. Management includes neem oil, soap spray, or horticultural oil.

Slugs eat the leaves and stems of herbaceous plants. To control them, use a granular slug bait such as Sluggo, or remove by hand to a salt water bath and monitor plants closely in the evenings.

Spider mites suck chlorophyll from leaves, turning them pale green or yellowish. Mites appear as tiny reddish specks. To control spider mites, apply neem oil, soap spray, or horticultural oil.

Scale insects look like raised, brownish, black, or green spots along stems and leaf ribs. Infested plants are stunted with yellow leaves. Branches are ringed with scales and they may die. Apply neem oil, soap spray, or horticultural oil to control scales or remove by hand by gently scraping.

Whiteflies are small, white-winged insects that cluster on the underside of leaves. Leaves turn yellow and fall off of infested plants. To control whiteflies, wash off infested area of plant by hand with a strong spray of water, or use horticultural oil.

Spittle bug infestations resemble spit on the tips of plants. They are small, green, round beetles that live under the spit-like substance. To control, wash off by hand.

Chinese Rose Beetles eat holes in leaves during the night and may weaken plants due to reduced leaf surface. Most times the affected plant will not sustain lethal damage due to these beetles so control is not necessary. If needed, a systemic pesticide or a bacterial insecticide (bacillus) can be used to control the beetles.

Black Twig Borer bore small holes in the trunk or stem of plants. They lay their eggs in these holes and when larvae hatch, they feed on the pith, causing the plant to die from the hole upwards. Cutting and burning the infested twig or stem will help control the borer. Plants may grow back from below bore hole. Plants are more susceptible to bore damage when stressed, unhealthy, or when tree seedlings are younger. To manage pest, keep plants healthy and be aware of any bore holes.

Resources

- **CTAHR: Native Hawaiian Plants for Landscaping, Conservation, and Reforestation** http://www.ctahr.hawaii.edu/oc/freepubs/pdf/OF-30.pdf
- Gutmanis, June. *The Authoritative Best-selling Book on the Secrets and Practice of Hawaiian Herbal Medicine: Kāhuna Lāáu Lapaáu*. Honolulu: Island Heritage, 1976.
- Handy, E. S. Craighill, Elizabeth Green Handy, and Mary Kawena Pukui. *Native Planters in Old Hawai`i: Their Life, Lore, and Environment*. Revised ed. Honolulu: Bishop Museum, 1991.
- **Hawai'i Board of Water Supply** http://www.hbws.org/cssweb/
- **Hawai'i Conservation Alliance: Pacific Island Plant Restoration Database**http://hawaiiconservation.org/resources/publications/pacific_island_plant_restration_database
- **Hawai'i's Noxious (invasive) Weed List** http://plants.usda.gov/java/noxious?rptType=State&statefips=15
- **Hui Kū Maoli Ola Hawaiian Plant Specialists** http://www.hawaiiannativeplants.com/
- **Hui o Koʻolaupoko** http://www.huihawaii.org
- Lilleeng-Rosenberger, Kerin E. Growing Hawai`i's Native Plants. Honolulu: Mutual Publishing, LLC, 2005.
- **Native Plants Hawai'i** http://nativeplants.hawaii.edu
- **Oʻahu Invasive Species Committee** http://www.hawaiiinvasivespecies.org
- Oregon Rain Garden Guide: Landscaping for Clean Water and Healthy Streams. Oregon State University: 2010.
- Staples, George W., Robert H. Cowie. Hawai`i's Invasive Species. Honolulu: Mutual Publishing: 2001.
- **United States Department of Agriculture** http://plants.usda.gov
- Wagner, Warren Lambert., Derral R. Herbst, and S. H. Sohmer. *Manual of the Flowering Plants of Hawai'i*. Revised ed. Vol. 1 and 2. Honolulu: University of Hawai'i, 1990.

Glossary

Alien species occur in a particular place because of human introduction. They do not occur there naturally. Alien species can be referred to as non-indigenous, non-native or exotic species.

Ecology studies the relationship between organisms and their environment.

Endangered species that are in danger of extinction.

Endemic species are native species that occur in only in a particular geographical location and nowhere else in the world.

Foliar feed is a liquid chemical fertilizer sprayed on plant leaves.

Horticultural oils are diluted organic sprays used to control pests on plants.

Indigenous species are native species that are also found in other geographical locations.

Invasive species are alien species that spread rapidly and cause serious problems.

Native species occur naturally in a particular place.

Neem oil is derived from the Neem Tree, a semi-evergreen tree from the East Indies. The oil pressed from the fruits and seeds are used as a natural insecticide.

NPK fertilizer (Nitrogen-Phosphorus-Potassium) is a combination of primary macronutrients necessary for plant growth. NPK fertilizer labeling consists of three numbers which designate the percentages present of each element.

Vermiculite is a coarse aggregate material made from expanded mica and has a high water-holding capacity and is used as a rooting medium and soil additive.

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Feel free to contact us at any time and stay tuned for quarterly e-mails as a chance to touch base and check in on the health of your foster plants.

Protecting ocean health by restoring the ʻāina: mauka to makai