Field Release of *Psylliodes chalcomera* (Coleoptera: Chrysomelidae), a Nonindigenous Leaf Beetle for Biological Control of Musk Thistle, *Carduus nutans* (Asteraceae)

Environmental Assessment

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I. Description of the Proposed Action

The Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA) has received an application from the U. S. Agricultural Research Service (ARS) for a permit to release an exotic leaf beetle, *Psylliodes chalcomera* (Illiger) (Coleoptera: Chrysomelidae), in the United States (Appendix 1). The insect feeds on leaves of musk thistle, *Carduus nutans* L., a noxious weed in the family Asteraceae.

Preparatory to field releases, the applicant proposes to import *P. chalcomera* from Italy into the USDA-certified ARS insect quarantine facility at Temple, Texas. Parasitoids and disease agents will be screened out in quarantine before the beetles are released into the environment.

Initially, ARS will introduce weevils at release sites near Kerrville, Texas; DeSoto, Kansas; and at as-yet-undecided locations in Wyoming and Michigan. Approximately 1,000 to 3,000 weevils will be released at each site.

Voucher specimens have been deposited in the collection of the U. S. Museum of Natural History, Washington, DC, and the USDA European Biological Control Laboratory, Montpellier, France. Specimens were determined by Richard White, ARS Systematic Entomology Laboratory, Beltsville, Maryland.

The pending application was submitted in accordance with the Federal Plant Pest Act (7 USC 150aa *et seq.*) and the Plant Quarantine Act (7 USC 151aa *et seq.*). This environmental assessment (EA) was prepared in compliance with the National Environmental Policy Act (NEPA) (42 USC 4321 *et seq.*) as described in the implementing regulations adopted by the Council on Environmental Quality (40 CFR 1500-1509), by the USDA (7 CFR 1b), and by APHIS (7 CFR 372).

II. Purpose of and Need for the Proposed Action

The purpose of the proposed releases of *P. chalcomera* is to reduce the severity of infestations of musk thistle in 32 states of the West and Appalachian Midwest. Musk thistle competes with forage plants for moisture and soil nutrients. Also, the spiny leaves, stalks, and seed heads interfere with the grazing of livestock and with recreational uses of land. Musk thistle is among the most important weeds in the United States.

III. Alternative to the Proposed Action

The no-action alternative to issuing a permit for the release of *P. chalcomera* is to deny the permit. If the permit is denied, attempts will continue in some areas to control musk thistle through the use of herbicides and mechanical means.

IV. Environmental Impacts of the Proposed Action and Alternative

The intended environmental impact of the proposed action is a reduction in the severity of musk thistle infestations with consequent improvement in the quality of land for pasturage and recreational use.

In the absence of successful biological control agents, efforts to control musk thistle will continue, adding to the pesticide load of the environment and possibly increasing contamination of groundwater supplies in some areas. Infestations of musk thistle can be eliminated only through repeated applications of herbicides over a period of years. Cleared sites sometimes are reinvaded rapidly, further multiplying the need for herbicidal treatments and the risks of environmental pollution.

Biological control agents such as *P. chalcomera* generally spread even without the agency of man. In principle, therefore, release of this species at even one site must be considered equivalent to release over the entire area of the United States in which potential host plants occur and in which the climate is suitable. Since *P. chalcomera* occurs over a large area of Europe, it might be expected eventually to spread throughout the 32 states occupied by the target host.

The proposed introductions of *P. chalcomera* raise the question of environmental safety since the weevils conceivably might harm nontarget species. A large body of data on host specificity of *P. chalcomera* has been gathered from (1) the extant scientific literature, (2) field surveys in the insect's native home in Italy, (3) controlled laboratory tests, and (4) controlled field tests. Most of the following findings are summarized from the petition submitted by Campobasso and Knutson (1996) to the Technical Advisory Group (TAG) on the biological control of weeds.

Scientific literature

A recent literature search revealed no examples of *P. chalcomera* as a pest of cultivated plants in Europe.

Field surveys

ARS scientists in Italy conducted broad field surveys in Italy by examining *Carduus acanthoides* L. (plumeless thistle), *Carduus nutans* (musk thistle), *Carduus pycnocephalus* L. (Italian thistle), *Cirsium arvense* (L.) (Canada thistle), *Cirsium vulgare* (Savi) (bull thistle), *Cynara scolymus* L. (artichoke), and *Onopordum* spp. Of these plants, only the three species of *Carduus* and *Onopordum* spp. were attacked. No life stages of the beetle were found in other asteraceous plants such as artichoke and safflower (Dunn and Rizza, 1976a, 1976b).

Laboratory tests

In laboratory no-choice tests (i.e., tests in which the beetle was offered a single species of plant), adult beetles caused minor feeding damage to artichoke, bachelor button, endive, lettuce, safflower, and sweet sultan (Asteraceae), basil (Lamiaceae), beets (Chenopodiaceae), carrot (Apiaceae), and tomato (Solanaceae). However, artichoke was the only test plant on which a few eggs were deposited, and those eggs produced no larvae. In the same series of tests, adults fed significantly on the experimental controls, *Carduus nutans* and *C. pycnocephalus*, and *Cirsium arvense* and *C. vulgare*--all of which are weedy thistles. However, feeding on *Cirsium arvense* and *C. vulgare* is not to be interpreted as evidence that these species lie within the physiological host range of the insect. Results of no-choice tests conducted in the confines of a cage are definitive only if they are negative; insects often feed on unnatural hosts if they are closely confined on the plants. Customarily, plants yielding positive results in no-choice tests are subjected to choice tests.

Field tests

In controlled, choice tests conducted in field conditions, adult beetles fed on and deposited eggs on the target host, musk thistle, but did not accept *Carduus acanthoides* nor any of the seven tested species of *Cirsium--Cirsium andrewsii* (Gray), *C. douglasii* (DeCandolle), *C. eriocephalum* Gray, *C. flodmanii* (Rydbon) (Flodman thistle), *C. palustre* (L.) (marsh thistle), *C. horridulum* Michaux (reported in Dunn and Campobasso, 1993 as *C. spinosissimum*) (yellow thistle), and *C. undulatum* (Nuttal) (wavyleaf thistle) (Dunn and Campobasso, 1993). The failure of *P. chalcomera* to feed on any *Cirsium* species in field conditions indicates that members of this genus are outside the host range of *P. chalcomera*.

Cirsium arvense and *C. vulgare* were not subjected to no-choice tests because field surveys had already indicated that these major weeds are not attacked. No *Onopordum*

species were tested because field surveys had already indicated that members of this genus are attacked, and the three U.S. species (*O. acanthium* L., *O. illyricum* L., and *O. tauricum* Willd.) are introduced and weedy.

No tested crop plants were attacked--artichoke (Asteraceae), cabbage and rape (Brassicaceae), potato (Solanaceae), and sage (Lamiaceae).

Three species of *Cirsium* are federally listed as threatened or endangered, and three others are proposed for listing (Table 1). However, it should be emphasized that in the preliminary no-choice screening test, *P. chalcomera* either failed to deposit eggs on *Cirsium* spp. or deposited eggs (e.g., on *C. vulgare*) that failed to develop. Furthermore, in the critical choice tests, no life stage of the beetle fed upon any species of *Cirsium*.

Certain biological characteristics of *P. chalcomera* offer further assurance that nontarget hosts, especially threatened and endangered species, will not be damaged. Commonly, adult beetles feed on a wider range of plants than the females utilize for oviposition. However, adults of *P. chalcomera* do not significantly damage even musk thistle; the plant readily compensates for the small holes eaten by adults in the leaves (larvae are the damaging stage). Nontarget plants such as an endangered species are even less likely than musk thistle to be significantly damaged by adults.

Table 1. Species of *Cirsium* federally listed or proposed for listing

Species	Distribution	Status
Cirsium fontinale	CA	Endangered
C. pitcheri	IL, IN, MI, WI	Threatened
C. vinaceum	NM	Threatened
C. hydrophilum	CA	Proposed
C. loncholepis	CA	Proposed
C. rhothophilum	CA	Proposed

The biological characteristics of *P. chalcomera* preclude any adverse effects on human health or the human environment.

In summary, all available evidence indicates that *P. chalcomera*, if released in the United States, will feed only upon certain species of *Carduus* and *Onopordum*, all of which are nonindigenous and most of which are weedy. Futhermore, it is expected that releases will not place any members of the genus *Cirsium* in jeopardy, especially three threatened and endangered species already listed and three more proposed for listing. *P. chalcomera* is a safe agent to release in the United States.

V. References

Campobasso and Knutson. 1996. *Psylliodes chalcomera* (Illiger) (Coleoptera: Chrysomelidae) A biological control agent against musk thistle, *Carduus* spp., in the United States. Unpublished report, USDA--Agricultural Research Service, European Biological Control Laboratory, Montpellier, France. 39 pp.

Dunn, P H., and A. Rizza. 1976a. Bionomics of *Psylliodes chalcomera*, a candidate for biological control of musk thistle. Ann. Entomol. Soc. Amer. 69: 395-398.

Dunn, P H., and A. Rizza. 1976b. Host specificity of *Psylliodes chalcomera*, a candidate for biological control of musk thistle. Environ. Entomol. 6: 449-454.

Dunn, P. H., and G. Campobasso. 1993. Field test of the weevil (*Hadroplanthus trimaculatus*) and the fleabeetle (*Psylliodes chalcomera*) against musk thistle (*Carduus nutans*) Weed Science 41: 656-663.

VI. Preparators, Consultants, and Reviewers

This document was prepared by Paul Boldt, ARS, Temple, TX, and Ronald D. Hennessey, APHIS, Riverdale, MD. It is based largely on a petition submitted by Gaetano Campobasso and Lloyd Knutson, ARS, Montpellier, France to the Technical Advisory Group (TAG) on the biological control of weeds. Subsequently, TAG officially recommended that APHIS issue a permit for the release of *P. chalcomera* from quarantine into the environment. The TAG members were: **Bryan Arroyo**, U. S. Fish and Wildlife Service, Washington, DC; **Thomas A. Bewick**, Ph.D., University of Florida, Gainesville, FL; **David Sisneros**, Ph.D., U. S. Bureau of Reclamation, Denver, CO; **Alfred F. Cofrancesco**, Ph.D., U. S. Army Corps of Engineers, Vicksburg, MS; **Jack R. Coulson**, ARS, Beltsville, MD; and **James G. Saulmon**, Ph.D., U. S. Environmental Protection Agency, Washington, DC.

VII. Appendix

Appendix 1. Application for a permit to release *Psylliodes chalcomera* in the United States.

FINDING OF NO SIGNIFICANT IMPACT

The Animal and Plant Health Inspection Service of the United States Department of Agriculture has received an application for a permit to release *Psylliodes chalcomera* (Coleoptera: Chrysomelidae) into the environment of the United States. This nonindigenous leaf beetle is potentially useful for the biological control of musk thistle, *Carduus nutans* (Asteraceae), an important weed in 32 States of the West and Appalachian Midwest. Releases of *P. chalcomera* are expected to have no significant adverse impacts on the quality of the human environment. This conclusion is based on the following considerations:

--Both field surveys and laboratory tests indicate that the host range of *P. chalcomera* is restricted to thistles in the genera *Carduus* and *Onopordum*, all of which are nonindigenous and most of which are weedy.

--Threatened and endangered species of *Cirsium* are not expected to be attacked because when seven nonendangered members of that genus were tested in the laboratory they were not attacked.

--Members of the genera *Carduus* and *Onopordum* are not known to provide habitat or serve as a significant food source for any threatened or endangered species.

--The biological characteristics of *P. chalcomera* preclude any harmful effects on human health.

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