Please report new infestations to:

BIG ISLAND
County of Hawai'i Coqui Frog Coordinator:
961-8066/961-8065
Hawai'i Dept. of Agriculture: 974-4140
Big Island Invasive Species Committee: 961-3299

MAUI
Maui Invasive Species Committee: 573-6472
miscpr@hawaii.edu
Hawai'i Dept. of Agriculture: 873-3558
(sprayer loan program available)

O'AHU
Hawai'i Dept. of Agriculture: 973-9538
Oahu Invasive Species Committee: 286-4616

KAUA'I
Hawai'i Dept. of Agriculture: 274-3069

COUNTY OF HAWAI'I RESOURCES

Community Loan Sprayer Program
The County of Hawai'i, USDA, Hawai'i Dept. of Agriculture, and Hawai'i Island Economic Development Board (HIEDB) have 100–400-gal capacity sprayers for use at no charge to the community. To schedule a sprayer on the Big Island, call USDA at 933-6955 or County of Hawai'i at 961-8066.

Citric Acid and Hydrated Lime
The Big Island Invasive Species Committee (BIISC) will match your purchase of citric acid for the control of coqui frogs (up to 9 bags). You must call 933-3346 first for availability and to schedule a pickup. Malama O Puna (East Hawai'i only) and HIEDB provide vouchers for hydrated lime to eligible individuals. Call Rene Siracusa (Malama O Puna 965-2000) or Andrea Dean (HIEDB 889-5806). Community groups that have received or are eligible for county grant funding for chemicals are not eligible for the free citric acid and hydrated lime programs.

Community Grants
The County of Hawai'i Community Grants Program supports communities combating coqui frogs with grants up to $5,000, which can be used to purchase citric acid, hydrated lime, gloves, masks, and other supplies. Call 961-8065 for information. Download an application at www.ctahr.hawaii.edu/coqui/resources.asp or check whether your neighborhood has received a grant.

Produced by the Coqui Frog Working Group
UNIVERSITY OF HAWAI'I AT MĀNOA
College of Tropical Agriculture and Human Resources (CTAHR)
UNIVERSITY OF HAWAI'I AT HILO
College of Arts and Sciences, College of Agriculture, Forestry and Natural Resource Management (CAFNRM)
HAWAI'I DEPT OF AGRICULTURE Plant Industry Division
HAWAI'I DEPT OF LAND AND NATURAL RESOURCES
Division of Forestry and Wildlife
COUNTY OF HAWAI'I, Office of the Mayor
U.S. DEPT OF AGRICULTURE Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center
U.S. FISH AND WILDLIFE SERVICE
BIG ISLAND INVASIVE SPECIES COMMITTEE
HAWAI'I ISLAND ECONOMIC DEVELOPMENT BOARD

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The University is an equal opportunity/affirmative action institution.
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Coqui Frog Control for Homeowners

Methods To Stop the Spread of Coqui Frogs in Hawai'i

PLEASE REMEMBER!
It is illegal in Hawai'i to import, export, breed, or sell coqui frogs, or keep them as pets.

WEBSITES

University of Hawai'i at Mānoa, CTAHR
www.ctahr.hawaii.edu/coqui

Hawai'i Department of Agriculture
www.hawaiiag.org/hdoa/coqui/htm

Hawai'i Ecosystems at Risk
www.hear.org/AlienSpeciesInHawaii/species/frogs/

Hawai'i Island Economic Development Board
www.stopcoqui.com

Nonchemical Control of Coqui Frogs

INSPECT for frog eggs, juveniles, and adults regularly. Male frogs can usually be located by their calling. Shortly after sunset, take a flashlight and scan over and between leaves, checking folded or curled leaves, leaf axils, dead leaves hanging from plants, and leaf litter beneath plants for adults as well as eggs. The frogs prefer broad-leaved plants but will perch on any leaf that will support their weight and provide cover. One or more silent females are often found near a calling male. Treat infested plants before moving them from or to your property. Carefully inspect building and gardening materials before bringing them onto your property. Inspect your vehicle (tire wells, truck beds) for hitchhiking frogs after leaving infested areas.

HAND-CAPTURE frogs by grabbing them quickly. They do not bite and are not poisonous. Or, use a short length of clear plastic tubing with a plastic bag taped over the upper end. Place the open end of the "tube tool" over the frog, and it will climb up the tube and into the bag. (See instructions on how to make a "tube tool" at http://everyfroghasastory.tripod.com)


"tube tool"

SHOWER landscape plants with hot water (113–115 °F) and collect frogs flushed from plants. Potted plants can be placed in a sink or tub and showered with 113 °F water for 5 min (or 115 °F for 3 min), followed by 1 min of cold water to cool off the plant. This treatment will kill any frogs or eggs in the plant. Verify water temperature with a thermometer, because cooler water is not effective, and hotter water may damage plants.

ELIMINATE frog-friendly habitats in your yard. During the day, coqui frogs retreat under leaf litter or other moist shelter, including piles of building material or empty pots. At night, they emerge to feed, and males climb and perch on vegetation to call. Remove dead leaves, prune and thin shrubs, and clear debris under plants to reduce frog habitats. Dispose of green waste by composting or mulching (or treat with hot water, citric acid, or hydrated lime) to kill any frogs or eggs. In dry weather, frogs can be attracted to standing or dripping water, so fix any leaky faucets and empty any containers that accumulate rainwater. If possible, avoid landscaping with broad-leafed plants preferred by coqui frogs.

SET OUT LURE TRAPS to take advantage of the coqui frog's "nesting" behavior and remove brooding males and egg clusters from areas with relatively high populations. Since the frogs can freely come and go from these artificial nesting sites, the traps must be checked and emptied at least every 2 weeks, before eggs can hatch. Traps can be made from various materials, such as PVC (polyvinyl chloride) pipe or bamboo.

To make a PVC trap, place a T-joint at the top of an 8-inch length of ¾-inch diameter PVC pipe. The traps are more effective after weathering by exposure to the sun and rain to dissipate the PVC odor. Trap efficiency in tests at Lava Tree State Park (Pāhoa, Hawai'i) is 28–40%, depending on weather conditions.


PVC trap

Bamboo, ¾–1 inch in diameter, can be also used; however, field trials indicate that the frogs prefer PVC to bamboo. Cut the bamboo between nodes to make a cylinder (8–10-inch length) with one open (top) and one closed end (bottom). Drill a 1-inch diameter hole along the side, about 4 inches from the closed end, to serve as an entrance to the trap. Partially cover the open end of the bamboo cylinder with black plastic to provide protection for the frogs seeking refuge while allowing rain to collect in the trap, making it more attractive to the frog.


Bamboo trap

Affix traps about 2–3 ft above the ground at 2-ft intervals in heavily infested areas or along a border between infested and non-infested areas. Check the traps during the day at least every 2 weeks (eggs hatch in 14 days), and remove any adults and eggs you find into a plastic bag or container with a lid.

Apply any of the following treatments to kill the adults and prevent the eggs from hatching:

a) fill the container with hot, soapy water (at least 113 °F for 5 min), OR
b) freeze for at least 3 hours, OR
c) thoroughly spray with 16% citric acid solution or 3% hydrated lime suspension.

Make sure that frogs and eggs are dead before disposal to avoid accidentally infesting dump sites.

Chemical Control of Coqui Frogs

Currently, two chemicals are available to homeowners to control coqui frogs in Hawai'i: citric acid and hydrated lime (also called calcium hydroxide). In April 2005, the U.S. EPA approved the use of hydrated lime against coqui frogs for 3 years, at which time its impact will be reassessed. Since citric acid is primarily used as a food additive, it is listed as a non-restricted chemical.

HOW THEY WORK: Both hydrated lime and citric acid are corrosive and burn the skin of the frog, interfering with its ability to breathe. Either solution requires direct contact with frogs or eggs and does not have significant residual (long-lasting) effects. Frogs and froglets usually die within a few minutes; treated eggs absorb the chemical and do not hatch. Hydrated lime (high pH) and citric acid (low pH) should not be mixed together because they will neutralize each other and be ineffective.

6 days after treatment: eggs sprayed with 16% citric acid (left) or 3% hydrated lime (middle) have died and are covered with mold, compared to untreated eggs with visible embryos developing (right).

SAFE FOR MOST PLANTS: While the citric acid solution is mild, it can burn sensitive plants, especially (but not limited to) ferns and orchids and new growth. To avoid damage (phytotoxicity) to valuable or delicate plants or flowers, thoroughly rinse the treated plants with fresh water to completely remove citric acid residue about an hour after spraying. Pre-testing on a small section of a plant is always recommended. After spraying and/or rinsing, observe the section for a few days for discolor-ation before spraying valuable plants or a large number of plants. Application of hydrated lime does not generally cause damage to plants but will leave a white residue and will raise soil pH (making soil more alkaline or basic).

PRECAUTIONS: Read the chemical label precautions and follow the directions for application and clean-up carefully. Use protective clothing and equipment while handling hydrated lime or citric acid to avoid personal injury. During clean-up, thoroughly rinse all spray and protective equipment to remove chemical residue and prevent corrosion

What do I need to do?

Step 1: Scout and identify location of coqui frogs.
In daylight, walk through suspected area; identify hazards, environmental concerns (water sources), and navigational landmarks. Clear paths through overgrown vegetation. After dusk, listen for calling males, and mark locations with flagging tape.

Step 2: Decide whether to spray hydrated lime or citric acid. Read label directions carefully before preparing chemical solution.

HYDRATED LIME: Hydrated lime does not dissolve in water but forms a suspension that requires constant agitation or mixing. Mix hydrated lime with water to make a 3% suspension (1 cup or ¼ lb per gallon) and apply as a foliar or drench spray. Hydrated lime is highly alkaline, corrosive, and the dust should not be inhaled. DO NOT APPLY AS A DUST! See label for detailed precautions at www.hawaiiag.org/hdoa/pi_pest_forms.htm

CITRIC ACID: Mix citric acid with water to make a 16% solution (2½ cups or 1 lb 5 oz per gallon) and apply as a foliar spray. Pre-mix citric acid in small batches before pouring into 100-gal sprayer tank to prevent settling. Citric acid should not be inhaled as powder or spray. See label for detailed precautions at www.ctahr.hawaii.edu/coqui/spray.asp

Step 3: Spray the previously marked area.

Night spraying: Spray after dark on humid nights, avoiding heavy rains or dry periods or drought when frogs remain hidden and call less frequently. Thoroughly spray to cover the vegetation where frogs are perched, including undersides of leaves, and a wide area beneath the vegetation. Frogs will be actively calling, mating, or foraging.

Day spraying: Spray to cover the vegetation where frogs may be hiding and a wide area below, saturating any crevices where the frogs are taking refuge.

Step 4: Clean-Up
Drain solution; flush sprayer thoroughly with water (nozzle and other metal fittings) to prevent corrosion. Rinse all protective equipment and clothing.

Step 5: Follow-Up
Subsequent sprays every 2 weeks may be needed for frogs that were missed (estimated to be up to 20%, including females, juveniles, and recently-hatched froglets). Continue to monitor for calling males for at least a year to determine if there are any remaining frogs.

Should I use citric acid or hydrated lime?

CHARACTERISTICS	CITRIC ACID	HYDRATED LIME
Safe to use on food crops	Yes	No
Cost	$50 per 50 lb bag (powder)	$15 per 50 lb bag (powder)
Available pre-mixed	Yes, concentrated liquid	No
Can be stored for later use once mixed with water	Yes, for up to 3 weeks	No
Requires constant agitation for proper application	No, only initial mixing required to dissolve powder	Yes, powder does not dissolve but creates a "suspension" that easily settles out
Requires personal protection equipment and clothing	Yes, use a mask to avoid inhalation during spraying, protect skin from spray	Yes, use a respirator to prevent inhalation, protect skin from spray
Apply as foliar spray	Yes, but cost-prohibitive for treating large areas	Yes
Apply as soil drench	Yes, but cost-prohibitive for treating large areas	Yes
Concentration	16% (2½ cup or 1 lb 5 oz per gallon of water)	3% (1 cup or ¼ lb per gallon of water)
Spray coverage	Not restricted	87 sq ft foliar or 44 sq ft soil drench per gallon
May cause burning on plants	Yes, test new growth and sensitive (ferns, orchids, etc.) or valuable plants; rinse off spray 1 hour after application	No
Dries leaving a white reside	No	Yes

If coqui frogs are well established in your area:

- **REPLACE** thick understory vegetation with thinner vegetation.
- **SPRAY** all landscape and potted plants with citric acid, hydrated lime, or hot water.
- **MOW** a buffer zone around your house to keep frogs at a distance.

Studies show that female frogs can lay up to 24 clutches, consisting of 34–75 eggs, per year in Hawai'i. Approximately 98% of the eggs survive. The eggs hatch in 14–17 days, and the froglets are capable of reproducing in 8–12 months.

Coqui Frog Life Cycle

Coqui eggs: incubation 14–17 days; clusters of 34–75 eggs can be laid every 2–4 weeks by adult females; no free-swimming tadpole stage

Newly hatched froglet: approximately 8–12 months to maturity (capable of reproduction)

Adult coqui: entirely terrestrial; adults may live as long as 4–6 years; males guard eggs to prevent desiccation and predation until hatching