

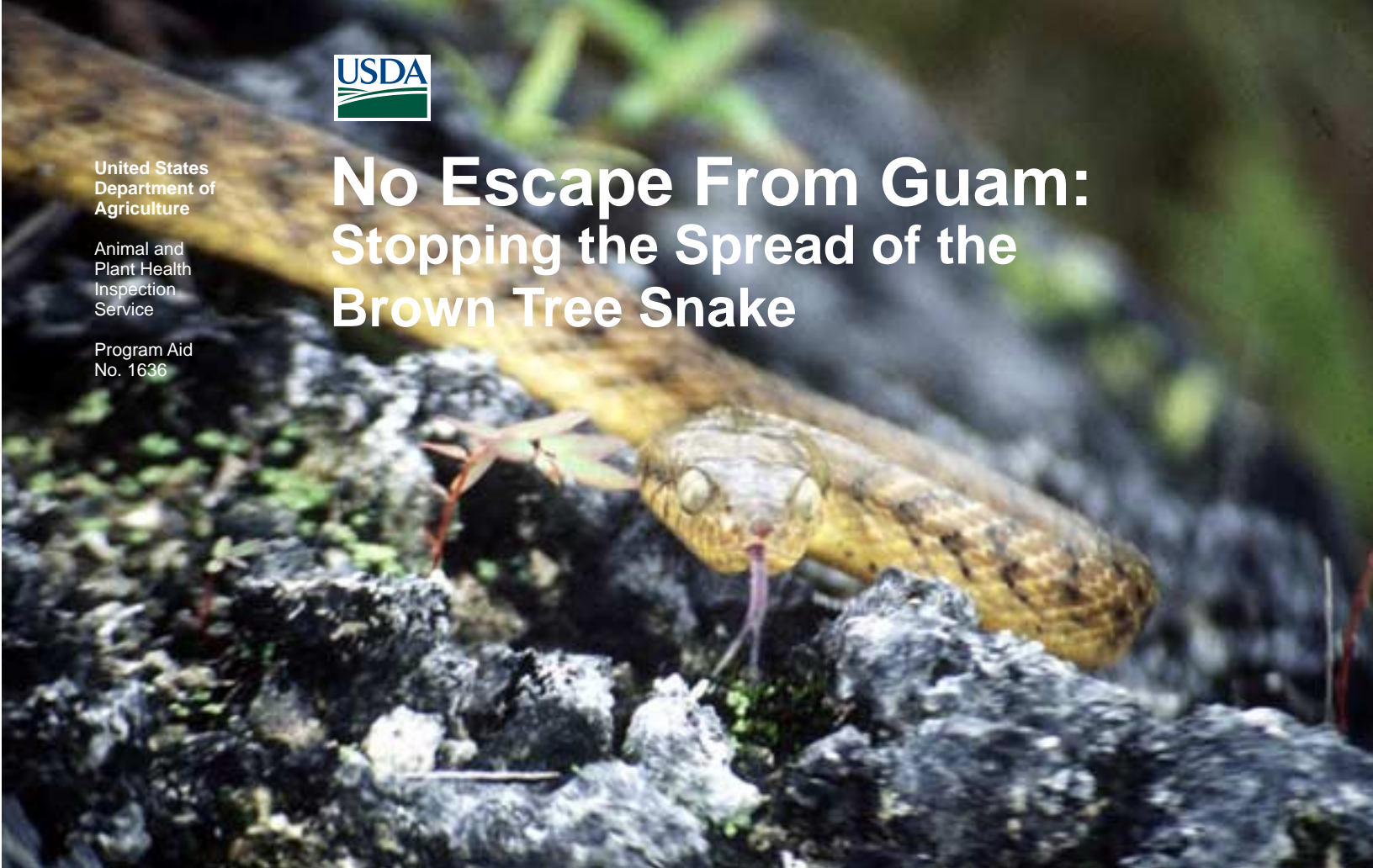


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# No Escape From Guam: Stopping the Spread of the Brown Tree Snake



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*Photo credits:* Figures 1-4 and the cover photograph were taken by APHIS' Daniel Vice. Figure 5 was shot by APHIS employee Danny Rodriguez.

*Cover photo:* Its distinctive coloration and markings make the brown tree snake easy to identify. Keeping this pest species from migrating to Hawaii or the continental United States in cargo holds is a high priority for USDA and the Department of Defense.

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## **In the Beginning**

The brown tree snake (*Boiga irregularis*) was accidentally introduced into Guam in the late 1940's or early 1950's. With no natural predators and abundant prey on Guam, the snake population spread throughout the island, causing major ecological and economic problems. This brochure briefly describes brown tree snake biology and damage and gives information on the agencies and activities involved in snake control as well as some suggestions for capturing and handling snakes.

## **Where Do Brown Tree Snakes Live?**

Brown tree snakes are native to eastern Indonesia, the northern part of Australia, Papua New Guinea, and the Solomon Islands. The brown tree snakes on Guam probably arrived as stowaways in cargo from the Admiralty Islands near Papua New Guinea.

Within their native range, brown tree snake populations are probably controlled primarily by limited food and habitat. On Guam, the snakes are killed by residents, automobile traffic, pigs, monitor lizards, and cats and dogs. Some snakes are electrocuted while climbing on electrical lines. Unfortunately, these hazards do not effectively control Guam's brown tree snake population, which is estimated at between 12,000 and 15,000 snakes per square mile.

## **Brown Tree Snake Biology and Behavior**

Brown tree snakes range in color from dark or pale green to brown, and the belly is yellow or cream colored. Black or brown stripes may run lengthwise on the forward half of the body.

When threatened, the snake will coil back into a strike position, flatten the head, and lunge to bite. This species is mildly venomous. Small grooved fangs located in the rear of the mouth enable venom to trickle into a bite while the snake constricts its prey.

The brown tree snake feeds on a variety of animals, including birds and their eggs, lizards, and small mammals.

On Guam, brown tree snakes reproduce year-round, although there may be a breeding peak during the rainy season. Not much is known about the snake's breeding habits on Guam, however. Between 3 and 12 leathery-shelled eggs are laid in a cool, dark place such as a crevice or hollow tree, where the eggs are protected from drying and overheating. Females may lay two clutches per year. Hatchlings are about 14 inches long and may grow to lengths of 3 feet in the first year. Brown tree snakes first reproduce at about the age of three, when they are 4 to 5 feet long. Large adults can be 10 feet long and weigh 5 pounds (fig. 1).



**Figure 1—** Adult brown tree snakes can often grow longer than a person is tall.

## Where Will I Find Brown Tree Snakes?

Brown tree snakes are excellent climbers. The fact that they can support their weight with their tail enables them to stretch both upward and sideways (fig. 2). The snakes can also coil their flexible bodies and hide in extremely confined spaces. Although most brown tree snakes live in trees in forest and scrub habitat, these snakes can be found almost anywhere.



**Figure 2—**Though brown tree snakes cannot “leap tall buildings at a single bound,” they can climb impressively.

Brown tree snakes are active at night and any area that provides protection from bright light and high temperatures may serve as a daytime retreat.

Brown tree snakes invade homes, commercial buildings, and other urban habitats in search of food and hiding spots. Snakes have been found in homes, vehicles, washing machines, lawnmowers, outdoor swing sets, barbecue grills, and almost every other imaginable hiding place.

### **The Impact of Brown Tree Snakes on Guam's Island Ecosystem**

The spread of brown tree snakes throughout Guam is directly linked to changes in several animal populations. Eight species of forest birds, some found only on Guam, have disappeared from the island. Three other bird species are listed as threatened or endangered and remain in small numbers in the wild. Brown tree snakes eat young Mariana fruit bats (*Pteropus mariannus mariannus*), which are also listed as endangered on Guam. Small mammals are rare in forests and scrub habitat to begin with. Two gecko species once common on Guam are now considered rare, though they flourish on snake-free Cocos Island nearby.

Indirectly, brown tree snakes may disrupt other aspects of Guam's island ecosystem. Some native trees and plants that depend on birds and fruit bats for seed dispersal and pollination may not reproduce. Insects and spiders, normally controlled by forest birds, have become more abundant.

### **Economic Effects**

Substantial economic losses are associated with brown tree snakes. Guam Power Authority reports millions of dollars in increased costs and lost revenue caused by brown-tree-snake power outages. Snakes climb on electrical transmission lines and short-circuit wires. After snake-induced power outages, electrical distribution equipment frequently needs replacement or repair. Thus, maintenance crew costs rise with overtime and night shifts, compensation must be paid to consumers for damages to electrical equipment, and the need for backup equipment increases. Island residents incur additional costs when food spoils during power outages and shops have to close.

The agricultural community also reports losses due to the brown tree snake. These snakes eat valuable pet birds, young chickens, and chicken eggs. Snakes will often kill prey too large to be eaten, including puppies, rabbits, and young goats. Medical expenses for treatment of bites by brown tree snakes are an additional cost. No human fatalities are known.

## What Is Being Done To Control Damage by the Brown Tree Snake?

Brown tree snakes occasionally stow away in cargo leaving Guam. Unless intercepted, the species may become established on other islands. Brown tree snakes have already been found in Hawaii, Saipan, Rota, the mainland United States, and many other locations. A small population may already exist on Saipan. The agencies in the next paragraph are working to minimize the probability that brown tree snakes from Guam will colonize other islands, to enhance native wildlife on Guam, and to reduce economic damage caused by the snake.

Wildlife Services (WS), a part of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS), conducts operations on Guam aimed at keeping brown tree snakes from reaching other destinations. Two methods WS uses are snake trapping and nighttime spotlight searches to reduce the number of snakes in areas where cargo is packed or stored. Specially trained Jack Russell terriers are employed to detect any brown tree snakes that may have hidden in outgoing cargo (fig. 3). Educational materials, such as videos, brochures, and dog demonstrations, are used to raise the awareness of outbound cargo handlers about snake-control issues.



**Figure 3**—Jack Russell terriers are used to sniff out snakes trying to hitch a ride off the island.

WS' National Wildlife Research Center (NWRC) is developing snake lures, toxicants, and irritants along with delivery systems for these products to improve brown tree snake control programs. The operational efficacy of searching cargo with Jack Russell terriers is also being evaluated by NWRC scientists.

The U.S. Geological Survey's Biological Resources Division researches the ecology and life history of brown tree snakes to identify means for reducing snake populations. This agency is developing and testing barriers that may be used to create snake-free areas to keep goods quarantined until departure from Guam and allow goods arriving from Guam to be quarantined on other islands. Snake barriers could also be used with captive breeding programs to reintroduce endangered species to Guam.

The Guam Division of Aquatic and Wildlife Resources, in cooperation with several zoos of the American Association of Zoological Parks and Aquariums, has established captive breeding programs for the endemic Guam rail (*Rallus owstoni*) (fig. 4), Micronesian kingfisher (*Halcyon cinnamomina cinnamomina*), and the Mariana crow (*Corvus kubaryi*). The remaining wild Mariana crows on Guam are monitored, and their nests are protected from brown tree snakes. Several



**Figure 4—** The brown tree snake has hunted the Guam rail almost to the point of extinction.

captive-bred Mariana crows have been released and are also being monitored. The control of brown tree snakes in certain areas of Guam may allow the release of other endangered species.

The U.S. Department of the Interior's U.S. Fish and Wildlife Service operates the Guam National Wildlife Refuge at Ritidian Point. A large portion of the refuge is covered with native limestone forest. This forest provides important habitat for endangered species affected by the snake, such as Mariana crows, Mariana fruit bats, and Mariana gray swiftlets (*Aerodramus vanikorensis bartschi*). The limestone forest of the refuge could provide future release sites for captive-bred endangered species.

Together, these government agencies are attempting to minimize the negative impacts of the brown tree snake on Guam's island ecosystem and prevent similar destruction in other areas. The full cooperation of Federal and territorial government agencies on Guam, military personnel, private corporations, civilians, and other Pacific island governments is necessary to address this important issue.

## **What Can I Do?**

Cargo, baggage, and materials shipped from or through Guam should be carefully inspected for brown tree snakes (fig. 5). Government agencies alone cannot prevent the brown tree snake from leaving Guam. The responsibility is shared by travelers, cargo handlers, and island residents alike. If you or your company moves or receives goods and materials from Guam, contact WS at (671) 635-4400 or fax (671) 635-4401 for more information on the inspection of cargo and household goods.

A few simple steps can help minimize snake-human encounters. Keep doors and screens secured, screen air ducts and pipes that open outdoors, and keep garbage and pet food in secured containers.

## **What If I Find a Snake?**

Do not panic. Brown tree snakes will readily strike when aroused but do not present a serious health risk to adults. Infants and young children, however, should receive immediate medical attention for brown tree snake bites or constriction.

A brown tree snake can easily be captured with the aid of common household items. Described in the following paragraphs are a few methods that can be used. Please note, however, that handling a brown tree snake increases your chances of being bitten.





**Figure 5**—Nobody wants an angry snake leaping out of a cargo box. Inspect all items leaving the island and prevent the escape of the brown tree snake.

A brown tree snake can be captured by pinning it down with a broom, golf club, or garden tool. If necessary, grab the snake directly behind the head. A blow to the snake's head with a heavy object or boot heel will be fatal.

Wrap some masking tape around a broom handle with the sticky side out. Pin the snake with the tape on the broom handle, and twirl the handle. The snake will stick to the tape and wrap up like a spaghetti noodle. A towel or other heavy fabric, such as a shirt or pair of pants, can be used to minimize the risk of snakebites during the broom-handle maneuver. Throw the towel on top of the snake. The fabric will slow the snake's escape, giving you additional time to catch it or get help. The fabric may offer some protection from snakebites when used to cover your hand while grabbing the snake directly behind the head.

A bucket can also be used. Place a bucket over the head of the snake and allow a small space for the snake's body to follow the head until the entire snake is underneath the bucket. Once the snake is completely under the bucket, press the bucket down and use a heavy object, such as book, to keep it in place. This method works only on a firm, flat surface.

In short, you can employ almost any available tool or material to catch a brown tree snake.

The brown tree snake is a serious pest. Although its presence should not affect your enjoyment of life on Guam, it is important to be aware of the issue. All household goods and cargo originating or stopping over on Guam are susceptible to snake invasions. Please be responsible and ensure that your cargo is snake free.

You can learn more about the brown tree snake from the WS home page on the World Wide Web. Point your Web browser to <http://www.aphis.usda.gov/ws> and click on "Special Projects."