Giant African snail (*Achatina fulica*)
Ecological Screening Summary

U.S. Fish and Wildlife Service, June 2015

Photo: R Eaglin, USDA-APHIS.

1 Native Range, and Status in the United States

Native Range
From Thiengo et al. (2007):

"Native to East Africa."

Status in the United States
From Skelley (2010):

"This species is established in the United States."

"In 1966, three Giant African Snails (GAS) were smuggled into South Florida by travelers following a trip to Hawaii. In 1969, infestation discovered by agricultural officials initiated eradication programs. GAS were declared eradicated in 1973, with more than 18,000 snails collected at an equivalent 2012 cost of $ 4 million."

"In 2009, federal agents learned of captive GAS, seizing all known colonies. In September 2011, GAS were found infesting residential areas of Miami, initiating an intense survey by State and

Federal agencies. As of Feb. 2012, GAS are known to inhabit 14 residential areas, infesting hundreds of properties with over 40,000 snails collected so far."

Means of Introductions to the United States

From USDA-APHIS (2011):

"Imported as pets and for educational purposes; may also arrive accidentally in cargo (Thiengo et al. 2007)."

Remarks:

From Venette and Larson (2004):

"The giant African snail, *Achatina fulica*, occurs in a large number of countries around the world, but all of the countries in which it is established have tropical climates with warm, mild year-round temperatures and high humidity."

"Raut and Barker (2002) suggest that *A. fulica* is tolerant of a wide variety of environmental conditions. Data presented by these authors were used in a subsequent analysis by Smith and Fowler (2003) who concluded that temperatures in the southern-border and Pacific coast states were likely to be suitable to the snail. Our analysis of the worldwide geographic distribution of *A. fulica* suggests that this snail is most closely associated with tropical and subtropical moist broadleaf forests; and tropical and subtropical dry broadleaf forest."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2010):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Lophozoa
Phylum Mollusca
Class Gastropoda Cuvier, 1797
Order Stylommatophora
Suborder Sigmurethra
Infraorder Holopodopes
Family Achatinidae
Genus Achatina
Species Achatina fulica (Ferussac, 1821)"

"Taxonomy: valid:"

"**Synonyms**: *Lissachatina fulica* (Bowdich) **Note**: *A. fulica* was recently redesignated Lissachatina fulica, largely on the basis of Mead's (1961) observations (Naggs, 2002)."

Size, Weight, Age

From GISD (2010):

"Generally average about 5 to 10 cm with adults potentially exceeding 20 cm in shell length."

"The average weight of the snail is approximately 32 grams (Cooling 2005)."

From EOL (2015):

"Height: around 7 centimeters. Length: can reach 20 centimeters or more."

Life Expectancy: "Captivity: 5-6 years. Wild: up to ten years."

Environment

From Capinera (2011):

"These snails are active over a temperature range of about 48-90°F (9-32°C), but can survive both lower and higher temperatures, sometimes by burrowing into the soil. Based on their distribution elsewhere, giant African snail is thought to have the potential to survive as far north as 40 degrees latitude, which might include areas such as New Jersey and Colorado."

From USDA-APHIS (2015):

"This snail is able to survive in many different environments. They require areas rich in calcium, thriving in locations with limestone, marl and places with concrete and cement."

From EOL (2015):

"*Achatina fulica* inhabits the lower altitudes: lowland plains and hilly country up to about 1000 m altitude, mostly in or near human settlements. It has not been found in truly "wild" conditions, and not in tropical rain forest or in the higher mountains." (van Benthem-Jutting, 1952)."

Climate/Range

From USDA-APHIS (2007):

- "Subtropical rainfall
- Minimum temperature of 34° C
- Available calcium and soil pH of 7.0-8.0."

From Stokes (2006):

"This species is found in temperate, tropical, and terrestrial habitats, having adapted to cooler climates."

Distribution Outside the United States

From USDA-APHIS (2007):

"A*chatina fulica* spread to several Caribbean Islands. It was found in Brazil in 1997, and has spread throughout most of that nation. Coltro (1997) and Paiva (2004) predict that it will spread to South and Central America. In the Pacific Ocean, *A. fulica* has continued to spread among the islands. It was found in Gordonville, Australia in 1977, and in Currumbin, Queensland in 2004. Both infestations were eradicated.

"*Achatina fulica* has also spread throughout Asia, to islands in the Pacific and Indian Oceans, and to the West Indies."

From EOL (2015):

"East Africa, Madagascar, Reunion, Mauritius, India, Ceylon, Malaya, Siam, S. China, S. Japan, Sumatra, Java, Borneo, Celebes, several Lesser Sunda Is., New Guinea, Philippines, Saipan, Tinian Is., New Britain, new Ireland, Palau Is., Okinawa" (van Benthem-Jutting, 1952)."

Means of Introduction Outside the United States

From CABI (2014):

"Most dispersal of *L. fulica* has occurred accidentally, with all developmental stages becoming attached to machinery (e.g., road construction, landscaping) unobserved. Through natural dispersal; agricultural practices with eggs and snails accidentally become attached to agricultural machinery and vehicles, and are readily transported in garden waste."

From EOL (2015):

"Two individuals of the Giant African Snail were brought to India from Mauritius by the pioneer of malacology in India, William Benson, in 1847. Benson left India soon after his return from Mauritius and handed the snails to a friend and neighbor in Chowringee, Kolkata, and it was the neighbor who subsequently released them in his garden. From these two individual snails the species spread throughout much of South Asia."

Short description

From GISD (2010):

"*Achatina fulica* has a narrow, conical shell, which is twice as long as it is wide and contains 7 to 9 whorls when fully grown. The shell is generally reddish-brown in color with weak yellowish vertical markings but coloration varies with environmental conditions and diet. A light coffee color is common."

Biology

From White-McLean (2011):

"Achatinids are generally nocturnal forest dwellers but have the potential to adapt to disturbed habitats. Concealed habitats are generally preferred; however, individuals may colonize more open habitats in the event of overcrowding. Achatinids often become more active during periods of high humidity (e.g., after rainfall); however, the occurrence of large numbers of individuals especially during daylight may indicate high population density."

Reproduction:

From CABI (2014):

"Lays up to 1,200 eggs a year, which hatch after about 8-21 days under tropical conditions, and are laid on the ground, often in the base of plants."

From EOL (2015):

"Is a hermaphroditic- each individual has both testes and ovaries and is capable of producing both sperms and ova. Self-fertilisation is rare, occurring only in small populations."

"Transferred sperm can be stored within the body for up to two years; therefore these snails can lay eggs over a period of several months after only one mating. A snail may lay 5-6 clutches per year, in damp places, showing a hatching viability of about 90%."

"It breeds rapidly, out-competes native species of snails and reaches large numbers in short periods due to their prolific breeding habits."

Human uses

From Stokes (2006):

"Fish farmers may also use giant African snails as a cheap source of bait to feed fish. These snails can also be used when making fertilizer, chicken feed, and biological compounds in laboratories."

From CABI (2014):

"In its native East Africa, *L. fulica* is a source of protein for some local people. Tillier et al. (1993) stated that although *L. fulica* is a vector of rat lungworm, which causes eosinophilic meningitis in humans, it is nevertheless suitable for human consumption if properly prepared and cooked, and has not been in contact with poisoned bait."

Diseases

From GISD (2010):

Disease Transmission:
"*A. fulica* distributes in its feces spores of *Phytophthora palmivora* in Ghana; *P. palmivora* is the cause of black pod disease of cacao (*Theobroma cacao*); the oomycete which also infects black pepper, coconut, papaya and vanilla (Raut & Barker 2002). *A. fulica* spreads *P. colocasiae* in taro and *P. parasitica* in aubergine (*Solanum melongena*) and tangerine (*Citrus reticulata*) (Mead 1961 1979a, Turner 1964 1967, Muniappan 1983, Schotman [et al.] 1989)."

From EOL (2015):

"Parasites of *Achatina fulica* include: 1. *Aelurostrongylus abstrusus*. 2. *Angiostrongylus cantonensis* - causes eosinophilic meningoencephalitis. 3. *Angiostrongylus costaricensis* - causes abdominal angiostrongyliasis. 4. *Schistosoma mansoni*- causes schistosomiasis, detected in faeces. 5. *Trichuris* spp. - detected in faeces. 6. *Hymenolepis* spp. - detected in faeces. 7. *Strongyloides* spp. - detected in faeces and in mucous secretion [India Biodiversity Portal, no date]."

Threats to humans

Agricultural/Commercial:
From White-McLean (2011):

"As one of the most damaging land snails in the world, *Lissachatina fulica* is known to eat at least 500 different types of plants, including peanuts, beans, peas, cucumbers, and melons. If fruits and vegetables are not available, the snails will eat a wide variety of ornamental plants, tree bark, and even paint and stucco on houses."

From Stokes (2006):

"The most significant time period for the Giant African Snail to cause destruction to a given area is when it is first established. Their ability to reproduce exponentially within their first 5 to 6 month of life offers little time to respond to such infestation."

"A wide variety of horticulture and medicinal plants are known to be attacked by this snail. Not only does this decrease the income for agricultural producers, but it also impacts their living conditions (often requiring relocation) and decreases food and medical resources for humans, animals and other species."

Human health
From GISD (2010):

"In many Asian, Pacific and American societies, *A. fulica* may play a role in the transmission of the metastrongylus causative agents of eosinophilic meningoencephalitis (A*ngiostrongulus cantonensis* and *A. costaricensis*)."

From Stockdale-Walden (2015):

"In the United States, *A. cantonensis* is established in Hawaii and in recent years has been reported in Alabama, California, Louisiana, and Florida, where it has been found in the reintroduced *Lissachatina fulica* (also known as *Achatina fulica*), the giant African snail that was once eradicated from the state."

3 Impacts of Introductions

From Cowie (2000):

Competition:
"By reaching such enormous numbers and invading native ecosystems, *Achatina fulica* poses a serious conservation problem. Not only may they eat native plants, modifying habitat, but they probably also out-compete native snails (e.g. Tillier 1992)."

"Introductions of putative biological control agents against *Achatina fulica* are extremely dangerous from the perspective of the conservation of native snail species. And in any case, there is no good evidence that they [biological control agents] can indeed control *A. fulica* populations."

Direct Ecosystem Changes:
"Direct costs to the natural environment may include (Raut & Barker 2002) herbivory; altered nutrient cycling associated with large volumes of plant material that pass through the achatinid gut; adverse effects on indigenous gastropods that may arise through competition."

"Indirect adverse effects on indigenous gastropods that may arise through control of the *L. fulica*: (e.g.: biological control with the rosy wolfsnail, *Euglandina rosea* or use of chemical pesticides applied against achatinids)"

From Cowie (2001):

Indirect Ecosystem Changes:
"Introduction of predatory snails, especially Euglandina rosea, in attempts to control Achatina fulica has been widely seen as disastrous (Civeyrel and Simberloff, 1996). Not only is there no convincing evidence that the control programs have been successful (above), but there is ample evidence that the predatory snails have had major impacts on native snail species, perhaps to the extent of causing the extinction of a large number of endemic species (Hadfield, 1986; Murray et al., 1988; Cowie, 1992). The most widely publicized impacts have been on the slow-reproducing endemic tree snails of the islands of the Pacific (Partulidae and Achatinellinae)."

Human nuisance:
From GISD (2010):

"*A. fulica* are also a general nuisance when found near human habitations and can be hazardous to drivers, causing cars to skid. Their decaying bodies release a bad odor and the calcium carbonate in their shells neutralizes acid soils, altering soil properties and the types of plants that can grow in the soil (Mead 1961)."

From Cowie (2000):

Agricultural:
"In tropical agriculture the cost of *A. fulica* is fourfold. First, there is the loss of crop yield caused by herbivory. Secondly, damage may be caused by the spread of disease through the transmission of plant pathogens. Thirdly, there is the cost associated with the control of the pest and, finally, there are the opportunities lost with enforced changes in agricultural practice such as limiting crops to be grown in a region to those resistant to snail infestation (Raut & Barker 2002). Irrespective of crop, the seedling or nursery stage is the most vulnerable stage. In more mature plants, the nature of the damage varies with the species, sometimes involving defoliation and in others involving damage to the stems, flowers or fruits (Raut & Barker 2002)."

Economic/Livelihoods:
"In the US state of Florida it has been estimated that *A. fulica* would have caused an annual loss of 11 million USD in 1969 if its population had not been controlled (USDA 1982)."

From GISD (2010):

Local Specific Impacts:
United States:
"Threat to endangered species: Threatened and endangered plants in the US are potential hosts for *A. fulica* (Venette & Larson 2004)."

Hawaii**:**

"Reduction in native biodiversity: Individuals of *Achatina fulica* were observed preying on veronicellid slugs at two sites on the island of Oahu, Hawaii. As such, the presence of *A. fulica* may pose a greater threat to terrestrial mollusc conservation than previously imagined."

4 Global Distribution

Figure 1. Known global distribution of *A. fulica* (GBIF 2015).

5 Distribution within the United States

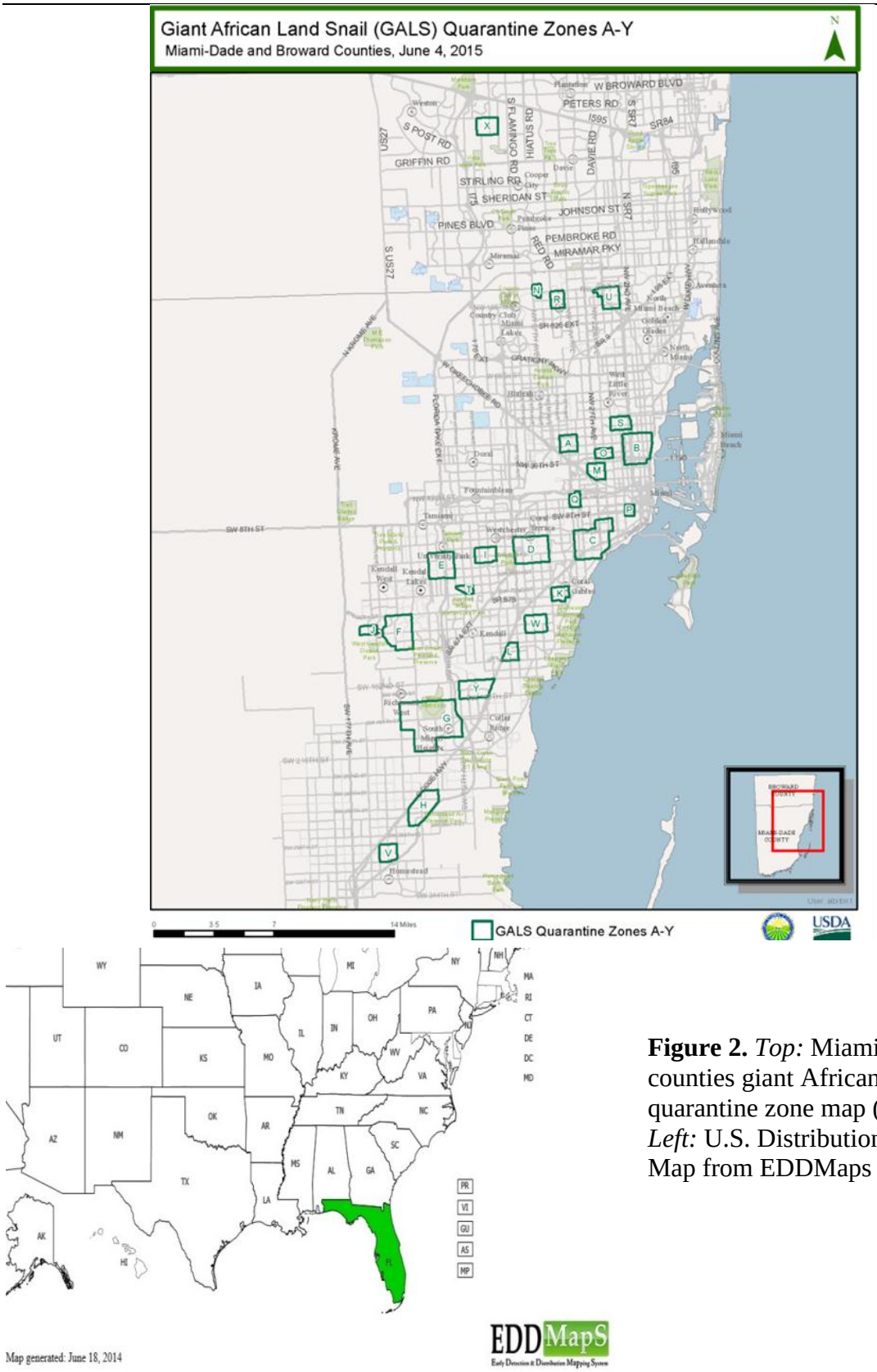

Figure 2. *Top:* Miami-Dade counties giant African land snail quarantine zone map (USDA 2015). *Left:* U.S. Distribution of *A. fulica.* Map from EDDMaps (2015).

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high for Florida. The climate match was low for the remainder of the continental U.S. Climate 6 proportion indicated that Florida has a high climate match and Texas has a medium climate match, but overall the climate match for the contiguous U.S. is medium. Climate matching shows a moderately high risk of expansion by *A. fulica* into the northwest and northeast regions of peninsular Florida as well as into the southern Coastal Plains region of Texas. The range for a medium climate match is 0.005 - 0.103; the climate match of *A. fulica* is 0.019.

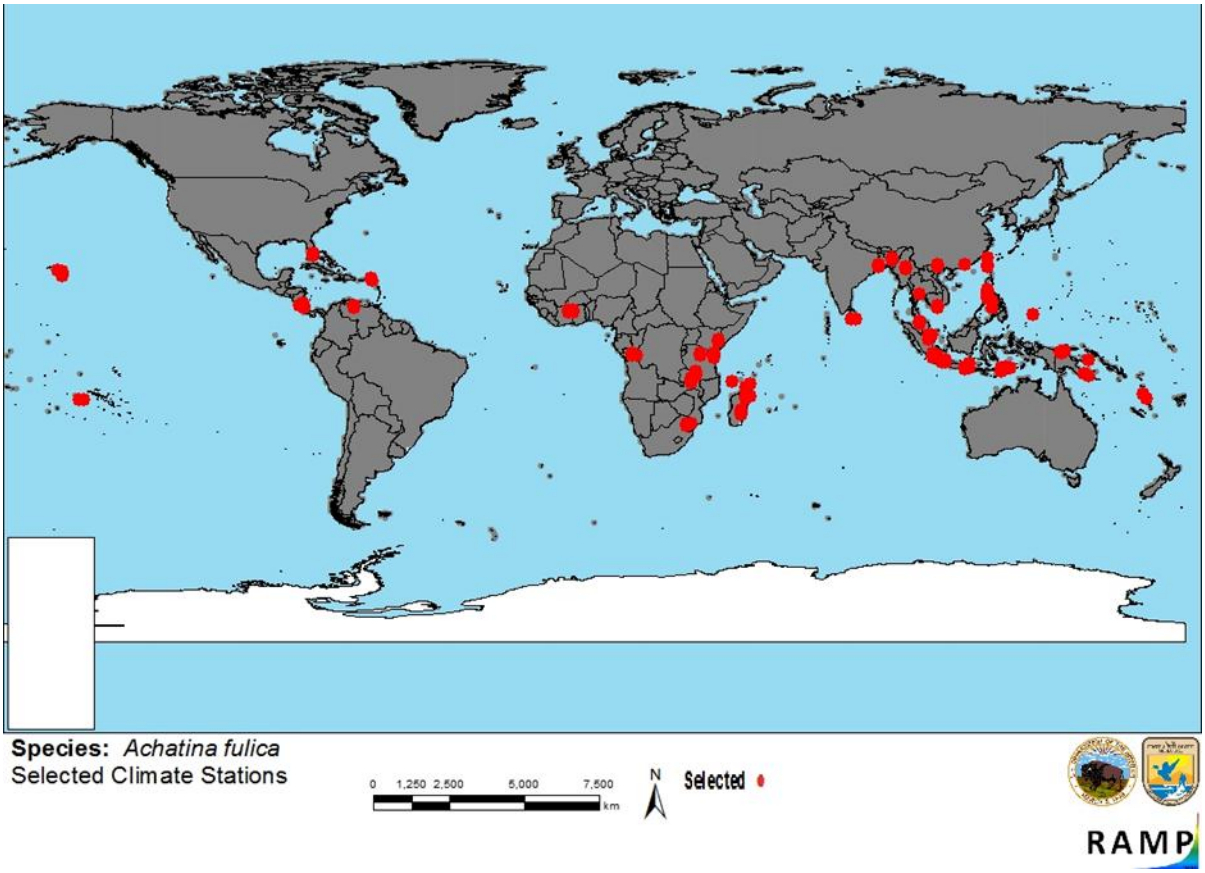

Figure 3. RAMP (Sanders et al 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *Achatina fulica* climate matching. Source locations from GBIF (2015).

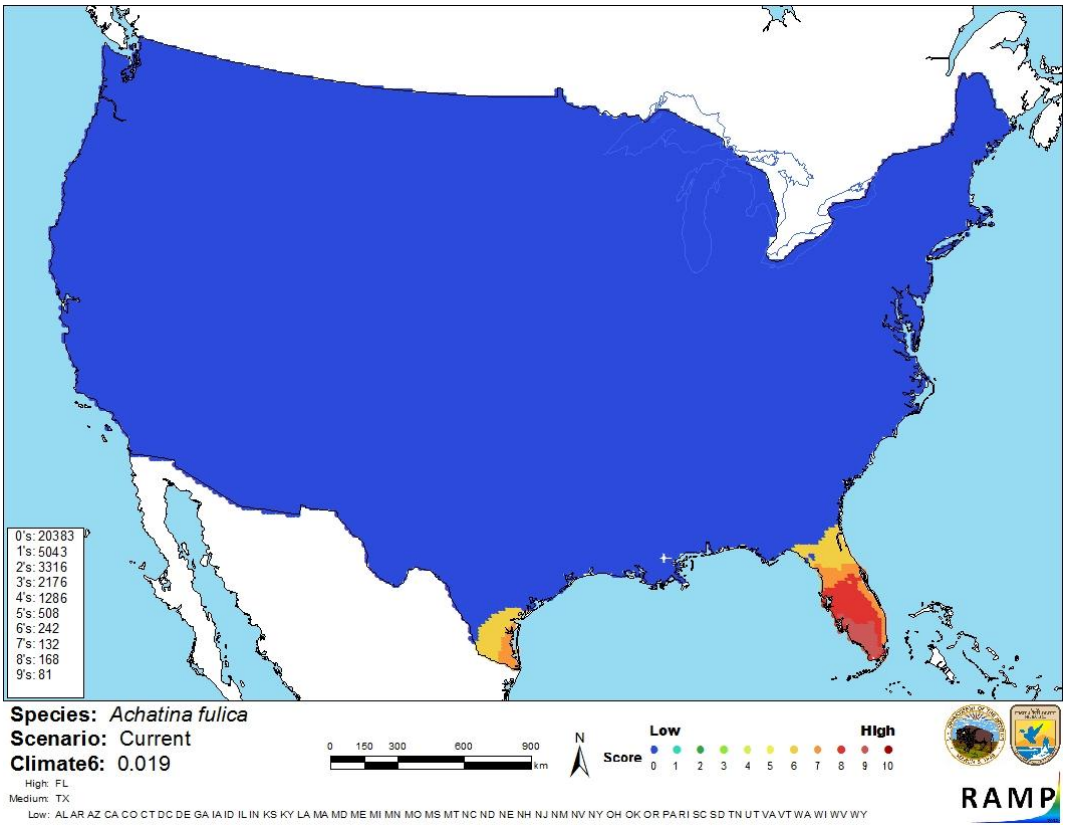

Figure 4. Map of RAMP (Sanders et al 2014) climate matches for *A. fulica* in the continental United States based on source locations reported by GBIF (2015).

7 Certainty of Assessment

Achatina fulica (*Lissachatina fulica*) is a studied species. Negative impacts from introductions of this species are adequately documented in the scientific literature. No further information is needed to evaluate the negative impacts the species is causing where introduced. Certainty of this assessment is high.

8 Risk Assessment

Summary of Risk to the Continental United States

Invasion, establishment, and impacts from the Giant African land snail are currently occurring in Florida, and eradication efforts are underway. Climate match profiles predict a significant expansion potential for this species into central and northern regions of peninsular Florida. South Texas is also at risk of establishment, based on climate match. Regions with similar habitat and climate environment are prime locations for this species to inhabit, especially when aided by human behavior in trade, accidental introductions, and potential industrial development as a food source. This species may also compete with native fauna, and can become a nuisance pest in urban areas. *Achatina fulica* is highly adaptive, capable of existing in diverse habitats, and is known as an extremely polyphagous herbivore with the potential to transmit several known human and agricultural pathogens. The climate match for the contiguous U.S. is medium. Overall, assessment for this species is high.

Assessment Elements

- **History of Invasiveness (Sec. 3):** High
- **Climate Match (Sec.6):** Medium
- **Certainty of Assessment (Sec. 7):** High
- **Important additional information:** Carries a parasite that causes meningitis in humans (CABI 2014).
- **Overall Risk Assessment Category: High**

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