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Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Field Release of *Rhinoncomimus latipes* (Coleoptera: Curculionidae), a Weevil for Biological Control of Mile-a-minute Weed (*Polygonum perfoliatum*), in the Continental United States

Final Environmental Assessment, July 2004

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1. Purpose and Need for Proposed Action

1.1 The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), is proposing to issue a permit to a University of Delaware researcher for release of a nonindigenous weevil, *Rhinoncomimus latipes* Korotyaev (Coleoptera: Curculionidae). The agent would be used by the applicant for the biological control (biocontrol) of mile-a-minute weed, *Polygonum perfoliatum* L. (Polygonaceae). Before a permit is issued for release of *R. latipes*, APHIS must analyze the potential impacts of the release of this agent into the continental United States.

R. latipes is a small (approximately 2 millimeters (mm) long) black weevil, which lays its eggs on leaves and stems of mile-a-minute weed. Newly hatched larvae bore into the stem and spend their entire larval period feeding internally in the stem. After about 3 weeks, the larvae leave the stem, drop to the soil and pupate. Adults emerge about one week later. Feeding by a single larva kills the stem terminal, preventing development of seeds on that terminal. Adults also feed on mile-a-minute weed foliage, ingesting about 0.1 square centimeters (cm^2) per weevil per day. Adults lay about 3 eggs per day. Adults can survive for several months, up to a year in the laboratory (Price *et al.,* 2003). Simulated damage studies suggest that larval feeding by this weevil has the potential to kill small mile-a-minute weed plants and stunt and reduce seed production by larger plants (Colpetzer *et al.*, 2004a). Observations in China, where the weevil was initially collected, indicate that it is host-specific and has caused considerable damage to mile-a-minute plants in its native range, especially through larval feeding (Ding Jianqing, personal communication).

This insect species was initially identified as *Homorosoma chinensis* (Wagner) (synonym: *Homorosoma chinense* Wagner) by Dr. Zhang Runzhi of the Zoological Institute of the Chinese Academy of Sciences, a specialist in the family Curculionidae but not in the subfamily Ceutorhynchinae, to which this weevil belongs. Specimens from the laboratory colony held in quarantine in Delaware were subsequently sent to Dr. Boris A. Korotyaev of the Zoological Institute of the Russian Academy of Sciences, the recognized world expert for the Ceutorhynchinae, who identified them as *Rhinoncomimus latipes*, a species that he had recently described (Korotyaev, 1997). Specimens from the laboratory colony were closely compared with type specimens of *R. latipes* by Dr. Korotyaev, and showed no differences from the type in any characters, including male genitalia. Voucher specimens have been placed in the University of Delaware Insect

Reference Collection and will also be sent to the U.S. National Museum and to the Canadian National Collection prior to release.

1.2 The applicant's purpose for releasing *R. latipes* into the environment is to reduce the severity of infestations of mile-a-minute weed, an annual vine native to parts of Asia. This weed was accidentally introduced into Pennsylvania on nursery stock (probably from Japan) in the 1930s and is now established throughout the northeastern United States. Mile-a-minute weed grows rapidly, with stems reaching up to 6 meters (m) long, and its stems, petioles, and leaf veins are covered with downward curving barbs that aid the plant in climbing and supporting itself on other plants. Large dense patches of mile-a-minute weed develop in the course of a summer, and this can reduce native plant species in natural areas as the vines climb over and cover other plants, blocking available sunlight. Mile-a-minute weed can interfere with Christmas tree farms, pine plantations, and reforestation projects by smothering tree seedlings, and it can be a problem to nursery and horticultural crops that are not regularly tilled. It is listed as a noxious weed in several States. Its pest risk potential was rated as high by USDA/APHIS (Lehtonen, 1994) based on high ratings for probability of spread and environmental impact potential, combined with a medium rating for economic consequences of establishment. In this assessment it was noted that eradication of this weed is no longer feasible because it is distributed in at least seven States and its seeds are spread by birds and water. Classical biological control was recommended if feasible (Lehtonen, 1994). An assessment conducted in Delaware also rated the invasiveness risk of mile-a-minute weed as high, because of its severe impacts on natural systems and great potential for spreading (Allen, 2002).

Before a permit is issued for release of *R. latipes*, APHIS needs to analyze the potential effects of the release of this agent into the continental United States.

1.3 APHIS must decide among the following alternatives:

A. To deny the permit application (no action),
B. To issue the permit as submitted, or
C. To issue the permit with management constraints or mitigation measures.

1.4 Issues arising from the environmental release of *R. latipes* are:

A. Will *R. latipes* attack non-target plants within or outside of the area infested with mile-a-minute weed?

B. Will *R. latipes* adversely affect any federally listed threatened or endangered species or their habitats?

1.5 The pending application for release of this biocontrol agent into the environment was submitted in accordance with the provisions of the Plant Protection Act (7 United States Code (U.S.C.) 7701 *et seq*.). This environmental assessment (EA) was prepared by APHIS in compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*) as prescribed in implementing regulations adopted by the Council on Environmental Quality (40 Code of Federal Regulations (CFR) 1500–1509), by USDA (7 CFR 1b), and by APHIS (7 CFR 372).

2. Alternatives Including the Proposed Action

2.1 This chapter will explain the alternatives available to APHIS. Although APHIS' alternatives are limited to a decision on whether to issue a permit for release of *R. latipes*, other methods available for control of mile-a-minute weed are also described. These control methods are not decisions to be made by APHIS and may continue whether or not a permit is issued for environmental release of *R. latipes*. These are methods presently being used to control mile-a-minute weed by public and private concerns and are presented to provide information to the reader.

2.2 Description of APHIS' alternatives.

2.2.1 Alternative 1 - No Action: Under this alternative, APHIS would not issue a permit for the field release of *R. latipes* for the control of mile-a-minute weed. The release of this biocontrol agent would not take place.

2.2.2 Alternative 2 - Issue the Permit: Under this alternative, APHIS would issue a permit for the field release of *R. latipes* for the control of mile-a-minute weed. This permit would contain no special provisions or requirements concerning release procedures or mitigating measures.

2.2.3 Alternative 3 - Issue the Permit with Specific Management Constraints and Mitigating Measures: Under this alternative, APHIS would

issue a permit for the field release of *R. latipes* for the control of mile-a-minute weed. However, the permit would contain special provisions or requirements concerning release procedures or mitigating measures.

2.3 The following alternatives are presently being used to control mile-a-minute weed. These controls will continue under the "No Action" alternative but may continue even if a permit is issued for release of *R. latipes.*

2.3.1 Chemical Control. Non-selective herbicides (*e.g*., glyphosate) are used in some areas such as Prime Hook National Wildlife Refuge in Milton, Delaware, to reduce mile-a-minute weed and enhance growth and survival of native plant populations. Herbicides are also used in commercial forest areas where the weed has affected regeneration (Wu *et al.*, 2002).

2.3.2 Mechanical Control. Frequent hand-pulling, cutting, and mowing are used by concerned homeowners and in managed natural systems where adequate labor is available. These methods are only effective if applied before plants set seed and over multiple years, because seeds can survive for a number of years in the soil.

2.3.3 Cultural Control. Lehtonen (1994) cited recommendations for habitat manipulation, including removal of dead and decaying plant matter which provides mulch that promotes mile-a-minute seed survival and germination. However, such methods are not generally feasible or desirable in natural areas.

3. Affected Environment

3.1 Mile-a-minute weed readily colonizes heavily disturbed areas such as clearcuts and powerlines, moderately disturbed areas such as streambanks and roadsides, and, increasingly, undisturbed areas such as wetlands and forest openings (Allen, 2001). It occurs mostly in riparian (wetland) areas in the Piedmont, and mostly in forested or agricultural locations in the Coastal Plain. It is present in a variety of wetland communities and some forested communities.

3.2 Evidence of host specificity of *R. latipes.*

Results of host-range tests conducted in the U.S. are summarized in appendix 1 (additional plants were tested in China, with similar results [Hough-Goldstein *et al.,* 2003; Colpetzer *et al.*, 2004b]). Adult weevils in no-choice tests consumed between 0.1 and 2.3 cm^2 of foliage (per weevil over 30 days) of several *Polygonum* species in addition to mile-a-minute weed and of two *Rumex* species, and between 10 and 80% of the weevils survived for at least 30 days on these plant species (appendix 1). However, none of these other plant species were eaten when a choice of mile-a-minute weed was given (results in square brackets in appendix 1). Also, no eggs were laid on any plant species other than mile-a-minute weed in the no-choice tests, while an average of 49 eggs per female were laid on mile-a-minute weed over 30 days. When newly hatched larvae were placed on the other plant species, no larvae were able to bore into the stems and survive, while 80% survived when placed on mile-a-minute weed (appendix 1, Larval Test).

3.3 Threatened and Endangered Plant Species:

Because *R. latipes* is so host specific, no federally listed threatened or endangered plants or animals are likely to be affected, either in the infested area or in areas that the target weed may spread. Although 18 species in the family Polygonaceae are federally listed as threatened or endangered and three species are candidates for listing, all but one are in genera for which no feeding was observed in host-specificity tests. Of the 21 listed plants within the plant family Polygonaceae, only one *Polygonum* species is listed as endangered, Scott's Valley polygonum (*P. hickmanii*). The range of this species is entirely in a restricted area of California, with a habitat and climate very different from that favored by mile-a-minute weed. Other Polygonaceae are locally rare, *e.g.* those marked with an asterisk in appendix 1, which are listed as threatened or endangered by at least one State. Some of these species co-occur with mile-a-minute. However, host-specificity tests indicate that they are highly unlikely to be damaged by *R. latipes*, and potential reduction of mile-a-minute populations by release of *R. latipes* should prove beneficial to these species. Although slight adult feeding did occur in no-choice tests on some of these species (appendix 1), none of these plant species are within the physiological host range of *R. latipes.*

4. Environmental Impacts of the Proposed Action and Alternatives

4.1 This chapter will analyze the potential environmental consequences of each alternative.

4.2 Effects of Alternative 1 - No Action

4.2.1 Effects on Non-Target Organisms: The continued use of chemical herbicides and mechanical controls at current levels would be a result if the "no action" alternative is chosen. Nonspecific herbicides and mechanical control methods that would continue to be used would negatively impact non-target plants. However, since most mile-a-minute weed currently goes uncontrolled, the most important impact of no action would be continued spread of mile-a-minute weed. Its aggressive viney habit allows it to overtop other species, making it highly competitive for sunlight. In addition, it germinates in early March before many native species, making it very competitive for soil nitrogen and other nutrients (Allen, 2001). Its dispersal by water and birds has resulted in continued spread in the Northeast (e.g. into Connecticut: Lamont and Fitzgerald, 2001) and even onto islands, such as Pea Patch Island in the Delaware River (Hough-Goldstein, personal observation).

4.2.2 Effects on Threatened and Endangered: Impact on threatened and endangered species as a result of chemical and mechanical control would be similar to effects on non-target species and habitats described in section 4.2.1.

4.3 Effects of Alternative 2 - Issue Permit

4.3.1 Effects on Non-Target Organisms: Data presented in appendix 1 (with more details in Colpetzer, 2003 and Colpetzer *et al.*, 2004b), in Price *et al.* (2003) and in Jianqing *et al.* (2000), indicate that *R. latipes* is specific to mile-a-minute weed, with no egg-laying or larval development on any other plant species. A small amount of feeding by adult weevils occurred on several plant species in the family Polygonaceae when insects were kept in cages in the laboratory with no access to any other plant material or ability to disperse. No eggs were laid on other plant species even after 30 days, suggesting that a host shift would be highly unlikely. In studies conducted in quarantine in Delaware, none of the plant species tested other than the target host fell within the physiological host range of *R. latipes*. Even when naïve neonates were placed on other plant species (necessary

for testing because eggs were never laid on these species and eggs could not be transferred without desiccating) the larvae failed to bore into the stems and all died within one to three days.

4.3.2 Impact on Threatened and Endangered Species:

Host specificity testing: From host specificity testing conducted in China and in quarantine in Delaware, the researchers determined that *R. latipes* has a narrow host range, with the physiological host range restricted to mile-a-minute weed. No plants outside of the family Polygonaceae were eaten by adults or larvae. In no-choice tests, adult weevils ate small amounts of foliage of several other *Polygonum* species (Tribe Persicarieae) and two *Rumex* species (Tribe Rumiceae), but did not lay any eggs or develop as larvae on these species. Both of these tribes are in the subfamily Polygonoideae. Representative species in other tribes in that subfamily and in the morphologically and taxonomically distinct subfamily Eriogonoideae were not fed on by adult weevils even after 30 days under no-choice conditions, and all weevils in these tests died. Of the 21 federally listed threatened and endangered species or candidate species of Polygonaceae (http://endangered.fws.gov, January 2004), 18 are in the subfamily Erigonoideae, two are in the genus *Polygonella*, and one is in the genus *Polygonum* (*P. hickmanii* H. Hinds and R. Morgan, Scotts Valley Polygonum). Based on laboratory host specificity tests, it is highly unlikely that any listed species would be in any danger from *R. latipes*.

Geographical/habitat isolation: *P. hickmanii,* the only *Polygonum* species listed as endangered, occurs in dry, shallow soils in a restricted region of California with a Mediterranean climate, very different from the moist regions with cold winters where mile-a-minute weed thrives. It has been shown repeatedly that the U.S. population of mile-a-minute weed (and its probable source population in Japan) requires a cold period to break achene dormancy and stimulate germination in the spring. In addition, mile-a-minute weed is typically found along stream banks, in flood plains, or in marshy areas. Thus this plant is highly unlikely to move into areas such as *P. hickmanii* habitat.

Since *R. latipes* is highly specific to mile-a-minute weed, and since mile-a-minute weed and *P. hickmanii* are geographically/ecologically isolated, APHIS determined that the release of *R. latipes* is not likely to adversely affect any candidate or listed threatened and endangered species or their habitats.

A biological evaluation and request for concurrence with APHIS' finding was submitted to the U.S. Fish and Wildlife Service (FWS), Arlington, VA,

in compliance with Section 7 of the Endangered Species Act of 1973, as amended. On April 9, 2004 the FWS issued a concurrence letter stating "that release of *R. latipes* for control of mile-a-minute may affect, but is not likely to adversely affect, any threatened or endangered species. It is also not likely to destroy or adversely modify any critical habitat of such species and is not likely to jeopardize any species proposed to be listed as endangered or threatened or result in destruction or adverse modification of any area proposed to be designated as critical habitat."

4.4 Effects of Alternative 3 - Issue the Permit with Specific Management Constraints and Mitigating Measures

4.4.1 Effects on Non-Target Organisms: No specific management constraints or mitigating measures have been recommended for this species. Therefore, under this alternative, impacts on non-target organisms would be identical to those described in 4.3.1.

4.4.2 Effects on Threatened and Endangered Species: No specific management constraints or mitigating measures have been recommended for this species. Therefore, under this alternative, impacts on threatened and endangered organisms would be identical to those described in 4.3.2.

4.5 No disproportionate effects are expected for minority, low income populations, or children due to the release of *R. latipes*.

4.6 An unavoidable effect of the proposed action would be the lack of complete control of the target pest. Should the proposed action be unsuccessful, the present chemical and mechanical control activities would continue. Mile-a-minute weed would likely continue to expand into areas presently uninfested.

4.7 Once a biological control agent such as *R. latipes* is released into the environment and it becomes established, there is a slight possibility it could move from the target plant to non-target plants and itself become a pest. Host shifts by introduced weed biocontrol agents to unrelated plants are uncommon (Pemberton, 2000). However, if a host shift were to take place, the resulting effects could be environmental impacts that may not be easily reversed. Recent studies have highlighted the ecological risks associated with classical biological control (*e.g.* Louda *et al.*, 2003a, b), but where damage to nontarget plant species has occurred, it has resulted from imported insects that have adapted to eat physiologically acceptable but less preferred and less suitable hosts, in situations where the "preferred" host is not present (Louda *et al.*, 2003b). Laboratory host range testing has

repeatedly been shown to accurately predict physiological host range, even though such tests may not always accurately predict ecological host range under field conditions (Pemberton, 2000; Louda *et al.,* 2003a, b).

Biological control agents such as *R. latipes* generally spread even without the agency of man. In principle, therefore, release of these insects at even one site must be considered equivalent to release over the entire area in which potential host plants occur and in which the climate is suitable for reproduction and survival.

5. List of Preparers

This environmental assessment was prepared by Dr. Judith A. Hough-Goldstein, Professor of Entomology at the University of Delaware, Newark, Delaware and Dr. Tracy Horner, Entomologist, USDA-APHIS - Policy and Program Development, Riverdale, Maryland.

6. List of Agencies Consulted

The Technical Advisory Group for the Biological Control Agents of Weeds (TAG) recommended the release of *R. latipes* on December 30, 2003. TAG members that reviewed the release petition (Hough-Goldstein *et al.,* 2003) included representatives from the U.S. Fish and Wildlife Service, Bureau of Indian Affairs, the Weed Science Society of America, Cooperative State Research, Education, and Extension Service, National Park Service, National Plant Board, Bureau of Land Management, U.S. Forest Service, Animal and Plant Health Inspection Service, U.S. Army Corps of Engineers, Bureau of Reclamation, and Agriculture and Agri-food Canada.

7. List of Reviewers

This document was reviewed by Dr. Robert Flanders, Pest Permit Evaluation Branch Chief, USDA-APHIS-Plant Protection and Quarantine, Riverdale, MD.

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Appendix 1. Survival, foliar consumption, and oviposition of adult *Rhinoncomimus latipes* (previously identified as *Homorosoma chinense*) and survival of larvae placed on plant species related to mile-a-minute weed (results from Colpetzer, 2003).

Taxonomic grouping [a]		Adult no-choice test [Choice test [c]]			Larval test
	Native (N) or Introduced (I) [b]	% Surviving for 30 days	Foliage consumed (cm2/ weevil/ 30 d) [cm2/ weevil/ wk]	Eggs laid (#/female)	%surviving to pupation
Order Polygonales					
Family Polygonaceae					
Polygonum L. sec. Echinocaulon					
Polygonum perfoliatum	I	88%	3.1 cm² [0.5-0.8]	48.7	80%
Polygonum sagittatum	N	0	0	0	0
Polygonum arifolium	N*	20	<0.1 [0]	0	0
Polygonum L. sec. Persicaria					
Polygonum caespitosum	N/I	10	<0.1 [0]	0	0
Polygonum hydropiperoides	N*	20	<0.1 [0]	0	0
Polygonum lapathifolium	N	70	0.2 [0]	0	0
Polygonum pensylvanicum	N	50	0.8 [0]	0	0
Polygonum punctatum	N	80	<0.1 [0]	0	0
Polygonum L. sec. Tovara					
Polygonum virginianum	N	80	1.2 [0]	0	0
Polygonum L. sec. Bistorta					
Polygonum bistorta	N/I	0	<0.1	0	0
Polygonum L. sec. Polygonum					
Polygonum aviculare	I	50	0.5 [0]	0	0
Polygonum L. sec. Tiniaria					
Polygonum scandens	N	60	1.2 [0]	0	0
Polygonella articulata	N*	0	0	0	0
Atraphaxis buxifolia	I	0	0	0	0
Rumex acetosa	I	60	2.3 [0]	0	0
Rumex altissimus	N*	20	0.6 [0]	0	0
Rumex obtusifolius	I	0	0	0	0

Table 1, cont.

Taxonomic grouping [a]	Native (N) or Introduced (I) [b]	Adult no-choice test [Choice test [c]] % Surviving for 30 days	Foliage consumed (cm2/ weevil/ 30 d) [cm2/ weevil/ wk]	Eggs laid (#/female)	Larval test %surviving to pupation
Brunnichia ovata	N	0	<0.1	0	0
Coccoloba uvifera	N	0	0	0	0
Chorizanthe staticoides	N	0	<0.1	0	0
Eriogonum fasiculatum	N	0	0	0	0
Eriogonum giganteum	N	0	0	0	0
Eriogonum parvifolium	N	0	0	0	0
Order Plumbaginales Family Plumbaginaceae					
Armeria maritime	N	0	0	0	0
Limonium leptostachyum	I	0	0	0	0
Order Caryophyllales Family Caryophyllaceae					
Dianthus caryophyllus	I	0	0	0	0
Order Urticales Family Cannabaceae					
Humulus japonicus	I	0	0	0	0
Humulus lupulus	N/I	0	0	0	0

N=20 individual weevils per host for no-choice adult test (repeated 6X for *P. perfoliatum* over the period that other hosts were tested); N=3 potted plants (each with 10 neonate larvae) for larval test (repeated 3X for *P. perfoliatum*).

[a] Suprageneric classification from Kubitzki et al. (1993); generic and sectional treatment of *Polygonum* L. *sensu lato* from Ronse Decraene and Akeroyd (1988); species names accepted by USDA-ITIS (2002).

[b] N, native; I, introduced; N/I, listed as both; *, listed as threatened or endangered by at least one state; from USDA-NCRS (2002).

[c] Foliage consumed (cm^2/weevil/week) in tests where weevils were given a choice of *P. perfoliatum* and one or two other host plants.

Decision and Finding of No Significant Impact
for
Field Release of *Rhinoncomimus latipes* Korotyaev (Coleoptera: Curculionidae), a Nonindigenous Weevil for the biological control (biocontrol) of mile-a-minute weed, *Polygonum perfoliatum* L. (Polygonaceae), in the Continental United States

Environmental Assessment
July 2004

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), is proposing to issue permits for release of a nonindigenous weevil, *Rhinoncomimus latipes* Korotyaev (Coleoptera: Curculionidae). The agent would be used for the biological control of mile-a-minute weed, *Polygonum perfoliatum* L. (Polygonaceae), in the continental United States. 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
Biological and Technical Services
4700 River Road, Unit 133
Riverdale, MD 20737

The alternatives available to APHIS are No Action (no permits), Issue Permit, and Issue Permit with Management Constraints or Mitigating Measures. Because of the action being proposed by APHIS, the Issue Permit and the Issue Permit with Management Constraints or Mitigating Measures alternatives will result in the release of the biological control agent into the environment. APHIS has therefore analyzed the potential effects of the release of the agent into the environment. The No Action alternative, as described in the environmental assessment, would likely result in the continued use at the current level of chemical and mechanical control methods for the management of mile-a-minute weed. These control methods described are not alternatives for decisions to be made by APHIS, but are presently being used to control mile-a-minute weed in the United States and may continue regardless of permit issuance for field release for *R. latipes*.

I have decided that an environmental impact statement need not be prepared for any of the alternatives. I have decided to authorize the PPQ permit unit to issue permits for the field release of *R. latipes* without management constraints or mitigating measures. The reasons for my decision are:

1. This biological control agent is sufficiently host specific and poses little, if any, threat to the biological resources of the continental United States.

2. This species will not disproportionately affect minority or low- income populations, nor will they disproportionately affect children or result in any environmental health risks or safety risks to children.

3. *R. latipes* poses no threat to the health of humans or wild or domestic animals.

4. *R. latipes* is not likely to adversely affect any endangered or threatened species or their habitats.

While there is not total assurance that the release of *R. latipes* into the environment will be reversible, there is no evidence that this organism will cause any adverse environmental effects.

Based on the analysis found in the EA, I find that none of the alternatives will have a significant impact on the quality of the human environment and an environmental impact statement need not be prepared.

/s/
Michael J. Firko July 20, 2004
Assistant Director
APHIS Plant Health Programs
Plant Protection and Quarantine