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Field Release of *Lilioceris* cheni Gressit & Kimoto (Coleoptera: Chrysomelidae) for

Biological Control of Air Potato, *Dioscorea*bulbifera (Dioscoreaceae), in the Continental United States

Environmental Assessment, February, 2011

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Table of Contents

	Purpose and Need for the Proposed Action	. 1
	Alternatives	. 2
	Affected Environment	. 5
	Environmental Consequences	. 7
	Other Issues	14
	Agencies, Organizations, and Individuals Consulted	15
	References	17
Tab	le 1. Seven Categories of Plants Considered for the Test	9

Appendix A

Appendix B

Appendix D
Appendix E
Appendix F

I. Purpose and Need for the Proposed Action

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) Pest Permitting Branch (PPB) is proposing to issue permits for release of the insect *Lilioceris cheni* (Coleoptera: Chrysomelidae). The agent would be used by the applicant for biological control of air potato, *Dioscorea bulbifera* L. (Dioscoreaceae), in the continental United States. Before permits are issued for release of *L. cheni*, the APHIS–PPQ PPB needs to analyze the potential impacts of the release of this agent into the continental United States.

This environmental assessment (EA) has been prepared, consistent with USDA–APHIS' National Environmental Policy Act of 1969 (NEPA) implementing procedures (Title 7 of the Code of Federal Regulations (CFR), part 372). It examines the potential effects on the quality of the human environment that may be associated with the release of *L. cheni* to control infestations of air potato within the continental United States. This EA considers a "no action" alternative and the potential effects of the proposed action.

The applicant's purpose for releasing L. cheni is to reduce the severity of infestations of air potato (Dioscorea bulbifera) in the continental United States. Air potato is a twining vine 65 feet long or greater, capable of climbing and out-competing native vegetation (e.g., Schmitz et al., 1997; Langeland and Craddock Burks, 1998; Gordon et al., 1999). Air potato was introduced to Florida as an ornamental from tropical Asia or Africa in 1905 (Morton, 1976), and it now constitutes one of the most aggressive weeds ever introduced to Florida (Hammer, 1998). By the 1980s, this vine was found growing in thickets, waste areas, and hedges or fencerows in south and central Florida (Bell and Taylor, 1982). By 1999, air potato was listed in Florida as a noxious weed by the Florida Department of Agricultural and Consumer Services (FDACS) (FLEPPC, 2003). Air potato is considered the most serious type of environmental threat, described as a Category I weed by the Florida Exotic Pest Plant Council (FLEPPC) (FLEPPC, 2003), "invasive exotics that are altering native plant communities by displacing native species, changing community structure or ecological functions, or hybridizing with natives." Presently, air potato is well established in Florida and probably throughout the Gulf states (Raz, 2002) where it has the potential to severely disrupt entire ecosystems (Hammer, 1998).

¹ Regulations implementing the National Environmental Policy Act of 1969 (42 United States Code 4321 et seq.) provide that an environmental assessment "[shall include brief discussions of the need for the proposal, of alternatives as required by section 102(2)(E), of the environmental impacts of the proposed action and alternatives, and a listing of agencies and persons consulted" (40 CFR § 1508.9).

Existing air potato management options (discussed below) are ineffective, expensive, temporary, or have non-target impacts. For these reasons, the applicant has a need to identify an effective, host-specific biological control organism and release it into the environment for the control of air potato.

II. Alternatives

This section will explain the two alternatives available to the APHIS–PPQ PPB—no action (no issuance of permits) and issuance of permits for environmental release of *L. cheni*. Although APHIS' alternatives are limited to a decision of whether to issue permits for release of *L. cheni*, other methods available for control of air potato are also described. These control methods are not decisions to be made by APHIS, and are likely to continue whether or not permits are issued for environmental release of *L. cheni*. These are methods presently being used to control air potato by public and private concerns.

A third alternative was considered, but will not be analyzed further. Under this third alternative, the APHIS–PPQ PPB would have issued permits for the field release of *L. cheni*, however, the permits would contain special provisions or requirements concerning release procedures or mitigating measures, such as limited release of *L. cheni*. No issues have been raised which would indicate that special provisions or requirements are necessary.

A. No Action

Under the no action alternative, the APHIS-PPQ PPB would not issue permits for the field release of *L. cheni* for the control of air potato—the release of this biological control agent would not take place. The following methods are presently being used to control air potato; these methods will continue under the "no action" alternative and are likely to continue even if permits are issued for release of *L. cheni*. Presently, control of air potato populations is limited to chemical and mechanical control or a combination of these two methods.

1. Chemical Control

Chemical control of vines requires repeated basal (cut stem) or foliar applications of triclopyr ester, triclopyr amine, and glyphosate herbicides (e.g., RemedyTM, Garlon 3ATM, or RoundupTM) and these treatments need to be repeated over a two or three year period (Mullahey and Brown, 1999). Herbicidal control with RoundupTM and RodeoTM of heavily infested areas (e.g., Fern Forest, Broward County Florida) that included other invasive weeds cost \$1,750/hectare/year. In this example, complete control was not achieved as re-sprouting continued despite three herbicide treatments during nearly two years.

2. Mechanical Control

Manual removal of aboveground plants and bulbils (aerial tubers; small bulb or bulb-shaped growth arising from the leaf axil or in the place of flowers) has become a common activity employed by diverse volunteer groups (Duxbury et al., 2003). Manual removal of plants and bulbils was found to be as effective at controlling air potato as a combination of herbicide (e.g. RoundupTM) and hand pulling (Gordon et al., 1999).

B. Issue Permits for Environmental Release of *L. cheni*.

Under this alternative, the APHIS–PPQ PPB would issue permits upon request and after evaluation of each application for the field release of *L. cheni* for the control of air potato wherever it occurs in the continental United States. These permits would contain no special provisions or requirements concerning release procedures or mitigating measures.

a. Biological control organism information

1. Description

Insect Taxonomy

Order: Coleoptera
Family: Chrysomelidae
Subfamily: Criocerinae
Genus: Lilioceris Reitter

Species: *cheni*Common name none

Lilioceris spp. adult beetles are typically 1 cm long by 0.5 cm wide at the abdomen. The beetle is a shiny patent leather black color except for its tan/light orange or bright red wing covers. The shape of the beetle is elongate, with a rectangular shaped abdomen, a thorax narrow and about half as wide as the abdomen, and narrow heads with bulging eyes. The shape somewhat resembles a square violin with a short neck.

2. Taxonomic Information

Specimens of *L. cheni* were identified by Dr. Alex Konstantinov at the USDA, Agricultural Research Service, Systematic Entomology Laboratory (A. Konstantinov, pers. comm., June 7, 2010).

3. Life History

Overwintered adult females begin egg laying (oviposition) at the end of May and continue through mid June. The oviposition period averages around 49 days with 13 active (effective) days of oviposition per female. Beetles lay an average of approximately 1,223 per female, or about 90 eggs per female per active oviposition date. Mean egg hatch is nearly 80 percent. The mean incubation period for eggs is approximately four days.

Lilioceris eggs are entirely pale white when first laid. As the larvae inside develop, the eggs become more yellow, and later, the anterior end of the eggs becomes clear. Two days before hatching, two distinct patches of light maroon spots are visible that become the eyes of the larva.

The larvae are brown, soft bodied, and somewhat slug-like, except for the six legs and head capsule. They are yellow in the first two instars (larval developmental stages), but become dark grey before pupation. *Lilioceris* larvae feed together in a group (gregariously) and skeletonize the leaves while moving across the undersides of the leaves, exuding frass (insect feces) onto their backs, producing a fecal shield. This fecal shield can deter predators, but can also attract parasites, (Schaffner and Müller, 2001). The larvae prefer tender, newly-emerged air potato leaves, but can also eat older toughened leaves. Early instar larvae can consume air potato bulbils if there is an initial tear through its surface, but more mature larvae can eat intact bulbils without difficulty. The average larval development period is approximately eight days (Pemberton, 2009).

When *Lilioceris* larvae finish feeding in their fourth instar, they move from the vines and enter the soil. The larvae secrete a white substance from their mouths and form a cocoon in which they pupate. The substance hardens to a Styrofoam-like substance. Pupation in the soil is done gregariously, often in clumps of six to eight individuals joined by the white StyrofoamTM-like substance. The pupal stage lasts approximately 16 days.

4. Native Range

Lilioceris cheni has been reported from China, India, Laos, and Nepal. Pemberton (2009) found *L. cheni* in the subtropical Katmandu Valley of Nepal at approximately 27 degrees North, and in the Chiang Mai area of northern Thailand and in subtropical Xishuanbanna in southern Yunnan Province of China at about 22 degrees North (Pemberton, 2009).

5. Potential North American Range

Lilioceris cheni is known only from subtropical and tropical areas of Asia. During the cool dry winter season its host plant, air potato, loses its leaves and the adult beetles seek shelter beneath debris on the ground. In the Katmandu Valley (4000 feet and approximately 28 degrees N) the source of the studied beetles, there are periodic frosts. This sheltering behavior of the beetles allows them to survive these conditions to successfully over winter. This may also allow the beetles to survive in northern Florida and the Gulf Coast states where air potato currently grows. Because these beetles are host specific to air potato, they will be limited to the current and potential geographic range of this plant in North America, which is Florida, the Gulf Coast areas and the adjacent interior areas.

6. Impact on Air Potato

Both the adults and larvae of L. cheni consume the leaves and aerial

bulbils of air potato. The larvae feed gregariously and quickly skeletonize leaves. The amount of leaf consumption by this beetle is very large. During the development of a single larva, it consumes approximately 11 square feet of leaf tissue, and the adults, which can live three months or more, can eat another 20 square feet of leaf. Thus, a single individual beetle can consume approximately 30 square feet of leaf tissue (Pemberton, 2009). In laboratory studies, potted plants defoliated by *L. cheni* re-grew slowly. The ability of the beetle larvae and adults to feed on the bulbils is also important because in the United States the weed rarely flowers or produces fruit, so the aerial tubers are the primary means of air potato persistence and spread. In laboratory studies, even minimal bulbil feeding on the shoot area by *L. cheni* greatly decreased the bulbil's ability to sprout, reducing the plant's reproductive capacity.

III. Affected Environment

Air potato is an herbaceous, perennial, twining vine 65 feet long or greater, capable of climbing and out-competing native vegetation (e.g., Schmitz et al., 1997; Langeland and Craddock Burks, 1998; Gordon et al., 1999). Air potato was introduced to Florida as an ornamental from tropical Asia or Africa in 1905 (Morton, 1976), and it now constitutes one of the most aggressive weeds ever introduced to Florida (Hammer, 1998). By the 1980s, this vine was found growing in thickets, waste areas, and hedges or fencerows in south and central Florida (Bell and Taylor, 1982).

A. Areas Affected by Air Potato

1. Native and Worldwide Distribution

Air potato is native to and widely distributed in tropical and subtropical Asia and Africa (Burkill, 1960; Coursey, 1967; Tindall, 1993). In the Western Hemisphere, it is widely naturalized in the tropics and subtropics of the West Indies, Central, and South America (McVaugh, 1989; Schultz, 1993). Air potato is naturalized in central and southern Mexico (Colima, Mexico, Puebla, Veracruz, San Luis Potosi, Oaxaca, and Chiapas states), and the West Indies (USDA, SCS, 1982; Nesom and Brown, 1998; USDA, NRCS, 2002). It is reported to be established in Central America and northern South America (Tellez and Schubert, 1994; Bennett and Prance, 2000).

2. Present
Distribution in the United
States

Since its introduction to Florida, air potato has aggressively spread throughout the state. From the northwestern panhandle, Escambia County, to the southern tip of the state, collections from herbaria and reports from biologists have listed 29 of 67 Florida counties infested with air potato (Schmitz, 1994; Gann et al., 2001; Wunderlin and Hansen, 2003). This species has also been reported to be naturalized in Mississippi, Louisiana, Texas, and Hawaii (Nesom and Brown, 1998; USDA, SCS, 1982).

Based on the known range of air potato in North America, the plant can survive in areas with an average annual minimum temperature range of -12.2 to -9.5 C (10 to 15°F). Climatic data (minimum January temperature and annual rainfall) from locations where air potato is known to occur in Florida have been extrapolated outside of Florida to estimate its potential distribution in the United States (Pemberton, 2009). These data suggest that air potato may be able to spread throughout much of the Gulf coast and along the Atlantic coast as far north as Charleston, South Carolina (Pemberton, 2009).

3. Habitat

In Florida, air potato is frequently found in tropical and subtropical hammocks. A hammock is a dense stand of trees that grows on natural rises that are only a few inches higher than surrounding marshland. Air potato may also invade disturbed uplands, scrub, sinkholes, alluvial flood plain forests, and urban lots (Schultz, 1993; Gann et al., 2001), pinelands (Langeland and Craddock-Burks, 1998), and hedges or fencerows (Bell and Taylor, 1982). Evidence also suggests that air potato aggressively exploits disturbed sites, such as forest canopies damaged by hurricanes, and it impedes the reestablishment of native species (Horvitz et al., 1998; Gordon et al., 1999).

B. Plants Related to Air Potato and Their Distribution

1. Taxonomically Related Plants

Information regarding plants taxonomically related to air potato (*Dioscorea bulbifera*) is included because native plant species which are closely related to air potato have the most potential to be attacked by *L. cheni*.

The Dioscoreaceae (the plant family to which air potato belongs) includes either four (Caddick et al., 2002) or seven genera (Al-Shehbaz and Schubert, 1989; Raz 2002). The largest genus in the family, Dioscorea, contains approximately 600 species (Raz, 2002) (850 species according to Al-Shehbaz and Schubert, 1989), most of which grow in the subtropics or tropics, with only a few species growing in the warmer temperate regions (Al-Shehbaz and Schubert, 1989; Raz, 2002). The Dioscorea genus is grouped into subgeneric sections. The two native North American (north of Mexico) species, D. floridana Barlett (Florida yam) and D. villosa L. (wild yam), are assigned to the section *Macropoda* (Knuth, 1924; Raz, 2002). Traditionally air potato (D. bulbifera) has been placed in section Opsophyton (Knuth, 1924; Huber, 1998). Rajania, an endemic genus in the West Indies (Raz, 2002), is the only other genus of the Dioscoreaceae in North America. Although this genus is being revised (L. Raz, unpubl. data), the center of origin appears to be Cuba with 19 species distributed throughout the West Indies (Knuth, 1924; Raz, 2002).

In the Western Hemisphere, approximately 130 *Dioscorea* species occur in Brazil and 120 in Central America and Mexico (Al-Shehbaz and

Schubert, 1989). The most comprehensive treatment of the Mexican *Dioscorea* included 63 species (Matuda, 1953). Six *Dioscorea* species occur in the southeastern United States (Al-Shehbaz and Schubert, 1989; Raz, 2002) and, of these, four are naturalized from Asia and two are native (*D. floridana* and *D. villosa*) (Raz, 2002). There are nine native *Dioscorea* spp. and 19 species of the genus *Rajania* from the West Indies (Knuth, 1924; Raz, 2002; L. Raz, unpubl. data) with their greatest diversity in Cuba (Leon and Alain, 1974; L. Raz, unpubl. data).

The closest *Dioscorea* species that occur in the northern extent of this range are south of the Texas border in the states of Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas, Mexico. *Dioscorea* species that occur in these states that are hosts of biological control agents could potentially provide a bridge between *D. bulbifera* populations in Texas to more southern *Dioscorea* species in the state of Veracruz, Mexico, and southward. The only *Dioscorea* species known from this northern 'bridging area' are *D. convolvulacea* (Barrera, 1990), *D. militaris*, and *D. remotiflora* (McVaugh, 1989) and these are only reported from the state of Tamaulipas, south of the Texas border. In Texas, *D. bulbifera* is not known to be widespread (B.L. Turner and T. Wendt, University of Texas; and M.D. Reed, TAMU herbarium, Texas A&M University, personal. comm.). However, a few scattered specimens have been collected from wild plant populations (USDA, NRCS, 2002) in the eastern part of the state (Nesom and Brown, 1998).

IV. Environmental Consequences

A. No Action

1. Impact of Air Potato on the Environment

a. Effects of air potato on native plants and animals

Air potato often dominates habitats that it invades, displacing native plants and the animals that depend on them. Air potato vines blanket native vegetation so completely that they may be injured or killed by shading (Langeland and Craddock Burks, 1998). Sometimes, air potato completely covers other vegetation so it is not possible to see other plants beneath it. Air potato is one of the more common natural area weeds in central and southern Florida. In southern Florida, the weed occurs in 15.2 percent of 315 of the conservation areas and 25 percent of 48 of the habitats surveyed (Gann et al., 2001). Air potato has a long-term impact on the community structure by invading and dominating sites following hurricane disturbance (Gordon et al., 1999).

Air potato is a Category I Florida Exotic Pest Plant Council plant. Invasive plants are assigned the Category I rating when they are understood to alter native plant communities by displacing native species, changing community structure or ecological functions.

b. Beneficial uses of air potato

Air potato was originally introduced into the United States as an ornamental and perhaps to a limited degree as a food plant by immigrants from the West Indies, where it is occasionally cultivated (Coursey, 1967). *Dioscorea alata* is the more popular yam used as an ethnic West Indian food plant, but home cultivation of this species in Florida is uncommon. No purposeful known cultivation of air potato in Florida is known and no commercial cultivation of other *Dioscorea* species is known in Florida. The attractive leaves and rapid lush growth promoted the introduction of the plant and the early use of it in Florida as an ornamental. Purposeful cultivation of the plant as an ornamental occurred to some degree for approximately 40 years (Long and Lakela, 1971), and may still occur occasionally, but ornamental cultivation is problematic because it could result in new infestations of the weed.

2. Impact from the Use of Other Control Methods

The continued use of chemical herbicides and mechanical controls at current levels would result if the "no action" alternative is chosen, and may continue even if permits are issued for environmental release of *L. cheni.*

a. Chemical Control

Chemical control of air potato is expensive (\$1,750/hectare/year) and requires multiple years of treatment to be effective. The herbicidal control has additional costs as non-target species, such as natives, may be injured due to the non-selective nature of these products.

b. Mechanical Control

Mechanical control can be effective in controlling air potato in accessible locations, but is expensive, labor-intensive, and results are short term. Plants that are located in natural areas, such as hammocks, may be difficult or impossible to access.

These environmental consequences may occur even with the implementation of the biological control alternative, depending on the efficacy of *L. cheni* to reduce air potato infestations in the continental United States.

B. Issue Permits for Environmental Release of *L. cheni*

1. Impact of L. cheni on Non-target Plants

Host Specificity Testing

Host range determination of *L. cheni* was based on plant species in seven categories listed in table 1 (Pemberton, 2009).

Table 1. Seven Categories of Plants Considered for the Test Plant List. These plants were used for host specificity tests using *L. cheni* and were conducted in quarantine facilities.

Category 1—Genetic Type of the Target Weed Species (Air Potato).								
Genus and Species	Common Name	Status						
Dioscorea bulbifera	air potato	Native Asia & Africa; Cultivated West Indies; Introd. MS, LA						
		TX, HI, and FL						

		IA, III, allu FL							
Category 2—Species in the Same Genus (<i>Dioscorea</i>) as Air Potato.									
Genus and Species	Common Name	Status							
Dioscorea floridana	Florida yam	Native FL, GA and SC							
Dioscorea villosa	Wild yam	Native FL north to							
		Ontario, Canada and							
		MN, west to TX.							
Dioscorea altissima	dunguey	PR; exotic-native to							
		Brazil							
Rajania cordata (Dioscorea) cordata	himber	Cuba; Jamaica;							
		Puerto Rico							
Dioscorea pilosiuscula	bulbous yam	Hispaniola; Puerto							
		Rico; VI; Jamaica							
Dioscorea polygonoides	mata gallina	Hispaniola; Puerto							
		Rico; Cuba; Jamaica							
Dioscorea trifida	cush cush yam	West Indies; S.							
		American, cultivated							
Dioscorea alata	white yam	Native Africa Eastern							
		US, PR, VI, Invasive in							
		FL							
Dioscorea cayenensis	chinese yam	Introduced FL north to							
		VT							
Dioscorea polystachya	yellow guinea yam	Cultivated West							
		Indies; African							
Dioscorea polystachya	cultivated Chinese	Eastern US weed;							
	yam	Cultivation limited;							
		Indochina							
Dioscorea rotundata	guinea yam	Cultivated West							
		Indies; African							
Dioscorea sansibarensis	Zanzibar yam	Native East Africa							
		Eradicated from FL							
Disocorea trifida	cush cush yam	West Indies; S.							
		American, cultivated							

Category 3—Species in Other Genera but in the Same Family. (Dioscoreaceae) as Air Potato.

Genus and Species	Common Name	Status
Tacca integrifolia	bat flower	Native Indochina,
		Malaysia;
		Ornamental in FL

Category 4—Threatened and Endangered Species in the Same Family as Air Potato.

There are no federally listed threatened or endangered species in the plant family Dioscoreaceae.

Category 5—Species in the Same Order (Liliales) as Air Potato.

Family, Genus, and Species	Common name	Status
Liliaceaceae; Lilium sp .	lily	Ornamental non- native, native species occur in FL
Liliaceaceae; Zephyranthes grandiflora .	rosepink zephyr lily	Rare; Native FL & Mexico
Nartheciaceae; Aletris farinosa	white colicroot	Native Central N America & E. Canada
Smilacaceae; Smilax laurifolia	laurel greenbrier	Native Central N. America, Bahamas & Cuba

Category 6—Plant Species in Orders Other than Air Potato.

Order	Family	Species	Common Nam	ne Status
	Acrecaceae	Arecales	cabbage palm	Native SE US, Bahamas & Cuba
Alismatales	Alismataceae	Sagittaria latifolia	broadleaf arrowhead	Native N. America
Asparagales	Amaryllidaceae	Crinum americanum	Seven sisters	Native SE US; Invasive PR
Asparagales	Iridaceae	Iris virginica	Virginia iris	Native E. N. America; widely cultivated
Commelinales	Commelinaceae	Tradescantia ohiensis	Ohio spiderwort	Native NE USA
Commelinales	Pontederiaceae	Pontederia cordata	pickerelweed	Native NE USA
Fabales	Fabaceae	Cassia (Senna) ligustrina	privet wild sensitive plant	Native Africa & Asia; Inroduced Neotorpics: VI
Pandanales	Pandanaceae	Pandanus spiralis	screw pine	Native Australia
Poales	Cyperaceae	Cladium jamaicense	Jamaica swamp sawgrass	Native Australia; Southern N. America; HI & PR
Poales	Juncaceae	Juncus effusus	soft rush	Cosmopolitan in temperate wetlands

Order	Family	Species	Common Name	Status
				worldwide
Poales	Poaceae	Saccharum officinarum	sugarcane	Native Asia; Cultivated FL to TX
Lamiales	Verbenaceae	Callicarpa americana	American beauty berry	FL, SE US
Zingerbales	Cannaceae	Canna flaccida	bandana of the Everglades	Native Neotropics: Widely cultivated
Zingerbales	Cannaceae	Canna indica	indian shot	Native to tropics; exotic
Zingerbales	Coastaceae	Costus woodsonii	red button ginger	Native Asia & PR; cultivated widely in tropics
Zingerbales	Heliconiaceae	Heliconia caribaea	lobsterclaw	Native Caribbean; cultivated exotic
Haloragales	Marantaceae	Thalia geniculata	alligatorflag	Native Africa, N and S Americas; Invasive FL
Zingerbales	Zingerberaceae	Hedychium coronarium	butterfly ginger	Native Asia; exotic FL, GA, LA, HI & PR
Zingerbales	Musaceae	Musa acuminata	edible banana	Native Asia & Africa; cultivated widely in tropics

Category 7—Any Species on which *L. cheni* or its Close Relatives are Found.

Plant Order, Family, Genus, and Species	L. cheni or Relatives	Status
Dioscoreales, Dioscoraceae, Dioscorea alata	L. cheni	Native to Africa. Introduced into GA, LA, PR, Virgin Islands. Invasive in FL
Urticales; Moraceae, Ficus elastica	L. cheni	Native to Asia; Introduced into FL & PR; widely cultivated
Fabales; Fabaceae, Cassia (Senna) ligustrina*	L. cheni	Native to Africa & Asia; Introduced into Neotropics; Virgin Islands
Lamiales; Verbenaceae; Callicarpa americana*	L. cheni	Native to the SE USA and Caribbean
Asparagales; Asparagaceae; Asparagus officinalis	Crioceris sp.	Native N Africa Europe & Asia; Widely cultivated
Asparagales; Asparagaceae; Asparagus sprengeri	Criocerus sp.	Native S. Africa; Introduced into Australia, New Zealand, West Indies, FL, CA, & HI

^{*}Target agent found on Cassia sophera and Callicarpa macrophylla

(1) Feeding and Survival Testing

In no-choice testing slight feeding occurred on three *Dioscorea* species besides air potato (appendix B). In all choice tests, adult feeding occurred only on air potato (appendix C and D).

In tests where *L. cheni* eggs were transferred directly to *Dioscorea* species test plants (air potato, *Dioscorea altissima*, *Dioscorea floridana*, *Dioscorea polystachya*, and *Dioscorea villosa*), 100 percent of larvae successfully hatched from the transferred eggs. First instar larvae died on all test plants without feeding except for air potato. Larvae hatched from eggs transferred onto air potato leaves fed immediately and began to grow (appendix E).

(2) Oviposition Testing

Three *Dioscorea* species (air potato and two native species) were used in oviposition studies (Pemberton, 2009). The native *Dioscorea* plants were used because they are the most closely related to air potato in Florida and thus would be considered at highest risk for attack by *L. cheni*. In testing, egg masses were laid on the two test species, *Dioscorea villosa*, and *Dioscorea floridana*, and the control, air potato (*D. bulbifera*). Oviposition was consistently lower on test plants than on air potato. In these studies, neither larval feeding nor adult feeding was documented on either test plant but occurred on air potato (appendix F).

(3) Discussion

In host specificity testing conducted in the laboratory, this tropical/subtropical beetle, *L. cheni*, was found to be host specific to the target weed *Dioscorea bulbifera* (Pemberton, 2009). Although *L. cheni* laid eggs on other *Dioscorea* plant species tested, no larvae were able to develop to the adult stage except on air potato. Very small amounts of test feeding by adult *L. cheni* were observed on the two North American and Florida native yams (*D. floridana* and *D. villosa*), and a naturalized weed (*D. polystachya*), and a Brazilian species naturalized in Puerto Rico (*D. altissima*), but larvae were unable to feed on the leaves of any of these *Dioscorea* species. In addition, there was no feeding or development by *L. cheni* on any cultivated *Dioscorea* species or plant representatives of monocot orders tested.

2. Uncertainties Regarding the Environmental Release of *L*.

Once a biological control agent, such as *L. cheni*, is released into the environment and becomes established, there is a slight possibility that it could move from the target plant (air potato) to attack non-target plants, such as the native plants *D. villosa* or *D. floridana*. Host shifts by

introduced weed biological control agents to unrelated plants are rare (Pemberton, 2000). Native species closely related to the target species are the most likely to be attacked (Louda et al., 2003). If other plant species were to be attacked by *L. cheni*, the resulting effects could be environmental impacts that may not be easily reversed. Biological control organisms such as *L. cheni* generally spread without intervention by man. In principle, therefore, release of this biological control agent at even one site must be considered equivalent to release over the entire area in which potential hosts occur, and in which the climate is suitable for reproduction and survival.

In addition, these agents may not be successful in reducing air potato populations in the continental United States. Worldwide, biological weed control programs have had an overall success rate of 33 percent; success rates have been considerably higher for programs in individual countries (Culliney, 2005). Actual impacts on air potato by *L. cheni* will not be known until after release occurs and post-release monitoring has been conducted.

3. Cumulative Impacts

"Cumulative impacts are defined as the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agencies or person undertakes such other actions" (40 CFR 1508.7).

A variety of Federal, State, County, City, and private organizations work to control air potato.

Archbold Biological Station in Lake Placid, Florida uses a combination of methods to control air potato, including hand collecting of bulbils during the late fall, winter, and spring months, manually removing vines from April through June before fruits are produced, and application of an herbicide during the growing season.

The Nature Conservancy coordinates with state agencies, invasive pest plant councils and local groups to halt the further spread of air potato by educating people about this plant's harmful effects, and works on their own lands as well as coordinating with other private and public land managers to control air potato on wild lands.

Palm Beach County has an ordinance that requires all properties within the County to remove air potato. In February 2003, the County created the Invasive Vine Strike Force Program in order to assist property owners with the treatment and removal of these vines. This program provides free treatment of the two vines for properties with infestations of approximately two-acres or less. If necessary, the County will perform one re-treatment within six months of the initial treatment after which the property owner is required by County ordinance to keep their property free

and clear of air potato.

The City of Gainesville Nature Operations Division organizes the annual Great Air Potato Round Up to keep the air potato reasonably under control for another year. Volunteers head out to some of the city's most infested areas to collect bulbils and destroy them.

Release of *L. cheni* is not expected to have any negative cumulative impacts in the continental United States because of its host specificity to air potato. Effective biological control of air potato will have beneficial effects for weed management programs, and may result in a long-term, non-damaging method to assist in the control of air potato, and prevent its spread into other areas potentially at risk from invasion.

4. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) and ESA's implementing regulations require Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of critical habitat.

APHIS has determined that, based on the host specificity of *L. cheni*, there will be no effect on any listed plant or designated critical habitat in the continental United States. In host specificity testing, the biological control organism survived only on air potato. No federally listed threatened or endangered plants belong to the family Dioscoreaceae (USFWS, TESS, 2010). In addition, no federally listed threatened or endangered species are known to depend on or use air potato.

V. Other Issues

Consistent with Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," APHIS considered the potential for disproportionately high and adverse human health or environmental effects on any minority populations and low-income populations. There are no adverse environmental or human health effects from the field release of *L. cheni* and their release will not have disproportionate adverse effects to any minority or low-income populations.

Consistent with EO 13045, "Protection of Children From Environmental Health Risks and Safety Risks," APHIS considered the potential for disproportionately high and adverse environmental health and safety risks to children. No circumstances that would trigger the need for special environmental reviews are involved in implementing the preferred alternative. Therefore, it is expected that no disproportionate effects on children are anticipated as a consequence of the field release of *L. cheni*.

EO 13175, "Consultation and Coordination with Indian Tribal Governments," was issued to ensure that there would be "meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications...." In July 2010, APHIS sent out letters to potentially affected tribal leaders and organizations to give notification of the proposed environmental release of *L. cheni* and to request input from tribes. APHIS will continue to consult and collaborate with Indian tribal officials to ensure that they are well-informed and represented in policy and program decisions that may impact their agricultural interests, in accordance with EO 13175.

VI. Agencies, Organizations, and Individuals Consulted

The Technical Advisory Group for the Biological Control Agents of Weeds (TAG) recommended the release of *L. cheni* on August 21, 2009. TAG members that reviewed the release petition (Pemberton, 2009) included representatives from USDA-Cooperative State Research, Education, and Extension Service, USDA-Animal and Plant Health Inspection Service, USDA-Agricultural Research Service, Environmental Protection Agency, California Department of Food and Agriculture, Oregon Department of Agriculture, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, U.S. Forest Service, and Agriculture and Agri-Food Canada, Health Canada.

This EA was prepared and reviewed by APHIS. The addresses of participating APHIS units, cooperators, and consultants (as applicable) follow.

U.S. Department of Agriculture Animal and Plant Health Inspection Service Policy and Program Development Environmental and Risk Analysis Services 4700 River Road, Unit 149 Riverdale, MD 20737

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Registrations, Identification, Permits, and Plant Safeguarding
4700 River Road, Unit 133
Riverdale, MD 20737

U.S. Department of Agriculture Agricultural Research Service Invasive Plants Research Lab 3205 College Avenue Fort Lauderdale, FL 33314

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Appendix A. Results of Adult Feeding Tests

In these tests, besides air potato, only some minor feeding occurred on some non-target. *Dioscorea* species. Additional tests were conducted only on plants with feeding in adult feeding tests with cut material; NA indicates plants without adult feeding and therefore received no further testing. Florida natives in bold.

		Cut Material				Whole p	lants		
Order; Family; (Section)	Genus species	Adult	Larval	Develo	pment	Adult Larval		Development	
		Feed	Feed	Pupa	Adult	Feed	Feed	Pupa	Adult
Alismatales; Alismataceae	Sagittaria latifolia	no	NA	NA	NA	NA	NA	NA	NA
Arecales; Acrecaceae	Sabal palmetto	no	NA	NA	NA	NA	NA	NA	NA
Asparagales; Amarillidaceae	Crinum americanum	no	NA	NA	NA	NA	NA	NA	NA
Asparagales; Iridaceae	Iris virginica	no	NA	NA	NA	NA	NA	NA	NA
Commelinales; Commelinaceae	Tradescantia ohiensis	no	NA	NA	NA	NA	NA	NA	NA
Commelinales; Pondeteriaceae	Pontederia cordata	no	NA	NA	NA	NA	NA	NA	NA
Dioscoreaceae Dioscoreaceae	Tacca integrifolia	no	NA	NA	NA	NA	NA	NA	NA
Dioscoreales; Dioscoreaceae - (Chondrocarpa)	Dioscorea altissima	min	no	no	no	NA	NA	NA	NA
Dioscoreaceae - (Dematostemon)	Dioscorea polygonoides	no	NA	NA	NA	NA	NA	NA	NA
Dioscoreales; Dioscoreaceae - (Enantiphyllum)	Dioscorea alata	no	NA	NA	NA	NA	NA	NA	NA
Dioscoreales; Dioscoreaceae - (Enantiphyllum)	Dioscorea cayenensis	no	NA	NA	NA	NA	NA	NA	NA
Dioscoreales; Dioscoreaceae - (Enantiphyllum)	Dioscorea polystachya	no	NA	NA	NA	NA	NA	NA	NA
Dioscoreales; Dioscoreaceae - (Enantiphyllum)	Dioscorea polystachya (batatas)	min	no	no	no	NA	NA	NA	NA
Dioscoreales; Dioscoreaceae - (Enantiphyllum)	Dioscorea rotundata	no	NA	NA	NA	NA	NA	NA	NA

| Dioscoreales;
Dioscoreaceae -
(Lynchonostemon) | Dioscorea
pilosiuscula | no | NA |
|--|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Dioscoreales;
Dioscoreaceae -
(Macrogynodium) | Disocorea
trifida | no | NA |
| Dioscoreales;
Dioscoreaceae -
(Macropoda) | Dioscorea
floridana | min | no |
| Dioscoreales;
Dioscoreaceae -
(Macropoda) | Dioscorea
villosa | min | no |
| Dioscoreales;
Dioscoreaceae -
(Opsophyton) | Dioscorea
bulbifera | yes |
| Dioscoreales;
Dioscoreaceae -
(Opsophyton) | Dioscorea
sansibarensis | no | NA |
| Dioscoreales;
Dioscoreaceae -
(Rajania) | Rajania
(Dioscorea)
cordata | no | NA |
| Fabales;
Fabaceae | Cassia
ligustrina | no | NA |
| Lamiales;
Verbenaceae | Callicarpa
americana | no | NA |
| Liliales;
Liliaceae | Asparagus
officinalis | no | NA |
| Liliales;
Liliaceae | Asparagus
sprengeri | no | NA |
| Liliales;
Liliaceae | Lilium sp
(ornamental) | no | NA |
| Liliales;
Liliaceae | Zephyranthes
grandiflora | no | NA |
| Liliales;
Nartheciaceae | Aletris
farinosa | no | NA |
| Liliales;
Smilacaceae | Smilax
laurifolia | no | NA |
| Pandanales;
Pandanaceae | Pandanus
spiralis | no | NA |
| Poales;
Poaceae | Saccharum
officinarum | no | NA |
| Poales;
Cyperaceae | Cladium
mariscus | no | NA |
| Poales;
Juncaceae | Juncus
effusus | no | NA |
| Urticales;
Moraceae | Ficus elastica | no | NA |

| Zingerbales;
Cannaceae | Canna
flaccida | no | NA |
|--------------------------------|-------------------------|----|----|----|----|----|----|----|----|
| Zingerbales;
Cannaceae | Canna indica | no | NA |
| Zingerbales;
Costaceae | Costus
woodsonii | no | NA |
| Zingerbales;
Heliconiaceae | Heliconia
caribeae | no | NA |
| Zingerbales;
Marantaceae | Thalia
geniculata | no | NA |
| Zingerbales;
Musaceae | Musa
acuminata | no | NA |
| Zingerbales;
Zingerberaceae | Hedychium
coronarium | no | NA |

Source: Pemberton, 2009

Appendix B. Results of No-choice Adult Feeding Tests

In no-choice testing slight feeding occurred on three *Dioscorea* species besides air potato. Florida natives in bold.

		Leaf Ar	ea Eaten (d	cm ²)
Test	Plant Species	Total	Mean	se
A&B**	Dioscorea bulbifera; air potato (Opsophyton)	1621.49*	324.30	62.18
Α	Dioscorea villosa; wild yam (Macropoda)	0.67	0.07	0.05
В	Dioscorea floridana; Florida yam (Macropoda)	0.46	0.05	0.07
С	Dioscorea bulbifera; air potato (Opsophyton)	1226.52*	306.63	63.81
С	Dioscorea alata; water yam (Enantiophyllum)	0.00	0.00	0.00
D	Dioscorea bulbifera; air potato (Opsophyton)	1216.06*	243.21	13.98
D	Smilax laurifolia; bamboo vine	0.00	0.00	0.00
Е	Dioscorea bulbifera; air potato (Opsophyton)	637.53	127.51	38.47
Е	Dioscorea altissima; dunguey (Chondrocarpa)	0.17	0.06	0.01
Е	Dioscorea cayenensis; yellow guinea yam (Enantiophyllum)	0.00	0.00	0.00
Е	Rajania (Dioscorea) cordata; himber (Rajania)	0.00	0.00	0.00
Е	Dioscorea pilosiuscula; bulbous yam (Lynchonostemon)	0.00	0.00	0.00
Е	Dioscorea polygonoides; mata gallina (Dematostemon)	0.00	0.00	0.00
F	Dioscorea bulbifera; air potato (Opsophyton)	615.67	123.13	30.27
F	Dioscorea alata; water yam (Enantiophyllum)	0.00	0.00	0.00
F	Dioscorea polystachya; cultivated chinese yam	0.00	0.00	0.00
F	Dioscorea polystachya batatas; chinese yam (Enantiophyllum)	0.05	0.05	0.00
F	Dioscorea rotundata; guinea yam (Enantiophyllum)	0.00	0.00	0.00
G	Dioscorea bulbifera; air potato (Opsophyton)	310.57	62.11	24.36
G	Dioscorea sansibarensis; Zanzibar yam (Opsophyton)	0.00	0.00	0.00
G	Disocorea trifida; indian yam (Macrogynodium)	0.00	0.00	0.00

^{*} Tests conducted for two months longer than others

^{**} Tests conducted concurrently

Appendix C. Results of adult multi-choice feeding tests using plant species other than *Dioscorea* (except for air potato).

In all choice tests, adult feeding occurred only on air potato (indicated in bold).

		Leaf A	Area Eaten (cm ²)		
Test	Species	Total	Mean	se	
A	Dioscorea bulbifera; air potato	1226.52*	306.63	63.81	
A	Callicarpa americana; beauty berry	0	0	0	
A	Cassia ligustrina; senna	0	0	0	
A	Tacca integrifolia; bat flower	0	0	0	
B&C**	Dioscorea bulbifera; air potato	1366.88*	273.38	102.58	
В	Crinum americanum; FL swamp lily	0	0	0	
В	Pontederia cordata; pickerel weed	0	0	0	
В	Sagittaria latifolia; broadleaf arrowhead	0	0	0	
В	Thalia geniculata; arrowroot	0	0	0	
С	Ficus elastica; Indian rubber tree	0	0	0	
С	Pandanus spiralis; screw palm	0	0	0	
С	Sabal palmetto; sabal palm	0	0	0	
С	Saccharum officinarum; sugarcane	0	0	0	
D	Dioscorea bulbifera; air potato (374.91	74.98	20.07	
D	Musa acuminata; banana	0	0	0	
D	Tradescantia ohiensis; Ohio spiderwort	0	0	0	
Е	Dioscorea bulbifera; air	379.63	75.93	18.48	
Е	Costus woodsonii; red button ginger	0	0	0	
Е	Hedychium coronarium; butterfly ginger	0	0	0	
Е	Juncus effusus; soft rush	0	0	0	
F&G**	Dioscorea bulbifera; air potato	606.23	121.25	56.98	
F	Cladium mariscus; sawgrass	0	0	0	
F	Iris virginica; blue flag iris	0	0	0	
F	Lilium sp (ornamental); lily	0	0	0	
G	Aletris farinosa; colicroot	0	0	0	
G	Canna indica; indian shot	0	0	0	
G	Heliconia caribeae;	0	0	0	
Н	Dioscorea bulbifera; air potato	323.39	64.68	9.69	
Н	Zephyranthes grandiflorum; rose pink zephyr lily	0	0	0	
Н	Canna flaccida; bandana of the Everglades	0	0	0	
I	Dioscorea bulbifera; air potato	369.58	73.92	10.94	
I	Asparagus officinalis; garden asparagus	0	0	0	
I	Asparagus sprengeri; asparagus fern	0	0	0	

Appendix D. Results of adult feeding tests, including *Dioscorea* plant species.

In all tests, feeding occurred only on air potato (indicated in bold).

		Leaf Area Eaten (cm ²)		
Test	Plant Species	Total	Mean	se
A&B**	Dioscorea bulbifera; air potato (Opsophyton)	1621.49*	324.30	62.18
A	Dioscorea villosa; wild yam (Macropoda)	0.67	0.07	0.05
В	Dioscorea floridana; Florida yam (Macropoda)	0.46	0.05	0.07
C	Dioscorea bulbifera; air potato (Opsophyton)	1226.52*	306.63	63.81
C	Dioscorea alata; water yam (Enantiophyllum)	0.00	0.00	0.00
D	Dioscorea bulbifera; air potato (Opsophyton)	1216.06*	243.21	13.98
D	Smilax laurifolia; bamboo vine	0.00	0.00	0.00
Е	Dioscorea bulbifera; air potato (Opsophyton)	637.53	127.51	38.47
E	Dioscorea altissima; dunguey (Chondrocarpa)	0.17	0.06	0.01
E	Dioscorea cayenensis; yellow guinea yam (Enantiophyllum)	0.00	0.00	0.00
Е	Rajania (Dioscorea) cordata; himber (Rajania)	0.00	0.00	0.00
E	Dioscorea pilosiuscula; bulbous yam (Lynchonostemon)	0.00	0.00	0.00
Е	Dioscorea polygonoides; mata gallina (Dematostemon)	0.00	0.00	0.00
F	Dioscorea bulbifera; air potato (Opsophyton)	615.67	123.13	30.27
F	Dioscorea alata; water yam (Enantiophyllum)	0.00	0.00	0.00
F	Dioscorea polystachya; cultivated chinese yam	0.00	0.00	0.00
F	Dioscorea polystachya batatas; chinese yam (Enantiophyllum)	0.05	0.05	0.00
F	Dioscorea rotundata; guinea yam (Enantiophyllum)	0.00	0.00	0.00
G	Dioscorea bulbifera; air potato (Opsophyton)	310.57	62.11	24.36
G	Dioscorea sansibarensis; Zanzibar yam (Opsophyton)	0.00	0.00	0.00
G	Disocorea trifida; indian yam (Macrogynodium)	0.00	0.00	0.00

^{*} Tests conducted for two months longer than others

Source: Pemberton, 2009.

^{**} Tests conducted concurrently

Appendix E. No choice larval development tests – egg transferal onto whole plants

Larvae that hatched from eggs transferred onto air potato leaves fed immediately and began to grow. First instar larvae placed on test leaves other than air potato died without feeding. Feeding measurement reflects one week of larval feeding.

Florida natives in bold.

	Leaf Area Eaten (cm ²)		
Plant Species		Mean	se
Dioscorea bulbifera; air potato (Section Opsophyton)	79.04	15.81	6.55
Dioscorea altissima; dunguey (Section Chondrocarpa)		0.00	0.00
Dioscorea floridana; Florida yam (Section Macropoda)		0.00	0.00
Dioscorea polystachya batatas; chinese yam (Section Enantiophyllum)	0.00	0.00	0.00
Dioscorea villosa; wild yam (Section Macropoda)	0.00	0.00	0.00

Source: Pemberton, 2009

Appendix F. Results of oviposition and larval development tests

Although eggs were laid on native *Dioscorea* plant species, no larvae were able to survive beyond the first instar on plants other than air potato. Larvae developed to the adult stage only on air potato. This test was repeated 4 times (A-D).

		Leaf area eaten (cm ²) ¹		Oviposition & development ²			
							% to
Test	Plant species	Total	Mean	se	Eggs	Adults	Adult
Α	D. bulbifera; air potato (Opsophyton)	523.79	104.76	19.90	124	118	95.16%
Α	D. floridana; Florida yam (Macropoda)	0.00	0.00	0.00	31	0	0.00%
Α	D. villosa; wild yam (Macropoda)	0.00	0.00	0.00	25	0	0.00%
В	D. bulbifera; air potato (Opsophyton)	574.81	114.96	7.31	143	129	90.21%
В	D. floridana; Florida yam (Macropoda)	0.00	0.00	0.00	21	0	0.00%
В	D. villosa; wild yam (Macropoda)	0.00	0.00	0.00	40	0	0.00%
С	D. bulbifera; air potato (Opsophyton)	348.21	69.64	17.38	201	189	94.03%
С	D. floridana; Florida yam (Macropoda)	0.00	0.00	0.00	11	0	0.00%
С	D. villosa; wild yam (Macropoda)	0.00	0.00	0.00	35	0	0.00%
D	D. bulbifera; air potato (Opsophyton)	483.00	96.60	34.80	182	167	91.76%
D	D. floridana; Florida yam (Macropoda)	0.00	0.00	0.00	38	0	0.00%
D	D. villosa; wild yam (Macropoda)	0.00	0.00	0.00	45	0	0.00%

¹ Adult feeding

Source: Pemberton, 2009.

²Eggs laid on test plants, number of adults produced on each plant, and the percent of larvae developing into adults.

Decision and Finding of No Significant Impact

Field Release of *Lilioceris cheni* Gressit & Kimoto (Coleoptera: Chrysomelidae) for Biological Control of Air Potato, *Dioscorea bulbifera* (Dioscoreaceae), in the Continental United States

February 2011

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ) Pest Permitting Branch (PPB), is proposing to issue permits for release of an insect, *Lilioceris cheni* (Coleoptera: Chrysomelidae), in the continental United States. The agent would be used by the applicant for the biological control of air potato, *Dioscorea bulbifera*. Before permits are issued for release of *L. cheni*, APHIS must analyze the potential impacts of the release of this organism into the continental United States in accordance with USDA APHIS National Environmental Policy Act implementing regulations (7 Code of Federal Regulations Part 372). APHIS has prepared an environmental assessment (EA) that analyzes the potential environmental consequences of this action. The EA is available from:

U.S. Department of Agriculture
Animal and Plant Health inspection Service
Plant Protection and Quarantine
Registrations, Identification, Permits, and Plant Safeguarding
4700 River Road, Unit 133
Riverdale, MD 20737
http://www.aphis.usda.gov/plant_health/ea/index.shtml

The EA analyzed the following two alternatives in response to a request for permits authorizing environmental release of L. cheni: (1) no action, and (2) issue permits for the release of L. cheni for biological control of air potato. A third alternative, to issue permits with special provisions or requirements concerning release procedures or mitigating measures, was considered. However, this alternative was dismissed because no issues were raised that indicated that special provisions or requirements were necessary. The No Action alternative, as described in the EA, would likely result in the continued use at the current level of chemical and mechanical control methods for the management of air potato. These control methods described are not alternatives for decisions to be made by APHIS, but are presently being used to control air potato in the United States and may continue regardless of permit issuance for field release of L. cheni. Notice of the EA was made available in the Federal Register on January 19, 2011 for a 30-day public comment period. One comment was received on the EA from a commenter from the Florida Department of Agriculture and Consumer Services/Division of Plant Industry (FDACS/DPI). The commenter was in support of the release of L. cheni but had some concerns regarding permitting and identification that were resolved in personal communications between APHIS, FDACS/DPI, and the petitioner.

I have decided to authorize APHIS to issue permits for the environmental release of L. cheni. The reasons for my decision are:

- This biological control agent is sufficiently host specific and poses little, if any, threat to the biological resources, including non-target plant species, of the continental United States.
- The release will have no effect on federally listed threatened and endangered species or their habitats in the continental United States.
- L. cheni poses no threat to the health of humans or wild or domestic animals.
- No negative cumulative impacts are expected from release of *L. cheni*.
- There are no disproportionate adverse effects to minorities, low-income populations, or children in accordance with Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations" and Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks."
- While there is not total assurance that the release of *L. cheni* into the environment will be reversible, there is no evidence that this organism will cause any adverse environmental effects.

I have determined that there would be no significant impact to the human environment from the implementation of the preferred alternative (issuance of permits for the release of *L. cheni*) and, therefore, no Environmental Impact Statement needs to be prepared.

Dr. Michael J. Firko

Director

Registrations, Identification, Permits, and Plant Safeguarding

Plant Health Programs

APHIS, Plant Protection and Quarantine