Hawaii Backyard Conservation

Ideas for every homeowner

Natural Resources Conservation Service

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In this publication, you will find practices you can use to conserve and improve natural resources in your backyard. These handy tips can help to protect the environment, help wildlife, and in many cases, make the area more attractive and enjoyable. Most backyard conservation practices are easy to put in place. Ideas are provided here, but for more information or for help in developing your backyard plan, you may want to consult a local landscaper, garden club, or any of the organizations listed on the back of this booklet.

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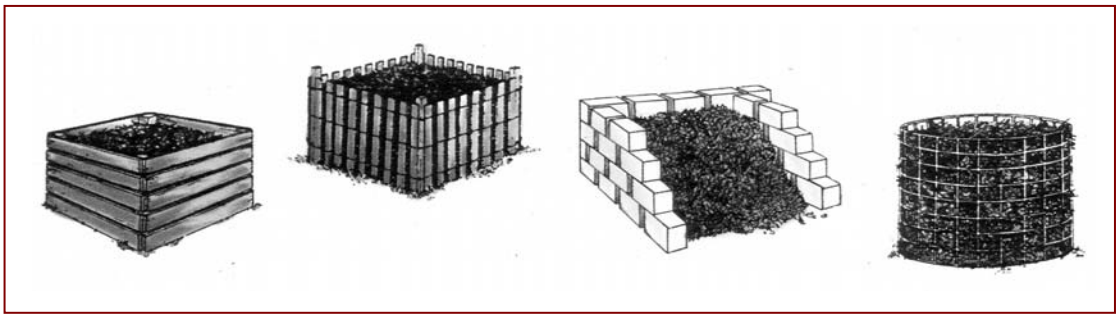
Composting

Imitating nature's disposal system

A process by which organic materials (branches, leaves, fruits) biologically decompose under controlled conditions. Composting speeds the process by providing an ideal environment for bacteria and other decomposing microorganisms. When composted, the final product looks and feels like fertile garden soil. This dark, crumbly, earthy-smelling stuff works wonders on all kinds of soils and provides vital nutrients to help plants grow and maintain good health.



Four Key Elements:

1. Nitrogen (green leaves)
2. Carbon (woody stems)
3. Moisture (from water)
4. Oxygen (from air)

For best results, mix materials high in **nitrogen** (such as fresh leaves, grass clippings, seaweed/aquatic plants, fruits, vegetables) and those high in **carbon** (such as dried leaves, twigs, stems from fibrous grasses, shredded palm fronds, chipped trees, shredded paper). **Moisture** is provided by rain, but you may need to water the pile to keep it damp. Be careful not to saturate the pile, use a cover to prevent saturation. Turning or mixing the pile supplies **oxygen**. More turning yields faster decomposition.

Methods of composting

- Passive (cold) composting

With this method, you mix grass clippings and dry leaves on the ground or in bin. Shredding of the material by running your lawn mower over small piles of weeds and trimmings speed up the process. Passive composting requires no maintenance. Keep weeds and diseased plants out of the mix. Add yard waste as it accumulates.

- Active (hot) composting

Hot piles must be built all at once in a four to five foot cube and turned regularly. As decomposition occurs, the pile will shrink. A three-foot cube is needed to maintain necessary heat. Hot piles can reach 110 to 160 degrees Fahrenheit, killing most weed seeds and plant diseases. Spread several inches of the high-carbon material (woody, fibrous), and then mix high-nitrogen material (green leaves/grass) together. Water periodically. Punch holes in the sides of the pile for aeration. The pile will heat up, when it begins to cool, start turning the compost. Move material from the center to the outside and vice versa. Finished compost will smell sweet and be cool and crumbly to touch.

Mulched material (green waste), which has already been ground or chipped, obtained from the local green waste facilities can easily be turned in to compost. Pile a cubic yard on the ground, periodically turn the pile with a pitchfork or shovel to aid in the aeration and decomposition.

Note: Composting is not an exact science. Be patient. The rate of decomposition will vary depending on weather conditions and materials composted.

Worm Composting (Vermicomposting)

Vermicomposting uses worms and associated microorganisms to compost kitchen scraps and other organic wastes. Two species are commonly used for vermicomposting in Hawaii, *Eisenia fetida* (Red worms) and *Perionyx excavatus* (Indian Blue worms). Materials required for worm composting include a bin (plastic is most common), bedding (shredded paper, cardboard etc.), worms and food. Most organic materials can be composted with worms. Composting with worms can take longer than other forms of composting, but it is worth the wait. Properly produced vermicompost is an exceptional plant food, rich in plant nutrients and beneficial to plant growth.

Additional Resources:

www.opala.org
www.recyclehawaii.org

Good vs. Bad Bugs

Beneficial insects to your yard

One of the colorful and common flies in Hawaii which is most often mistaken for a harmful fruit fly is *Allograpta oblique*, a hover fly, flower fly, or syrphid fly. These flies are expert fliers and can hover or fly backward, an ability possessed by few insects other than syrphid flies. Adults often visit flowers for nectar or may be seen around aphid colonies where they feed on honeydew secreted by the aphids and lay their eggs. The adults are considered to be important agents in the cross pollination of some plants. The larvae are important predators, feeding primarily on aphids that attack citrus, subtropical fruit trees, lettuce, other vegetables, ornamentals, and many wild host plants of the aphids. When larval populations are high they may affect 70 to 100% control of aphid populations.

Good Bugs (photos by Gregory Koob, NRCS):

Bad Bugs (photos by Amy Tsuneyoshi, HBWS):

Additional Resources:

http://hbs.bishopmuseum.org/askascientist

www.ctahr.hawaii.edu/organic/resources.asp

Integrated Pest Management

Early detection of pests means healthy environment

Black Stink Bug

(Coptosoma xanthogramma)

-Can produce large number of offspring.
-Feeds on plant juices, affecting plant health.
http://en.wikipedia.org/wiki/Stink_bug

Cottony Cushion Scale

(Icerya purchasi)

-Commonly found on woody ornamentals, feeds on sap affecting plant health, also excretes honeydew attracting ants and causing black sooty mold growth.
-Adults usually found on twigs/branches.
-Females: orange, yellow, or brown with white cottony egg sac attached to body
-Males: small, red, winged, rarely seen.
http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7410.html

Good planning can put you a step ahead of unwanted insects, weeds, and diseases. Healthy, vigorous plants minimize pest damage. Regular monitoring of your lawn or garden is the best way to stay on top of potential plant health and pest problems. If you see minimal damage, it is often easiest to just tolerate it and continue monitoring. If pests begin to cause serious damage, there are a number of management methods.

Preventing pests

- Plant disease and pest-resistant or tolerant species.
- Clean up litter and remove weeds before they go to seed.
- Don't over water or over fertilize your plants. It can make them vulnerable to insects and disease.

Physical pest control

- Remove insects by hand.
- Wash pests away using a water spray nozzle.
- Set traps where possible.
- Make physical barriers around plants, such as a wire mesh fence partially sunk into the ground for rabbits, aluminum foil wrapped around vegetable plants for cutworms, and solid barriers to prevent weeds from invading flower beds or vegetable gardens.

Chemical controls

If the methods listed above fail to solve your pest problem, use chemicals of low toxicity and rapid decomposition. Always read the label, follow directions, wear protective clothing, and spot-spray. Some of these chemicals are:

- Pesticidal soaps for aphids, scale crawlers, whiteflies, and thrips.
- Insecticidal dusts for aphids, beetles, fleas, ticks, ants, and crickets.
- Horticultural oils for aphids, mites, leafhoppers, mealybugs, scales, plant lice, and mosquito larvae.
- Biologically based pesticides such as Bacillus thuringiensis (B+) or spinosad for control of caterpillars
- Botanicals for leafminers, fleas, and ticks.
- Liquid formulations and products for control of insects, mites, diseases, nematodes, and weeds.
- Before you apply pesticides, make sure that they will not harm beneficial insects or be hazardous to humans, pets, or wildlife.

Additional Resources:

Master Gardener (808) 453-6050
www2.ctahr.hawaii.edu/extout/extout.asp
www.hawaii.gov/health/environmental/vector/index.html

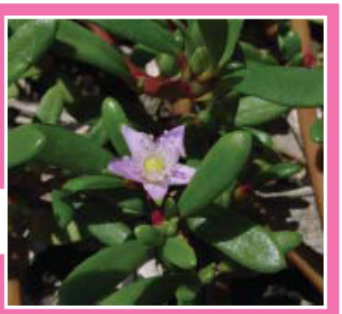
Native Plants

Select a native plant that suits your yard

Plants that arrived and survived in Hawaii prior to human contact are considered to be native. These plants traveled to Hawaii without the help of people by three methods: Wind, Water and Wings (birds-either inside or outside). Many native Hawaiian plants are beautiful, easy to grow and are now available for purchase through local nurseries. The table below list some of the more common native plants that are suitable for most landscapes. *Native Plant photos by Amy Tsuneyoshi, HBWS.*

GROUNDCOVER

Plant Name	Habitat	Height	Spread	Water Needs
ʻAeʻae *Bacopa monnieri*	Thrives in moist areas	2-4 inches	1-4 feet	Moderate to Heavy
ʻĀkulikuli *Sesuvium portulacastrum*	Tolerates salt, wind, drought	2-5 feet	1-2 feet	Light
Hinahina *Heliotropium anomalum*	Tolerates salt, wind, drought	2-6 inches	2-4 feet	Moderate
ʻIlima papa *Sida fallax*	Tolerates salt, wind, drought	2-8 inches	3-4 feet	Moderate
Nanea *Vigna marina*	Tolerates salt, wind, drought	6-8 inches	4-8 feet	Moderate
Pāʻūohiʻiaka *Jacquemontia ovalifolia*	Tolerates salt, wind, drought	2-4 feet	3-5 feet	Moderate
Pōhinahina *Vitex rotundifolia*	Thrives in sandy soils	0.5-4 feet	3-6 feet	Moderate



HERBACEOUS PLANTS

Plant Name	Habitat	Height	Spread	Water Needs
* Ālula *Brighamia insignis* or *rockii*	Thrives in well drained soils	3-6 feet	3 feet	Light
Koʻokoʻolau *Bidens torta*	Thrives in dry to mesic areas	4-10 feet	8 feet	Light to Moderate
* Naupaka (Dwarf) *Scaevola coriacea*	Thrives in well drained soils	1-2 feet	4 feet	Light
Pia *Tacca leontopetaloides*	Thrives in various habitats	4-6 feet	6 feet	Light to Moderate
Pua kala, Hawaiian Poppy *Argemone glauca*	Thrives in well drained soils	3-6 feet	4 feet	Light
ʻUkiʻuki *Dianella sandwicensis*	Thrives in various habitats	2-8 feet	6 feet	Moderate

*** These Endangered Plants MUST have a tag detailing that it was legally cultivated for sale and not poached from the native forest.**

Additional Resources:
www.boardofwatersupply.com
http://mauiwater.org/plantingplan.html

Native Plants

SHRUB

Plant Name	Habitat	Height	Spread	Water Needs
ʻĀnapanapa *Colubrina asiatica*	Tolerates dry areas	4-8 feet	8 feet	Light to Moderate
* Koʻoloaʻula *Abutilon menziesii*	Tolerates dry areas	3-6 feet	2-4 feet	Light
Kuluʻī *Nototrichium* sp	Tolerates dry areas	3-6 feet	8 feet	Light to Moderate
Maiapilo *Capparis sandwichiana*	Thrives in dry to mesic areas	3-5 feet	3-5 feet	Moderate
Maʻo *Gossypium tomentosum*	Tolerates salt, wind, drought	2-6 feet	11 feet	Light to Moderate
* Maʻo Hau Hele *Hibiscus brackenridgei*	Tolerates dry areas	4-11 feet	8 feet	Light to Moderate
ʻŪlei *Osteomeles anthyllidifolia*	Thrives in various habitats	4-10 feet	4-6 feet	Light to Moderate

SHRUB-TREE

Plant Name	Habitat	Height	Spread	Water Needs
ʻAʻaliʻi *Dodonaea viscosa*	Thrives in moist areas	2-4 inches	1-4 feet	Moderate to Heavy
Alaheʻe *Psydrax odoratum*	Tolerates salt, wind, drought	2-5 feet	1-2 feet	Light
* Kokiʻo keʻokeʻo *Hibiscus arnottianus*	Tolerates salt, wind, drought	2-6 inches	2-4 feet	Moderate
* Nānū *Gardenia brighamii*	Tolerates salt, wind, drought	2-8 inches	3-4 feet	Moderate
Pāpala *Charpentiera* sp	Tolerates salt, wind, drought	6-8 inches	4-8 feet	Moderate
Pāpala kēpau *Pisonia* sp	Tolerates salt, wind, drought	2-4 feet	3-5 feet	Moderate

TREE

Plant Name	Habitat	Height	Spread	Water Needs
Kōpiko *Psychotria* sp	Thrives in moist areas	2-4 inches	1-4 feet	Moderate to Heavy
Lama *Diospyros sandwicensis*	Tolerates salt, wind, drought	2-5 feet	1-2 feet	Light
Lonomea *Sapindus oahuensis*	Tolerates salt, wind, drought	2-6 inches	2-4 feet	Moderate
Loulu *Pritchardia* sp	Tolerates salt, wind, drought	2-8 inches	3-4 feet	Moderate
Olopua *Nestegis sandwicensis*	Tolerates salt, wind, drought	6-8 inches	4-8 feet	Moderate
ʻŌhiʻa *Metrosideros polymorpha*	Tolerates salt, wind, drought	2-4 feet	3-5 feet	Moderate

Invasive Plants

Acacia auriculiformis (above) is non-native and should not be confused with *Acacia koa* (below) which is native. Photos by Gregory Koob, NRCS.

Avoid Planting Invasive Species

One of the greatest threats to Hawaii's native plants, wildlife and fresh water supply is the spread of invasive non-native plants. There are more than 250,000 species of plants in the world, and 10,000 of these have already been brought to Hawaii. About 10% of these plants have become invasive—they grow and reproduce quickly, producing abundant seeds, and they monopolize space, water, sunlight and nutrients, replacing other plants and the wildlife that depends on them.

Some plant species are ultra-competitive because they are adapted to survive in their home range in the presence of their natural enemies such as competing plants, plant predators or diseases. When we move ultra-competitive plants to a new location, Hawaii, for instance, we remove them from these natural suppressants and they become invasive species.

Some ornamental plants such as strawberry guava, fountain grass, miconia, and Himalayan ginger (AKA kāhili ginger) were imported to Hawaii and planted in yards and gardens. From backyards, these seeds were carried by the wind and animals into natural areas where they are invading and harming native ecosystems and watersheds.

Plant Pono

Although not purposefully done, we are responsible for moving invasive plants. New plants continue to be imported and sold (10% of these will become invasive in Hawaii), but the good news is that we can make better planting decisions by taking some simple steps.

- When landscaping, or visiting your nursery or garden shop, ask for native Hawaiian plants or non-invasive plants.
- Do a quick check online for information about plants that are known to be invasive in Hawaii. Use a search engine to type in the name of the plant you want to use, and the word "invasive" and "Hawaii." If conservation groups are working to control it, please consider using a different plant.

Some Invasive Ornamentals to Avoid

Instead of Non-native *Acacia* shrubs/trees: Choose native Acacias instead, such as koa or koaiʻa.
Instead of Australian tree fern: Choose the native Hawaiian tree ferns or even ʻape, giant dryland taro, for a tropical look.
Instead of Strawberry guava: Choose queen's crape myrtle if for bonsai or pua kenikeni for small tree.
Instead of Yellow Himalayan ginger (kāhili ginger): Choose torch ginger for flowers, or nānū, the native gardenia, or tiare the Tahitian gardenia for scent.
Instead of *Medinilla* species: Medinillas are in the same family as the invasive tree *miconia*, and they are starting to spread. There are many alternatives, including a variety of native hibiscus species.
Instead of Pampas grass: Choose ʻuki, the look-alike native Hawaiian sawgrass, or kō, the Hawaiian sugar cane.

Other Ways to Help

- Before and after hikes, always clean your hiking shoes and gear of seeds and mud that might carry seeds.
- Be aware that seeds also travel on vehicles, dogs, horses and even in some nursery products such as cinder and hapuu fern logs.
- When you travel, take care not to bring invasive species back to Hawaii or between islands.
- If you see invasive species such as snakes or other suspicious creatures or plants, report it to the Pest Hotline at 643-PEST (643-7378), direct from any island.

Managing Nutrients

Apply only those nutrients the plants can use

Nutrients are essential for good plant growth, but over applying nutrients is not good for plants or for the environment. Excess nutrients leach through the soil and end up in ground water, or run off into storm drains and enter our streams and bays. The three primary plant nutrients are nitrogen (N), phosphorus (P), and potassium (K). In Hawaii, nitrogen and phosphorus have caused problems with excessive aquatic plant growth. Remember to consider native plants or others with low fertilizer needs.

Soil test is key

The key to good nutrient management in your backyard is a reliable soil test. Without a soil test, you could be applying too much, too little, or the wrong nutrients. You'll want a separate soil test for your lawn and garden.

Commercial soil test kits available are not calibrated to give accurate recommendations for Hawaii. Contact your local Cooperative Extension Service (CES) office for information on how to take and submit soil samples to the University of Hawaii Agricultural Diagnostic Service Center (ADSC). Consult with your local cooperative extension agent to help you understand soil test results, fertilizer recommendations, and how to correctly calibrate your spreader.

Organic or conventional fertilizers usually provide primary plant nutrients (N-P-K), but plants require at least 10 other nutrients (called micronutrients). You can get a plant tissue test to determine if your plants need micronutrients. Apply only the nutrients needed according to soil test results. Never exceed the recommended rates and timing.

The importance of soil pH

Acidic soils occur wherever rainfall is substantial. Hawaii's soils tend to be acidic in the areas that receive moderate to high rainfall. So, you can expect acidic soils in Mililani and the wet windward valleys of Oahu (i.e., Haiku and Maunawili), but on the hot and dry plains of Ewa soils are neutral to alkaline. The pH (acidity level) is measured on a scale of zero to fourteen, with zero being very acidic and fourteen being very alkaline. Most plants grow best in soil with pH values between 5.5 and 6.5. When the pH level is lower than five or higher than eight, nutrients that plants need are not as available to the plant. In acidic soils with pH below 5.5 elements like aluminum (Al) and manganese (MN) occur at toxic levels and these soils must be limed to prevent harm to the growing plants. Every home and garden center carries pH test kits. These kits provide a general indication of your soil pH and fertility, but you must make sure you follow the testing instructions precisely. Sulfur will lower pH. Lime will increase pH.

Fertilizing lawns

- To avoid excess nitrogen in Hawaii's waters, use slow-release nitrogen fertilizers. Consider using compost to enhance or replace fertilizers.
- Leave grass clippings on the lawn for fertilizer.
- Avoid using fertilizers that contain weed killer or insecticide. These chemicals should be used only when other more environmentally-friendly pest control options fail. Use them only on affected areas.
- Be careful not to spread fertilizer on sidewalks and driveways.
- Be sure to calibrate your spreader correctly.

Fertilizing gardens

- Use compost to enhance or replace fertilizers.
- Choose a level site, or terrace the garden, to avoid runoff and erosion.
- Place fertilizer near plants rather than broadcast it over the entire garden.

In general, native plants such as `Ilima do well without supplemental fertilizer applications. Photo by Amy Tsuneyoshi, HBWS.

Additional Resources:

Agricultural Diagnostic Service Center
http://www2.ctahr.hawaii.edu/adsc/

Testing Your Soil: Why and How to Take a Soil-Test Sample
www.ctahr.hawaii.edu/ctahr2001/PIO/FreePubs.asp
Or call (808) 956-6706

Xeriscaping

Xeriscape promotes water conservation landscaping and can reduce outside water use from 30 to 80 percent! Follow the seven Xeriscape principles below to maximize the beauty and value of your landscape and minimize waste of our natural resources.

Planning & Design: Start with a good plan and work in phases, it promotes good budgeting and time management which leads to better design and water conservation.

Soil Improvement: Use organic material to improve the soil's ability to retain moisture, provide necessary plant nutrients and encourage root development. Check local university's agriculture, horticulture, or botany departments for soil evaluation and analysis services.

Efficient Irrigation: Maximize water conservation by watering according to plant and turf needs. Customize irrigation system to provide best watering method (i.e. drip irrigation, bubblers, or sprinklers.)

Plant Selection: The key is to plant appropriately. Choose plants that do well in your environment and group them according to water needs. Native plants, which thrive on natural rainfall, do best in a Xeriscape. (See Native Plants page 6.)

Mulch: Mulches cool the soil, retain moisture, minimize evaporation, reduce weed growth, and slows erosion.

Limit Turf Area: Grass requires the greatest amount of water and maintenance. Use turf only when necessary.

Good Maintenance: A well-maintained landscape can be easy to care for, requiring less maintenance and reducing the need for chemical fertilizers and pesticides.

What makes a good xeriscape plant? There are many different plants that you can choose to grow in your landscape. Here are a few characteristics that can help identify them as "less-thirsty."

Aloe	**Thick and waxy leaves** - store water and reduce transpiration.	'Akia	**Small or tiny leaves** – less leaf area reduces transpiration.
Rosemary	**Needle-like leaves** – reduced surface area from which moisture can evaporate.	Crown flower	**White milky sap** – reduces need for water as a substitute for survival.
Variegated False Oregano	**Hairy / Fuzzy leaves** (tricomes) – acts as a physical barrier to reduce transpiration from leaf surface.	Cacti	**Thorny succulent** – stores water in plant core and root system.

Additional Resource:
www.boardofwatersupply.com

Water Conservation

Drip irrigation and other practices can save water & money

Photo by Nghia Bui. Drip emitters are sold at most lawn/garden stores.

In your Backyard

If you rely on watering to make your lawn grow and your garden productive, consider a more efficient system. There are several ways to improve the use of water.

Watering to save energy

Whenever practical, water in the early morning. In arid areas, it's okay to water in the evenings and at night. You'll lose less water to evaporation than if you watered in the middle of the day, and the plants are less stressed and can take up the water more efficiently.

Mulch or fiber cloth preserves soil moisture.
You can find supplies and information at a nursery or hardware store. Also, consider planting native species and trees (refer to page 6). They usually use little or no water beyond normal rainfall.

Drip irrigation benefits

A drip irrigation system (like the one pictured to the right) will provide water directly to the plant. You can control the flow to each plant. Drip irrigation ranges from inexpensive soaker hoses to elaborate computerized systems. There may be an up-front investment, but you'll use less water and have better water distribution. Garden or hardware stores will have the supplies you need. You may even want to engineer your own system from a garden hose. Be sure not to over apply fertilizer when using a drip system.

Watering lawns

The worst possible irrigation program is to water turf daily for 5-10 minutes. An efficient and economical way to irrigate a lawn is to apply water at the first signs of water stress. Research has shown that turf watered at the first signs of visual wilt used 33 percent less water. Watering for a slightly longer period promotes deeper root growth.

Hawaii turf grasses require no more than 3/10 inch of water per day in mid-summer and about 1/5 inch or less in the cool winter months. Select turf grass for its relative drought tolerance. In order of the most drought tolerant is burmudagrass, zoysiagrass, St. Augustinegrass, seashore paspalum, centipedegrass, carpetgrass, hilograss, and akiaki.

Additional Resource:

www.epa.gov/owm/water-efficiency/index.htm

Sustainable Storm Water Practices

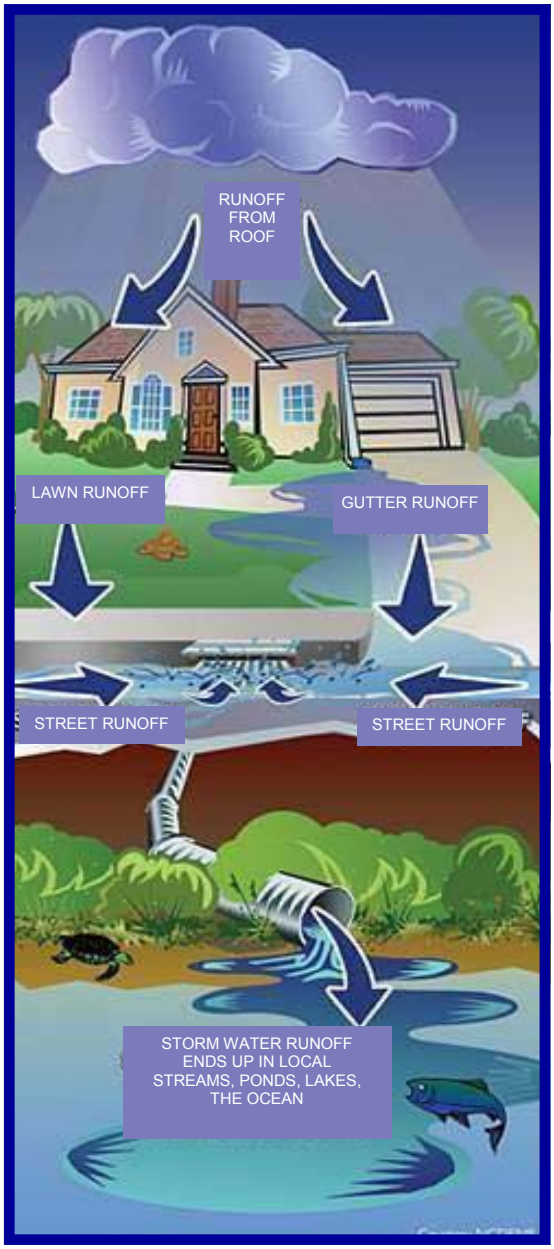
Everyone can help prevent storm water pollution

Why be concerned about storm water?

As impervious cover (any hard surface that water cannot penetrate) increases in an area, the natural capacity of the soil and vegetation to soak up the rain decreases, and more rainfall becomes storm water runoff.

This can produce negative impacts by causing erosion of land areas and stream banks, by causing or increasing flooding and also by carrying pollutants in storm water runoff.

On a rainy day you can see the impact of storm water runoff as it moves from rooftops, lawns, gutters, driveways, streets, storm drains, to our streams and the ocean.



www.enr.state.nc.us/upclose/pages/ounceofPrevention.html

The storm drainage system includes open channels or enclosed pipes that rain water flows into whenever there is a storm. They take the water running off from homes and roadways to help prevent or minimize flooding.

Because the water flowing into a storm water drain does not pass through a treatment plant before discharging into the ocean, it is important that the water is as clean as possible and not contaminated with pollutants such as sediment, pet waste, trash, paint, and other chemicals.

Soil erosion during construction

Nutrient runoff from chicken manure

Paint wash water on City street

Trash inside a catch basin

Individuals, government agencies, schools and private companies can take action to contain or minimize pollutants in storm water runoff.

Sustainable Storm Water Practices

Nine simple actions to be an everyday environmental hero

... in the yard 1 Keep soil covered by grass, shrubs and trees so the rain doesn't have a chance to get at it and move it. If the volume of water isn't great, divert the water running off yards and driveways into a vegetated area where the dirt can get trapped.

Rain can carry large amounts of soil to a storm drain or stream even on gentle slopes. A good idea is to plant a ribbon of trees and shrubs or a vegetated buffer, down slope of places like your home to capture soil and pollutants before they reach a stream. Minimize exposed areas on construction sites. Eroded soil is a major pollutant in our streams.

2 When using fertilizer, read and follow the directions on the label, applying only the amount recommended. Consider non-chemical fertilizers, for example, using compost as an alternative to fertilizer. Overfertilizing your lawn can result in an excess of phosphorus and other nutrients that can decrease the oxygen necessary for aquatic life.

3 Remove yard waste from sidewalks, street gutters and around storm drains. Reduce, reuse, recycle. This organic material decomposes in streams and decreases the oxygen necessary for aquatic life.

4 Bag pet waste and throw it in the trash before you leave an area. Never hose it down the street, storm drain, or a stream. It contains nitrogen, phosphorous, harmful bacteria and parasites that pollute our streams.

5 Direct roof drains to the yard, a rain barrel or rain garden instead of a driveway, street or storm drain.

... in the garage 6 Take your car to a commercial car wash where they recycle the wash water. Wash your car in an area that allows the water to soak into the ground, such as grass or gravel. Use interlocking pervious pavers on driveways that allow rain water to drain directly into the ground reducing runoff.

If you wash your car on a City street, use plain water, a bucket and a sponge or use a waterless car wash product. Car wash water carries soap, dirt and grease down the storm drain.

7 Use a broom instead of a hose to clean driveways, sidewalks and gutter areas. Soak up auto leaks or chemical spills with an absorbent (e.g. rag, clay-based kitty litter, dirt), sweep up, and put it in the trash. Go to professional who changes oil or use an oil change box if you do it yourself. Remember, it is your responsibility to keep the sidewalks, curbs and gutters fronting your property clean.

... around the house 8 Latex paint is water-based so remove excess paint before rinsing brushes in a sink. Allow unneeded latex paint to dry and throw in the trash. Store chemicals in a dry place protected from the rain. Do not allow paint wash water to flow to the street.

9 Household hazardous waste must be properly disposed of to prevent pollution. Materials which present serious health and safety hazards, including pesticides and highly flammable substances like gasoline and kerosene, require special handling. Call 768-3201 or email info@opala.org for an appointment to drop off these materials at the hazardous waste handling facility contracted by the City.

Sustainable Storm Water Practices

Green techniques in the backyard can help manage storm water runoff in a sustainable manner and improve the health of our waters.

Rain Barrels

Photo by Thomas Otaguro

A rain barrel is a system that collects and stores rainwater from your roof that would otherwise be lost to runoff and diverted to storm drains and streams. The tap and hose at the bottom of the barrel allows easy access to the water so that it can be used later to water your plants.

... frequently asked questions

1. **What kind of maintenance is required for a rain barrel?**
A rain barrel can be kept in perfect condition if you clean and apply a preservative a couple times a season.

Outside: Automotive cleaner—non toxic—biodegradable—ammonia free—use this product to remove bug, sap and other outdoor rain barrel stains and automotive preservative—SUN UV ray protector and preservative that is perfect for rain barrel plastic.

Inside: Visible inspection from time to time and if you see leaves or items that may eventually clog your hose bib, then just drain your barrel after pulling it away from the house. Stick a hose in the open down spout hole and spray it out and spray through the hose bib opening.

2. **How can I get better pressure from my rain barrel?**
You may elect to elevate your rain barrel, but make sure that it is stable and level. If you use blocks make sure they are set on a firm, level surface. Higher is better (but be very careful because a full barrel can weigh 400 pounds+.

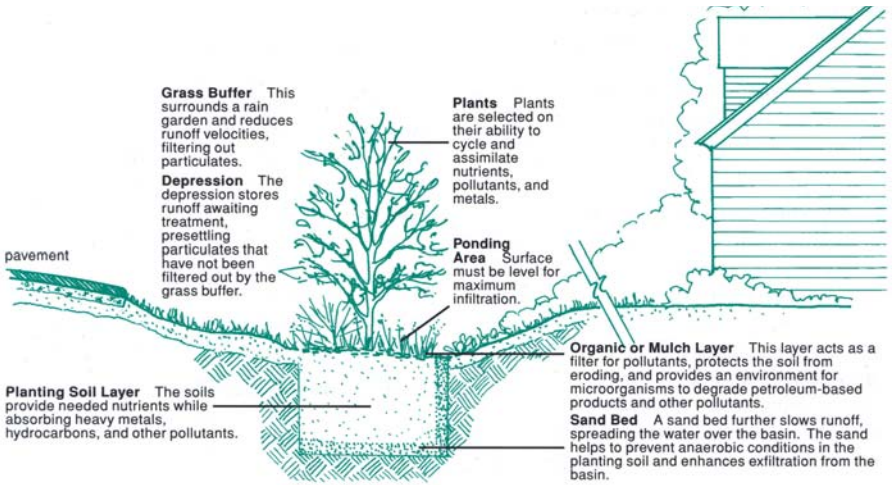
3. **Are there any concerns with using water stored in the rain barrel for watering plants?**
Do not use a rain barrel if you use chemical most killers, spray a large volume pesticides or herbicides, have a Zinc anti-moss strip on your roof, or if your roof is made with treated cedar shakes. These products are toxic chemicals that you might not want to store in your rain barrel. This is in relation to both water quality and algae issues. To be safe, it is recommended not to use on your vegetables. If the water is just to be used for general irrigation you might have less of a concern.

4. **What about mosquitoes?**
We recommend placing a screen at the opening of the barrel to not only reduce large items from getting into the barrel but also the potential for mosquitoes to breed. Mosquito Bits, when wet, release a biological larvicide's that is eaten by the baby mosquitoes (larvae) and is harmless to people, fish, birds, pets, and other animals.

For information on how to make a rain barrel, go to http://www.boardofwatersupply.com.

Sustainable Storm Water Practices

Rain Garden



Cross section of a Rain Garden
http://fairfaxcounty.gov/nvswcd/youyourland/landscape.pdf

Rain Gardens or bio-retention areas effectively reduce runoff volumes, remove pollutants, and provide groundwater recharge. To learn how a rain garden works, first know the layers of the rain garden (see cross section above).

- A grass buffer strip around the garden that will slow the velocity of the runoff;
- A mulch layer will provide a medium for the biological activities to occur and will keep the soil moist;
- Native plants that will use the runoff for moisture and nutrient requirements;
- A soil layer is where the native plant roots will collect the moisture and nutrients for their growth;
- A ponding area or depression of the garden will provide the storage needed for the runoff, and
- A berm or mound that is at least six inches of soil or rocks that works like a dam to pond the runoff.

Rain Gardens are in locations that collect storm water runoff, typically from roof downspouts, driveways, and parking lots, as a rain event occurs. They act as mini-retention ponds, reducing the volume of runoff, preventing the runoff from going into a curb and gutter storm drainage system, and helping to eliminate the pollutants from going directly into streams and eventually to the ocean.

Getting Involved and Reporting Pollution

1. Share your knowledge with family and co-workers.
2. Invite a guest speaker to talk about storm water pollution prevention.
3. Join a watershed group or attend a meeting
4. Call 780-8872 to volunteer to stencil storm drains with the message, "Dump No Waste" or participate in an Adopt-A-Stream/Adopt-A-Block cleanup.
5. Help keep our roadways clean by adopting a section of State High by calling 831-6703, Adopt-A-Highway.
6. Report illegal discharges or dumping to the storm drainage system

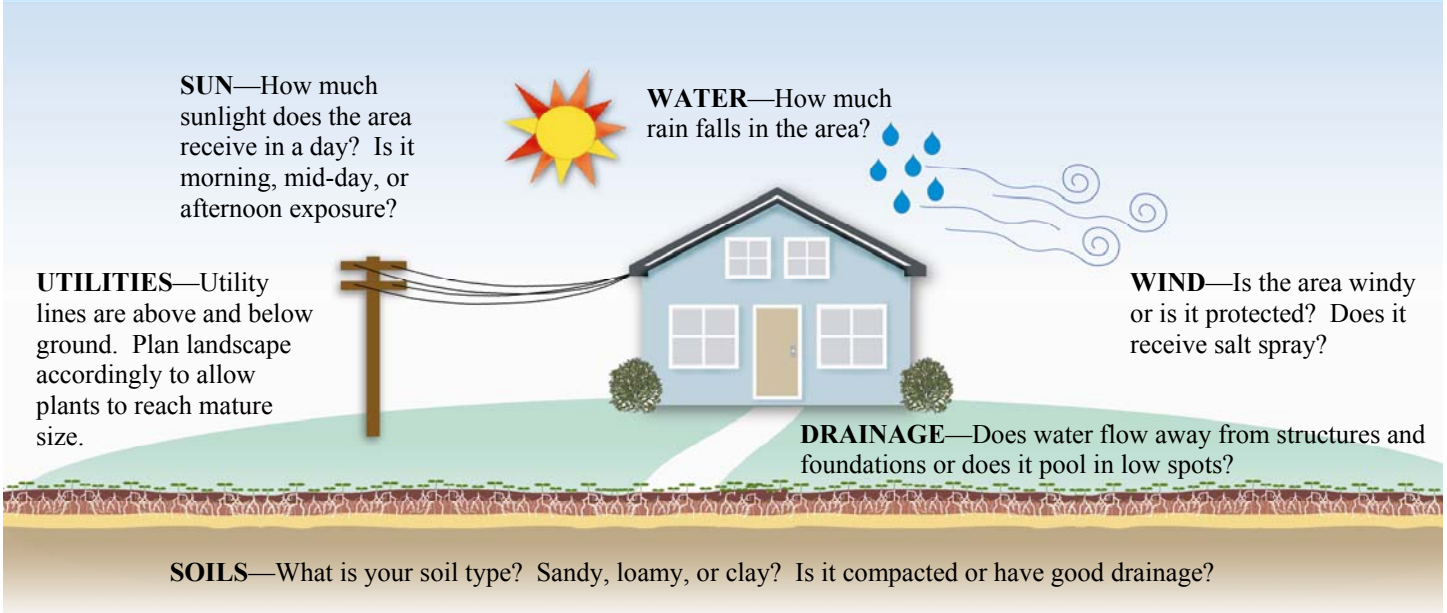
Call the City's Environmental Concern Line at (808) 768-3300, go to www.cleanwaterhonolulu.com, click on "Contact Us" or call the State's Highways Complaint Line at (808) 831-6714.

www.cleanwaterhonolulu.com
www.co.honolulu.hi.us/parks/hbg/fbg.htm
www.lichawaii.com/index.htm
www.ctahr.hawaii.edu/oahumg
www.rainscapes.org
www.hbws.org
stormwaterhawaii.com
www.epa.gov/nps/
www.plantnativehawaii.com

General Planting

Plant selection and planting information

Site preparation and plant selection are two of the most important things when planning a landscape.
Here are some things to consider about the **SITE** when planning your landscape.



Selecting Your Plant

Once the areas to be landscaped have been identified, it's time to select plants suitable for those sites. Here are some things to consider about the PLANT.

Sun: Does the plant prefer full sun, filtered sunlight, or the shade?
Water: Does the plant require a lot of water or is it xeriphytic?
Growth habit: What is the mature size of the plant? Is the area large enough for the plant to grow?
Plant features: What makes the plant special? Does it attract bees, butterflies, or other beneficial insects? Does it have thorns or is it poisonous?

Planting Your Plant

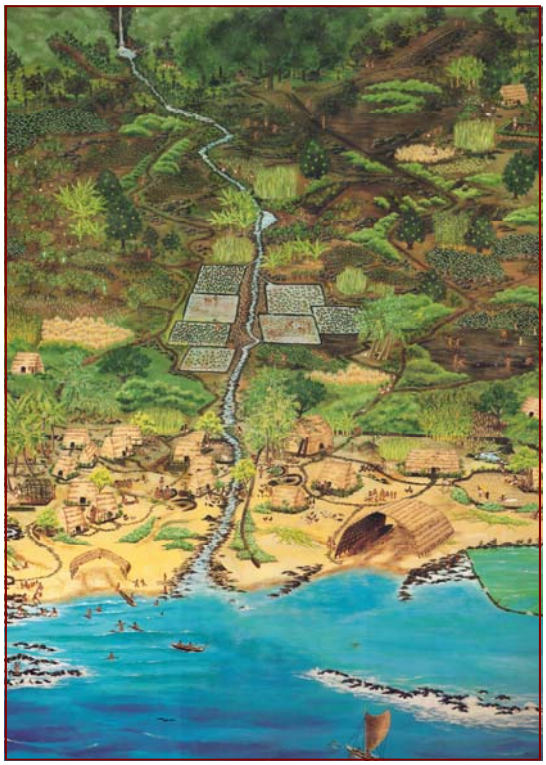
Planting the root ball at the proper depth is the foundation to maintaining a healthy plant. The following will guide you through the planting process:

1. Dig a hole as deep and a little wider than the root ball. To achieve the proper size, use the pot as a guide. Once the hole is deep enough, roughen the sides and bottom of the hole with a pick or shovel. This will help the roots penetrate the soil.
2. Carefully invert the plant in the pot while supporting the top of the root ball with one hand. Loosen and remove the pot with the other hand.
3. Gently separate the root ball. If there are roots circling the root ball, use a sharp blade to slice through those roots.
4. Place the root ball in the hole and backfill with existing soil. The root ball should be level with the ground, not buried.
5. Water thoroughly after planting and spread mulch over the soil in a three to five inch layer, keeping it away from the base of the plant. The plants should be monitored for the first few months after installation, watering when needed. As healthy new growth appears, watering may be decreased.

Additional Resources:
Online search for key words
"correct planting depth Hawaii"

OK **Too shallow** **Too deep**

Habitat



Traditional ahupua`a by Marilyn Kahalewai, used with permission from Kamehameha Schools.

Living in an Ecosystem

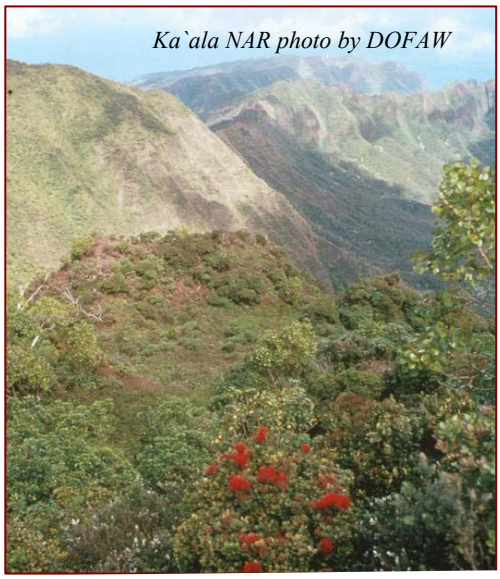
We all live in ecosystems: communities of plants, animals, and other living creatures living together, interacting with the physical environment, and functioning as a unit. Hawaii is unique because it is composed of many different types of ecosystems, dryland forests, rainforests, lowland swamps, upland bogs, and more. Humans were one of the latest introductions, and depending on how we interact with the other living creatures, we can negatively or positively impact the ecosystem we live in. There are some things everyone can do to keep Hawaii's water, people, plants, animals, and insects healthy.

In an Urban Community:

- Patio gardens are great for producing delicious, healthy, low cost food.
- Plant native ornamentals in pots on your lanai. Non-native plants can escape and spread. For more information, see page six.
- Storm drains near the sidewalk often lead directly to the ocean. Kokua our resources and keep them healthy by disposing of waste properly. Learn more about oil, pesticides, and pet waste on page 13.

In Suburban and Rural Communities:

- Cover bare ground with gravel, grass, and/or shrubs. Heavy rains carry dirt (and pollutants like oil and pesticides) into Hawaii's streams, which lead to the ocean. Help to keep Hawaii's water clean. It's our kuleana.
- Plant natives in your yard, be it small or large. For more information check out "Invasive Plants" on page 8.
- Washing cars in the driveway can use more water than a car wash. If washing a car, trade the hose for buckets of soapy water and a sponge.
- Alternative energy update: solar panels are much more bird friendly than turbines. Turbines kill all types of birds including forest birds, seabirds, and waterbirds. Support efforts for responsible energy choices for Hawaii.
- Minimize standing water. Even a small bucket of water or a water puddle on a tarp can be a breeding ground for mosquitoes. Dump water after heavy rains to avoid mosquito swarms. Mosquitoes carry diseases including avian malaria (bird flu), filariasis (which can lead to elephantitis), malaria, and denge fever.



Ka`ala NAR photo by DOFAW

Additional Resource:
www.kauai-seabirdhcp.info

Wildlife

Laysan Albatross mate in pairs and nest on the ground. Photo by Lindsay Young.

Downlighting can prevent seabird fallout. Photo by Andrea Erichsen.

Downy wedge-tailed shearwater chick. Photo by Fish and Wildlife Service.

Seabird-Friendly Lighting Strategies

When they leave their nests, seabird fledglings just learning to fly are guided by the light of the moon out to sea. Urbanization has increased the presence of lights in critical seabird nesting habitats. Fledglings are attracted to bright man-made lights rather than the moon and become disoriented, often flying around in circles, resulting in exhaustion and death (fallout). Eliminating stray light reduces fallout.

Bright Ideas:

- When landscaping or installing security lights around the home, use fully shielded lights that shine down at the ground rather than up into the sky. If birds cannot see the bulb, they are significantly less likely to become disoriented.
- Avoid using floodlights. A motion detector for floodlights minimizes energy use and fallout.
- Use lights with amber and yellow tones rather than bright white lights. They do not create as much glare and glow.
- When possible, use compact florescent bulbs.

If you find a dead bird, please call 211 and tell the operator the location and the condition of the bird.

Urban Wetlands and You:

We are lucky in Hawai‘i because throughout the islands there are wetland areas nearby to view endangered species like the ‘alea ke‘oke‘o (Hawaiian Coot), ae‘o (Hawaiian Stilt), Koloa, and ‘alae ‘ula (Hawaiian Gallinule). Visit Hāmākua Marsh, Kawainui Marsh, and Pouhala Marsh on O‘ahu; Kanahā Pond Wildlife Sanctuary, Keālia Pond and Wetlands on Maui; ‘Aimakapā Pond on the Big Island; and Mānā Reservoir on Kaua‘i to see these unique species. Keep Hawai‘i’s wildlife healthy. WILD BIRDS LIKE WILD FOOD. Human food is not healthy for wildlife and tame birds are often hurt by motorized vehicles.

Additional Resources:

www.hawaii.gov/dlnr/dofaw/hunting
www.abcbirds.org/abcprograms/policy/cats
www.hawaiihumane.org
www.gotdeadbird.org

Animals

Feral cat and dog communities can pose a threat to native species in Hawaii. Native seabirds, waterbirds and forest birds that are found nowhere else on earth are at risk for predation by these animals. It is important that we try to protect our native birds from wild and domestic cats and dogs.

Wedge-tailed shearwaters come to Hawaii to breed, and build their nests on the ground, leaving them vulnerable to predators like cats. The images on the right show a feral cat entering a burrow to catch, kill and eat one of these birds.

Above: Cat entering wedge-tailed shearwater burrow
Below: Cat devouring the extracted young shearwater

Tips for Cat Owners:

- Spay or neuter your cat at an early age before it can reproduce.
- Remember that even though a spayed or neutered cat cannot reproduce, it still remains a predator of native species and a potential reservoir of both animal and human disease.
- Keep your cat indoors. The average life expectancy of an outdoor cat is just 2-5 years, while an indoor cat may survive for 17 or more years.
- Do not feed stray cats and never abandon a cat you can no longer care for. Take it to the humane shelter.
- Support laws that prohibit the release and feeding of cats on public lands.

Tips for Dog Owners:

- Dogs off leash are a threat to native seabirds in coastal areas.
- Dogs should always be kept on a leash when on public lands. Although your pet may be well behaved at home, it is an animal's instinct to prey on smaller creatures.
- In 2006 on Oahu, at Kaena Point alone, more than 150 seabirds were killed by dogs.

Hunters Corner:

- Pigs, goats, deer, and sheep impact forest watershed areas by eating native plants. Often the bark, leaves, and/or roots are stripped away, fatally damaging the plant. When plants die, the root systems no longer hold the soil in place, exposing the area to weathering and erosion. Valuable soil and nutrients are washed away from the watershed area, leaving remaining native plants limited resources.
- Areas with significant damage from feral ungulates (hoofed mammals like pigs sheep goats and deer) are vulnerable to invasion by non-native plant species. For example, invasive plants like strawberry guava, bamboo and miconia can take the place of native koa, tree ferns and ohia.

Our Financial Sponsors

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1000 Uluohia Street, Suite 303
Kapolei, HI 96707
(808) 768-3248
www.cleanwaterhonolulu.com

Hawaii State Department of Transportation
Highways Division
727 Kakoi Street
Honolulu, HI 96819
(808) 831-6703
www.stormwaterhawaii.com

Hawaii State Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl St. Rm. 325
Honolulu, HI 96813
(808) 587-0166
www.dofaw.net

USDA Natural Resources Conservation Service
300 Ala Moana Blvd., #4-118
Honolulu, HI 96850
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www.pia.nrcs.usda.gov

Mahalo to Our Valued Contributors

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