United States Department of Agriculture

Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Field release of the the thrips *Sericothrips staphylinus* (Thysanoptera: Thripidae) for biological control of gorse, *Ulex europaeus* (Fabaceae), in the contiguous United States.

Environmental Assessment, October 2019

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Contents

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), Pests, Pathogens, and Biocontrol Permits (PPBP) is proposing to issue permits for environmental release of the thrips insect *Sericothrips staphylinus* (Thysanoptera: Thripidae). The agent would be used by the applicant for classical biological control of gorse, *Ulex europaeus* (Fabaceae), in the contiguous United States.

Classical biological control of weeds is a method where natural enemies from a foreign country are used to reduce exotic weed infestations that have become established in the United States. Several different kinds of organisms have been used as biological control agents of weeds: insects, mites, nematodes, and plant pathogens, although plant-feeding insects are the most commonly used. Efforts to develop a weed biological control agent consist of the following steps (TAG, 2016):

1. Foreign exploration in the weed's area of origin.
2. Host specificity studies.
3. Approval of the exotic agent by PPBP.
4. Release and establishment in areas of the United States invaded by the target weed.
5. Post-release monitoring.

This environmental assessment[1] (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 *S. staphylinus* to control infestations of gorse within the contiguous United States. This EA considers the potential effects of the proposed action and its alternatives, including no action. Notice of this EA was made available in the Federal Register on August 20, 2019 for a 30-day public comment period. APHIS received 10 comments on the EA by the close of the comment period. Most comments (8) were in favor of the release of the biological control agent. Two commenters were not in favor of and raised concerns regarding the release of the insect. These comments are addressed in appendix 5 of this document.

[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.

APHIS has the authority to regulate biological control organisms under the Plant Protection Act of 2000 (Title IV of Pub. L. 106–224). Applicants who wish to study and release biological control organisms into the United States must receive PPQ Form 526 permits for such activities. The PPBP received a permit application requesting environmental release of *S. staphylinus* from Europe, and PPBP is proposing to issue permits for this action. Before permits are issued, PPBP must analyze the potential impacts of the release of this agent into the contigous United States.

The applicant's purpose for releasing *S. staphylinus* is to reduce the severity of infestations of gorse in the contiguous United States. Gorse is a spiny shrub that was introduced into North America from Western Europe in the late 1800's (Hoshovsky, 2000). It is currently listed as a noxious weed in Washington, Oregon, California, and Hawaii. The plant is also recorded on the East Coast of the United States from Virginia to Massachusetts and in coastal British Columbia, Canada (USDA-NRCS, 2008). Gorse is most often a pest of disturbed sites in open wild or less-developed areas, where management is minimal or non-existent. It is most prolific in the maritime climate within a few miles of the ocean, where sandy soils and rocky outcrops are especially vulnerable to invasion. Impacts from gorse include displacement of native plants, including forest tree saplings, reduction in the quality of wildlife habitat, increased fire hazard, interference in rights-of-way and recreation sites, and reduced livestock forage production (Hoshovsky, 2000). The plant has sharp spines that are painful to the touch making densely infested areas impenetrable for humans, livestock, and larger wildlife. Control of this plant is difficult because of its ability to re-sprout after being cut or sprayed and because of its long lived seed bank.

Existing management options for management of gorse are expensive, temporary, ineffective, and can have nontarget impacts. For these reasons, the applicant has a need to release *S. staphylinus,* a host-specific, biological control organism for the control of gorse, into the environment.

II. Alternatives

This section will explain the two alternatives available to PPBP—no action and issuance of permits for environmental release of *S. staphylinus*. Although PPBP's alternatives are limited to a decision on whether to issue permits for release of *S. staphylinus*, other methods available for control of gorse are also described. These control methods are not decisions to be made by PPBP, and their use is likely to continue whether or not permits are issued for environmental release of *S. staphylinus*, depending on the efficacy of *S. staphylinus* to control gorse. These are methods presently being used to control gorse by public and private concerns.

A third alternative was considered, but will not be analyzed further. Under this third alternative, PPBP would have issued permits for the field release of *S. staphylinus*; however, the permits would contain special provisions or requirements concerning release procedures or mitigating measures. No issues have been raised that would indicate special provisions or requirements are necessary.

A. No Action

Under the no action alternative, PPBP would not issue permits for the field release of *S. staphylinus* for the control of gorse. The release of this biological control agent would not take place. The following methods are presently being used to control gorse; these methods will continue under the "No Action" alternative and will likely continue even if permits are issued for release of *S. staphylinus*, depending on the efficacy of the organism to control gorse.

1. Chemical Control

A variety of herbicides can be used to kill or inhibit gorse plant growth. The most commonly used systemic herbicide is glyphosate. Other herbicides are 2,4-D, triclopyr, metsulfuron, and dicamba. Application methods include broadcast foliar sprays, spot spraying of individual plants, and stem treatments.

2. Mechanical Control

Mechanical control of established gorse infestations using heavy machinery such as bulldozers can effectively clear gorse stand. Physical control can be most effective against infestations less than two years old.

3. Cultural Control

A cultural technique sometimes used to kill gorse is controlled burning. Burning can reduce the size of the gorse plants and kill up to 54 percent of seed in the soil (Miller, 1992).

4. Biological Control

Two intentionally introduced biocontrol agents and one accidentally introduced natural enemy are already widespread on gorse in the western United States (Coombs et al., 2004). *Exapion ulicis* (Forster) is a weevil (Coleoptera: Brentidae [= Apionidae]) first introduced to the United States in 1953. The adults feed on tissue under the cuticle of spines and stems, and the larvae feed in the growing seeds (usually one per seed) inside the pod (Coombs et al., 2004). Adults generally do not cause much damage to plants. Only gorse seeds in the pods are attacked leaving the vast number of long-lived seeds already in the seed bank. This weevil occurs at nearly all established gorse infestations, but not in recently burned areas. *Tetranychus lintearius* (Dufour) is a spider mite (Acari: Tetranychidae) introduced to California and Oregon in 1994 and into Hawaii and Washington in 1995 (Coombs et al., 2004). Established mite colonies can be spotted by the presence of fine webbing that wraps around the entire gorse shoot. The mite population exploded briefly after the introduction.

Unfortunately, two natural enemies, *Phytoseiulus persimilis* and *Stethorus punctillum*, soon colonized and reduced gorse mite populations dramatically (Pratt et al., 2003), preventing its success. *Agonopterix nervosa* (Haworth) (Lepidoptera: Oecophoridae) is an accidentally introduced moth that also feeds on scotch broom (*Cytisus scoparius*) flowers. It acts as a twig/leaf-tier on gorse, in some areas damaging more than 50 percent of growing shoot tips. The feeding damage causes stunting of the shoots making the plants appear more full and bushy (Coombs et al., 2004). It is not yet clear whether this insect is having any effect on gorse populations.

A close relative, of *Agonopterix nervosa, A. umbellana*, was released and is established in Hawaii. Testing for a mainland release was discontinued for lack of funding. Two pathogens, *Chondrostereum purpureum* and *Fusarium tumidum*, have been tested in New Zealand and found to be moderately effective at reducing gorse re-growth following cutting (Morin et al., 1998; Bourdot et al., 2006). The pathogens are already ubiquitous in the environment and can be used in an augmentative bio-herbicide spray. However, this approach has not been widely used, perhaps because these bio-herbicides are less effective than traditional synthetic herbicides.

B. Issue Permits for Environmental Release of *Sericothrips staphylinus*

Under this alternative, PPBP would issue permits for the field release of the *S. staphylinus*, for the control of gorse. These permits would contain no special provisions or requirements concerning release procedures or mitigating measures.

Biological Control Agent Information

1. Taxonomy

Class: Insecta Linnaeus, 1758
Subclass: Dicondylia
Order: Thysanoptera Haliday, 1836
Family: Thripidae Stevens, 1829
Tribe: Sericothripini (Karny) Priesner, 1925
Genus: *Sericothrips*
Species: *staphylinus* Haliday, 1836
Common name: gorse thrips

The gorse thrips *Sericothrips staphylinus* is native to Western Europe. However, most of the 99 species listed in the genus *Sericothrips* are native to Asia (Jacot-Guillarmod, 1971). The genus *Sericothrips* in Europe was revised extensively by Bhatti (1973) by moving many species into other genera including *Hydatothrips* and *Neohydatothrips*. Nakahara (1988) revised the genus for North America, retaining only three North American species in the genus *Sericothrips*. These include *S. cingulatus* Hinds, *S.*

pubescens Hood, and *S. smithi* Stannard. *Sericothrips cingulatus* is reported from *Trifolium* and *Vicia* species in Illinois (Vance, 1974), while the hosts of the other two species are unknown.

2. Geographical Range of *S. staphylinus*

a. Native Range

The native distribution of *Sericothrips staphylinus* is assumed to overlap with the majority of the range of *Ulex europaeus* in Europe. However, specific information on the extent of its range has been difficult to obtain.

b. Other Areas of Introduction

Sericothrips staphylinus is established as a biocontrol agent in New Zealand (throughout), Australia (Tasmania), and Hawaii (slopes of Mauna Kea, Big Island).

c. Expected Attainable Range of *S. staphylinus* in North America

The field release of *S. staphylinus* as a classical biological control agent for gorse is proposed for the Pacific Northwest. Initial releases will be made into Oregon, and subsequently into Washington and California. No releases are proposed for the eastern United States, as the distribution of gorse there is currently very limited.

3. Life History of *S. staphylinus*

Life history studies were previously carried out by Hill et al. (2001) and Ireson et al. (2008b). Eggs are deposited singly in slits in tender gorse stems. At 19º C, the average female lays 2.0 ± 1.3 eggs per day, has a lifespan of 32.5 ± 4.1 days, and a lifetime fecundity of 76.2 ± 8.9 eggs per female. Ireson et al. (2008b) determined that the eggs require 161 degree days to hatch, and that the total development from egg to adult requires 345 degree days, with a development threshold of 9.3º C. In addition, there is a 7 day pre-oviposition period which accounts for approximately 68 degree days. Thus, a total of 413 degree days are required for a full generation.

In Europe (Hill et al., 2001) and in Tasmania (Ireson et al., 2008b) the gorse thrips has two generations per year. In Europe, the field population abundance peaks once in June and again in July/August. Based on historic degree day accumulation in the Pacific Northwest (Integrated Plant Protection Center at Oregon State University), two generations are expected along the Oregon and southern Washington Coast. In northern Washington and British Columbia, one generation per year is expected. Three generations per year may be possible in northern California. Examples of total degree days (with 9.3° C threshold) include 1,277 in

Brookings (southern Oregon), 1,130 in Seaside, Oregon, 840 in Grayland, Washington, and 788 in Quillayute, Washington (Grevstad et al., 2012).

III. Affected Environment

A. Taxonomy and Description of Gorse

Class: Magnoliopsida Brongn (1843)
Subclass: Rosidae Takht. (1967)
Order: Fabales Bromhead (1838) or Rosales Perleb (1826)
Family: Fabaceae Lindl. (1836)
Subfamily: Papilionoideae
Tribe: Genisteae (Adans.) Benth. (1865)
Subtribe: Genistinae (Cytisus-Genista complex) (Bibsy 1981)
Genus, species: *Ulex europaeus* L.

Common name: gorse, furze, prickly broom, thorn broom
Specimens of *Ulex europaeus* have been collected and deposited in the Oregon State University Herbarium.

Gorse is a heavily branched, evergreen shrub that grows to 3 meters (m) in height (Hitchcock and Cronquist, 1973) (Figure 1). In place of leaves, the plant is covered with sharp spines (4.5–6.5 centimeters (cm)). Photosynthesis occurs in the epidermis of the stem and spines. The bright yellow, pea-like flowers are 12 to 19 millimeters (mm) long, and are borne on the second year twigs. The flowers are solitary or racemous, and clustered at branch tips. Flowering occurs March–April, with a partial secondary bloom in late fall. Seeds (3–8) are produced in hairy green pods, 15–18 mm long. As pods mature, they become black and eventually eject the shiny olive-colored seeds away from the plant. Seeds may remain viable in the soil for 30 years or more (Zabkiewicz and Gaskin, 1978).

Figure 1. (A) Gorse infestation near Baker Beach, Oregon. (B) Close-up of flowering twig (Grevstad et al., 2012).

B. Areas Affected by Gorse

1. Native and Introduced Range of Gorse

Gorse is native to Europe where it is particularly common on the western European seaboard from northern France to Portugal (Tutin et al., 1968). Gorse is introduced and naturalized on both coasts of the United States and in Hawaii, Western Canada, New Zealand, Australia, Southern Africa, India, and Chile (Holm et al., 1997). According to the USDA-NRCS PLANTS Database, gorse is present in the states of California, Hawaii, Massachusetts, Oregon, Pennsylvania, Virginia, Washington, and West Virginia and in the Canadian province of British Columbia. In western North America, gorse primarily infests areas within a few miles of the Pacific Ocean (Figure 2), but scattered inland and eastern infestations can also be found. Most gorse on the West Coast occurs in the USDA-ARS (2012) Plant Hardiness Zones 8–9. It is common on coastal plains and slopes, power line rights-of-way, and in disturbed places such as pastures, riverbanks, roadsides, and forest clearings. It can also invade undisturbed grassland and canopied forests with up to 80 percent shade. It prefers sandy soils, but does well in a variety of soil-types and moisture conditions (Hoshovsky 2000). The infestation is largest and most problematic in coastal Oregon, where it occupies 14,000 hectares (Burrill et al., 1989). California reported over 6,000 hectares of gorse, majority of which are growing along the coast (Hoshovsky, 1986). Gorse is especially prevalent in Mendocino Co., California where it has been reported for over a hundred years (Boyd, 1984). In Washington, gorse is reported from 11 counties west of the Cascade Mountains, with an estimated 300 hectares in Pacific County (Isaacson, 1992). On the islands of Hawaii and Maui approximately 15,000 hectares of gorse are present on high altitude slopes (1,800–2,220 m) of volcanoes (Markin et al., 1988). In British Columbia, it mainly occurs on the southern part of Vancouver Island and the nearby Gulf Islands with a total area estimated at close to 1,000 hectares (Clements et al., 2001). Because gorse continues to spread, these area values are likely underestimated.

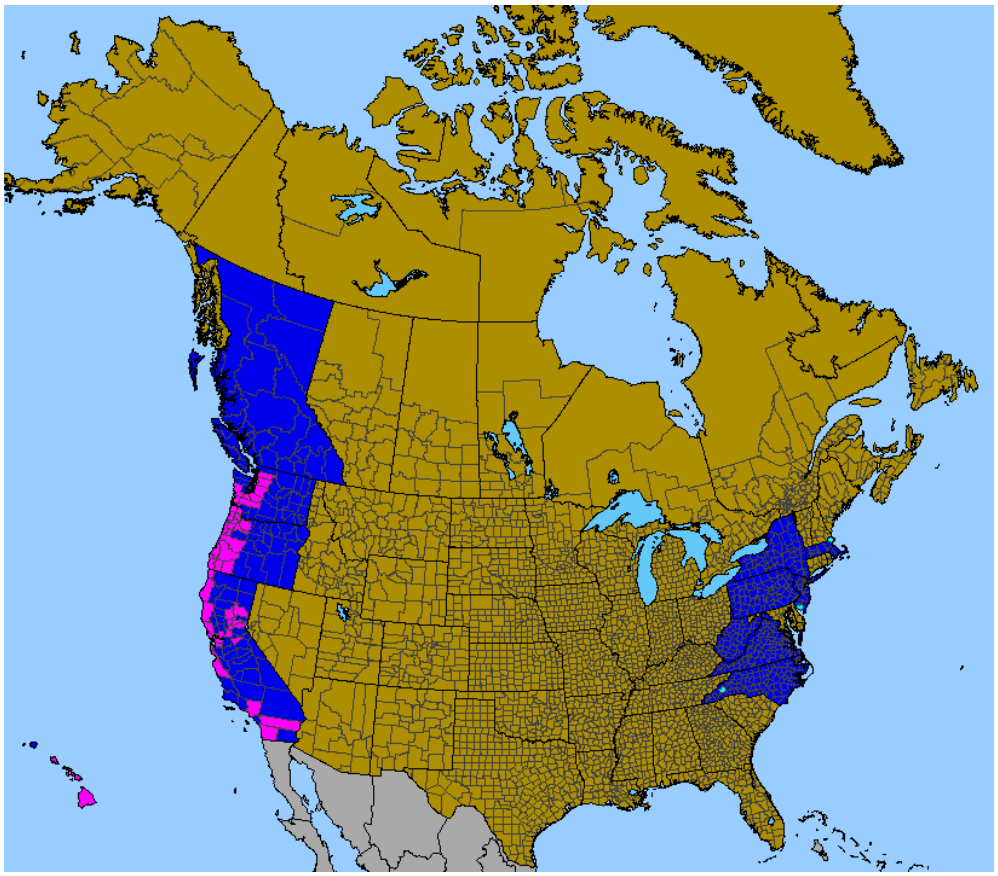

Figure 2. Distribution of gorse in North America. Legend: Brown = absent or no data for the state/province. Dark blue = present in state/province. Light blue = recorded in county (U.S. only). Pink = recorded in county and designated noxious (U.S. only). This map was created with The Biota of North America Program's Plant Atlas, a synthesis of North American herbarium records (Grevstad et al., 2012).

C. Plants Related to Gorse and Their Distribution

Gorse belongs to the plant family Fabaceae. The Fabaceae is a large family both ecological and economical importance. Legumes (members of the family Fabaceae) are widely used in agriculture as food and fodder crops and as ornamental plants. As nitrogen fixers, they are ecologically important in both natural and agricultural landscapes.

The Fabaceae contains three subfamilies, the Caesalpinioideae, Mimosoideae, and Papilionoideae, which can be distinguished primarily by the flowering parts. *Ulex europaeus* (gorse) is a member of the largest subfamily, Papilionoideae, which have pea-like flowers. The Papilionideae includes approximately 30 tribes, 450 genera, and 12,000 species (Polhill, 1994). *Ulex* is in the tribe Genisteae, which contains about 470 species worldwide. Gorse belongs to the subtribe Genistinae, or the "Cytisus-

Genista complex", which includes a suite of closely related European leguminous shrubs that are invasive to North America (Bisby, 1981). These include Scotch broom, *Cytisus scoparius* (L.) Link., Portuguese broom, *Cytisus striatus* Rothm., French broom, *Genista monspessulana* (L.) Johnson, and Spanish broom, *Spartium junceum* (L.). All have similar appearances, growth forms, and biologies and cause similar problems where invasive. There are no North American natives in the Genistinae subtribe. Like gorse, Scotch and French broom are also targets of biological control.

The closest native North American relatives of gorse are in the genus *Lupinus* (lupines). The lupines are in the same tribe as gorse, but a different subtribe, Lupininae. *Lupinus* is the only genus in its subtribe with over 200 species, the majority of which are native to North America. Lupines are found throughout North America in a wide variety of habitats. Several species occur in the same habitats as gorse along the Pacific Coast.

The tribe Genisteae segregates with a group of tribes referred to as the "Genistoid Alliance". Other tribes in the Genistoid Alliance include Thermopsideae, Crotalarieae, some Sophoreae, which occur in North America, and several other tribes that are absent from North America (Polhill et al., 1981; Doyle, 1995; Crisp et al., 2000). The Thermopsideae includes 33 species in three genera that are native to North America: *Thermopsis* (10 species), *Baptisia* (22 species), and *Pickeringia* (1 species). Native *Baptisia* species are found exclusively to the east of the Rocky Mountains (USDA-NRCS, 2008). And only two *Thermopsis* species grow in Pacific Coast states. The Crotolarieae in North America consists of one genus, *Crotalaria*, containing nine native species, most of which are distributed in the southeastern United States. The Sophoreae includes one genus in the United States, *Sophora*, which is represented by seven native species with distributions largely in warmer regions of the United States. Only one species is native to regions where gorse is invasive, *Sophora leachiana*, endemic to southwest Oregon.

IV. Environmental Consequences

A. No Action

1. Impact of Gorse

a. Native Plants

Gorse is an invasive pioneer species that rapidly excludes native plants and desirable forage species. As a strong competitor, it often forms dense monotypic stands and reduces ecosystem diversity (Figure 1).

b. Soil

Gorse alters soil properties. Sites infested with gorse on the Washington Coast were found to have increased organic matter, increased total nitrogen, and decreased pH compared to uninfested control sites (Scott, 2005). The changes increased with the duration of gorse infestation and were persistent following removal of gorse.

c. Livestock

Livestock will not forage on gorse due to its sharp spines, and pasture plants growing under or beside gorse are often avoided as well (Matthews, 1982). In regions that are heavily infested with gorse, pastures must be constantly grazed to keep gorse seedlings from growing. Leaving a pasture fallow for just a year or two can render it useless as the gorse seedlings grow beyond a palatable size.

c. Human health

Dense gorse stands are impenetrable and hazardous to humans, livestock, and larger wildlife. The sharp thorns can inflict painful wounds and deter access, making control of gorse a challenge.

d. Recreation

The lawns of homes and parks in gorse-infested areas are often interlaced with short pain-inflicting gorse plants causing a detrimental effect to their recreational value.

e. Fire hazard

The flammability of gorse creates a dangerous fire hazard. In 1936, the town of Bandon, Oregon was burned down by a gorse-fueled wildfire, resulting in loss of human life (McClintock, 1974).

f. Economic impacts

Gorse has significant impacts on the coastal forest industry. Gorse grows faster than most conifer seedlings and can impede reforestation efforts, reducing tree seedling survival by an estimated 50 percent (Radtke and Davis, 2000) and eventual tree stand density (Richardson and Hill, 1998). Later in the rotation, it can compete with trees for water, light, and nutrients, impede access for pruning and thinning, and ultimately reduce harvestable volumes of timber (Morin et al., 1998). In Oregon, its economic impact was estimated to cost $1.22 million per year, with a loss equivalent of 40 sector jobs (Radtke and Davis, 2000).

g. Beneficial uses

Gorse has a few beneficial qualities (Hoshovsky, 1986; Clements et al., 2001). It was originally introduced as living fence around homes and to contain livestock. Prior to developing hard spines, the young shoots of gorse are good fodder for cattle and sheep. The leaf-buds of gorse make a substitute for tea. Gorse's fragrant yellow flowers have been used as a dye and to make gorse wine. Cut gorse is an excellent fuel for starting a fire. Soap can be made from ashes of burned gorse. Some used its wood to make pencils and knick-knacks in Bandon, Oregon. All of these minor beneficial uses are historical and no longer a common practice today.

2. Impact from Use of Other Control Methods

The continued use of chemical herbicides, and mechanical, cultural, and biological controls at current levels would be a result if the "no action" alternative is chosen. These environmental consequences may occur even with the implementation of the biological control alternative, depending on the efficacy of *S. staphylinus* to reduce gorse populations in the contiguous United States.

a. Chemical Control

Broadcast herbicide sprays are often effective, but they are less selective and create concerns about non-target effects. A disadvantage of killing large gorse plants with herbicide is that it leaves tangled stands of dead plants. Such stands interfere with the control of seedlings and present a fire hazard. Other disadvantages of some herbicides include the persistence of residues in soil (Johnson, 1985; Johnson et al., 1995), public disapproval, and the possibility of selecting for herbicide resistant weeds (Green at al., 1990). Any plant parts missed while spraying often re-sprout. Chemically treating large dense stands of gorse can be very difficult due to the difficulty in penetrating the stand.

b. Mechanical Control

Mechanical control can be effective but the gorse population quickly re-establishes itself through the seed-bank, especially after burning the resulting brush piles.

c. Cultural Control

Burning can reduce the size of the gorse plants and kill seed in the soil (Miller, 1992). However, one must take extreme caution to prevent fire from spreading off site. Also, this method promotes seedling germination so follow up treatment is necessary.

d. Biological Control

Two intentionally introduced biocontrol agents and one accidentally introduced natural enemy are already widespread on gorse in the western United States. (Coombs et al., 2004). *Exapion ulicis* (Forster) is a weevil (Coleoptera: Brentidae [= Apionidae]) first introduced to the United States in 1953. Adults generally do not cause much damage to plants. Only gorse seeds in the pods are attacked leaving the vast number of long-lived seeds already in the seed bank. *Tetranychus lintearius* (Dufour) is a spider mite (Acari: Tetranychidae) introduced to California and Oregon in 1994 and into Hawaii and Washington in 1995 (Coombs et al., 2004). The mite population exploded briefly after the introduction. Unfortunately, two natural enemies, *Phytoseiulus persimilis* and *Stethorus punctillum*, soon colonized and reduced gorse mite populations dramatically (Pratt et al., 2003), preventing its success. *Agonopterix nervosa* (Haworth) (Lepidoptera: Oecophoridae) is an accidentally introduced moth. It is not yet clear whether this insect is reducing gorse populations.

B. Issue Permits for Environmental Release of *Sericothrips staphylinus*

1. Impact of *S. staphylinus* on Nontarget Plants

Host specificity of *S. staphylinus* to gorse has been demonstrated through field observations and host specificity testing. If an insect species only attacks one or a few closely related plant species, the insect is considered to be very host-specific. Host specificity is an essential trait for a biological control organism proposed for environmental release.

a. Field Observations

In the field in Europe, *S. staphylinus* has been reported as host specific to *Ulex* species. (Pitkin, 1976). Other accounts have reported also finding it on *Ulex nanus, Galium* species, *Vicia cracca,* and *Lotus corniculatus* (Jacot-Guillarmod, 1971) as well as on a *Pinus* species (family Pinaceae) in Southern Europe (Maurullo, 1990). These off target reports are likely to represent transient individuals only resting on the plant or misidentifications as there was never any confirmation of reproduction.

b. Host Specificity Testing

Host specificity tests are tests to determine how many plant species *S. staphylinus* attacks, and whether nontarget species may be at risk. Host specificity studies for *S. staphylinus* were previously conducted in the laboratory for the biological control programs in New Zealand, Australia, and Hawaii (Hill et al., 2000).

In no-choice test results for both the U.S. and New Zealand programs, no

development by *S. staphylinus* occurred on the vast majority of non-target plants tested. Development occurred only on plants within the *Genista-Cytisus* complex (close relatives of gorse that are introduced to North America) and on *Vicia tetrasperma*, a vetch introduced from Europe. The number of thrips reaching the adult stage on these non-targets was very small compared with gorse controls. All of the plants that supported development are introduced to North America and have little or no economic value.

(1) Site of Quarantine Studies

Quarantine research studies were carried out at the Richardson Hall Quarantine Facility, Department of Forest Science, Oregon State University, Corvallis, Oregon, 97331

(2) Test Plant List

The list of plant species used for North American host specificity testing of *S. staphylinus* is shown in appendix 2. The strategy used for selecting plants for testing is based on the phylogenetic approach, where closely related species are thought to be at greater risk of attack than are distantly related species (Wapshere, 1974).

The total number of North American plant species tested was 135. Preference was given to testing species that grow within the gorse-invaded regions, especially the West Coast of the United States. For rare or protected species, a close relative in the same genus or tribe was tested as a surrogate because of difficulty in obtaining rare species.

(3) Experimental Design

No Choice Tests

The majority of plants used for testing were grown in a glasshouse from seeds. Exceptions were *Cytisus scoparius* var. 'moonlight', *Genista spachianus*, *Polygala chamaebuxus,* and *Vaccinium macrocarpon,* which were obtained as potted plants from nurseries; *Genista lydia*, which was grown from cuttings; and *Vicia nigrigans, Sophora leachiana, and Galium aparine*, which were transplanted from the field. Gorse control plants were grown from seeds collected from a variety of sites along the Oregon Coast. All of the plants, including the gorse controls, were potted in 13 x 16 cm (Diameter (D) x Height (H)) plastic pots and fertilized with one teaspoon of balanced time-released fertilizer each month.

Host specificity tests were carried out by caging thrips onto test plants (including gorse as a control) in a 'no-choice' situation. Test plants were individually caged in either a 6 x 30 cm or 13 cm x 30 cm (D x H) clear

plastic tube, depending on the size of the plant species. The side of each tube had a 15 cm square ventilation hole that was covered with 150 x 150 micron “no-thrips” screening. The cap had an 8 cm diameter ventilation hole that was also covered with “no thrips” screen fabric. The tube was securely inserted 2 cm into the potting media. The treatments were conducted at 21º C under artificial light with a 16:8 hour (Light:Dark) regime and approximately 80 percent humidity within the tubes. Five pairs of adult thrips were placed on the plant for a 10-day oviposition period. At the end of the 10-day period, the surviving adults were counted (to provide an estimate of adult survival) and removed. Oviposition (egg laying) was not assessed due to the difficulty in finding the eggs non-destructively. Instead, positive host use was measured by the development of an F1 generation (first filial generation, the offspring resulting from a parental cross) of nymphs and adults. The test plants were maintained in the tube cage for 32 days after removing the initial adults, at which time they were thoroughly searched under magnification for the presence of nymphs and adults.

In the event that thrips development occurred on a non-target plant, those thrips were placed back on to the caged plant (or a new plant of the same species) and monitored for an additional 42 days to determine if the F1 generation was able to reproduce on the non-target host.

Impact on the target plant

In order to measure the potential impact of *S. staphylinus* on gorse seedlings, twelve seedlings (approximately 5-cm tall at the start) were caged without the insects and the plants were measured through time. Six cages received five male and five female thrips and six received no thrips. Plant height was measured every seven days. After 74 days, the plants were harvested and the roots cleaned. Biomass of roots and shoots were measured separately after drying the plants in a drying oven for 24 hours.

The experiment was repeated with larger plants (small bushes 30–40 cm in height) using the same number of replicates and the same number of thrips per treated plant. The experiment was run for 112 days.

(4) Results and Summary

Survival of adults in no-choice tests

Adult 10-day survival varied greatly among test plants (Figure 5). On average, 7.56 ± 0.19 of 10 adults survived the 10-day exposure period on gorse (N=115 plants tested), while the mean number surviving on the non-target plants ranged from 0 to 7.8 (N=6 plants tested of each species). The mean survival rate for gorse was higher than all other tested plant species

with the exception of *Lupinus caudatus*, where a higher survival rate may have arisen by chance. Survival on *L. caudatus* was not higher than gorse controls when compared directly with the six gorse plants that served as controls for the test set.

Reproduction and development in no-choice tests

On 58 of the 63 tested non-target plants, no new generation thrips were found at the end of the 37-day development period (Appendix 2). On five non-target test plant species, reproduction and development to adulthood did occur, but at much reduced levels (1 to 11 percent) compared to gorse controls. At the end of the development period, a mean of 0.17 ± 0.17 adults and 0.5 ± 0.34 nymphs was found on *Cytisus praecox*, 1.0 ± 0.26 adults and 1.83 ± 1.28 nymphs on *Genista monspessulana*, 5.83 ± 2.91 adults and 12.33 ± 4.43 nymphs on *Genista canariensis*, 5.5 ± 2.87 adults and 1.67 ± 0.92 nymphs on *Petteria ramentacea*, and 8.50 ± 3.93 adults and 5.33 ± 1.14 nymphs on *Vicia tetrasperma*. On gorse, the mean number of adults was 76.52 ± 3.53 and the mean number of nymphs was 7.84 ± 0.90. In all cases, F1 adults that developed on non-target plants did not successfully reproduce a second time; no nymphs or adults were found on any of these plants after an additional 42 days.

Risk to non-target plants

The risk of impact to non-target plants is extremely low. Five introduced non-target plant species were able to support low levels of development of *S. staphylinus* for one generation: *Chamaecytisus palmensis* (in New Zealand studies, Appendix 1), *Petteria ramentacea*, *Genista monspessulana*, *Genista canariensis*, and *Vicia tetrasperma*. All five are introduced to North America, but none are considered economically important. The first four are close relatives of gorse in the Genista-Cytisus complex (=subtribe Genistinae). *Chamaecytisus palmensis* (tagasaste) has been used as a fodder plant in Australia, but is not used as such in North America. *Petteria ramentacea* is an uncommon ornamental plant introduced from southeastern Europe. *Genista monspessulana* is listed as a noxious weed in California and is also a target of biological control (Coombs et al., 2004). *Genista canariensis* (Canary broom), has been introduced into California and Washington. The fifth species, *V. tetrasperma*, is in the same subfamily as gorse, but otherwise is not closely related. In its native Europe, this plant can be found in the same habitats as gorse. Here in North America, it is considered weedy and occurs in disturbed areas and waste places as well as intermixed with gorse in coastal dunes. Five other tested *Vicia* species, four from the mainland United States and one from Hawaii (Hill et al., 2001), did not support development of the thrips.

In specificity tests, the development rate (measured as the number of F1 adults successfully developing) on these non-target plants ranged from 1 percent to 11 percent of what was observed on gorse. None of these non-target plants supported a second generation when the F1 adults were left on the plants. Because *S. staphylinus* populations are unable to build up on non-target plants, no adverse impacts are expected on these plants.

2. Impact of *S. staphylinus* on gorse

Five pairs of *S. staphylinus* and their offspring were capable of stopping stem growth of seedlings within 30 days and caused their mortality within 65 days (Figure 3). The first seedling mortality occurred at 44 days and all six plants with thrips were dead by day 65. On day 79, the above and below ground biomass (now dead) of gorse exposed to thrips was reduced by 66.3 and 85.1 percent, respectively, compared to the controls (Figure 4). When the same number of thrips were placed on larger plants (30-40 cm height to start), they took much longer to slow plant growth (Figure 5). Measurements were terminated when the control plants filled the volume of the tube cages (112 days). At this point, the biomass of plants with thrips was reduced by approximately 25 percent (Figure 6).

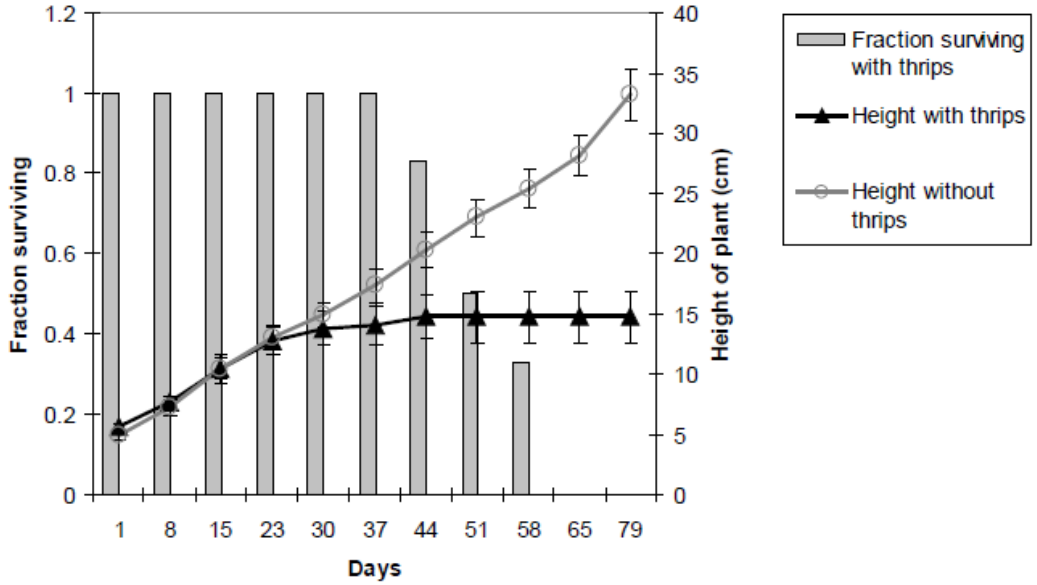

Figure 3. Impact of gorse thrips on gorse seedling growth and survival. Bars represent the fraction of thrips-infested plants surviving and lines represent plant heights through time. All plants with thrips were dead by day 65, while all control plants survived (Grevstad et al., 2012).

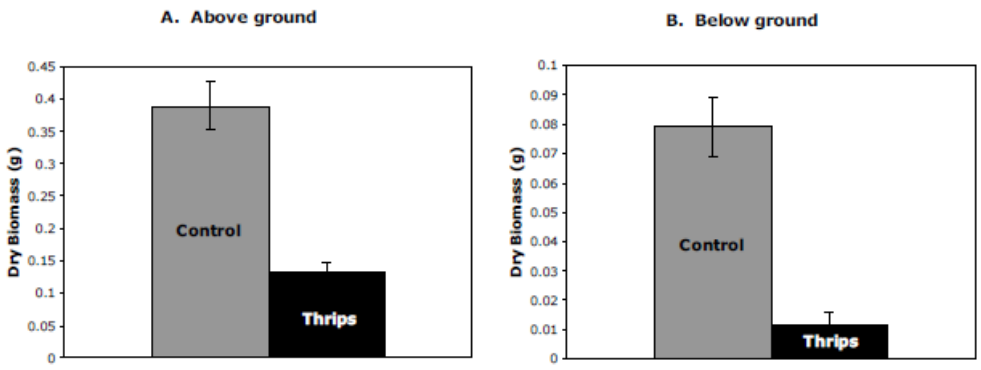

Figure 4. Impact of gorse thrips on (A) above-ground and (B) below-ground biomass of gorse seedlings after 79 days of exposure (Grevstad et al., 2012).

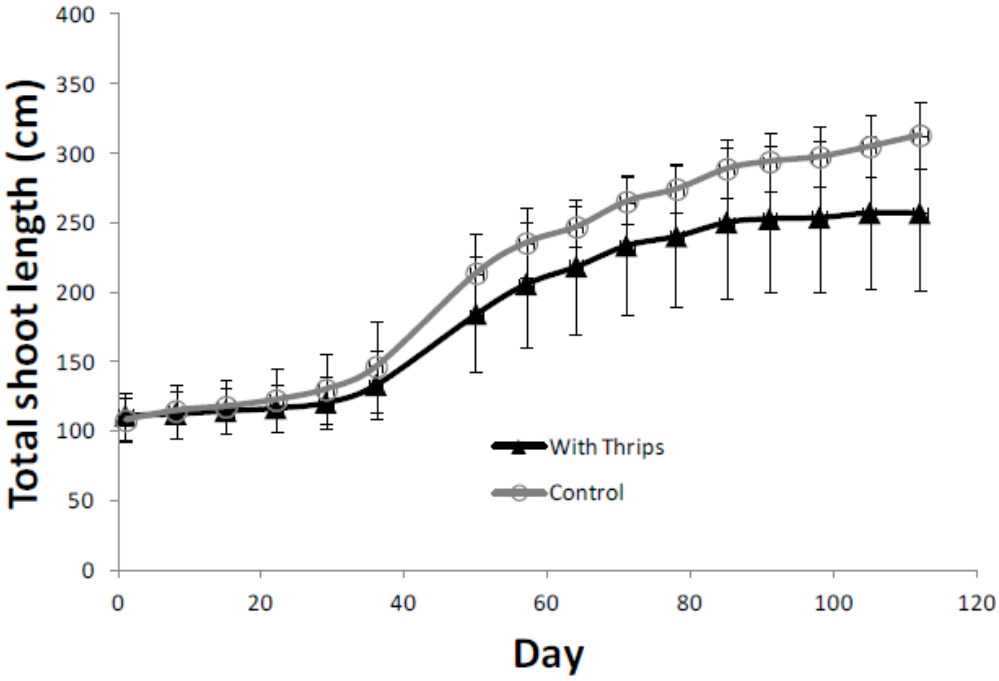

Figure 5. Impact of gorse thrips on growth of small gorse bushes. Data points represent the mean of the total shoot length (including primary and secondary shoots) through time. All plants were still alive at the end of the experiment (Grevstad et al., 2012).

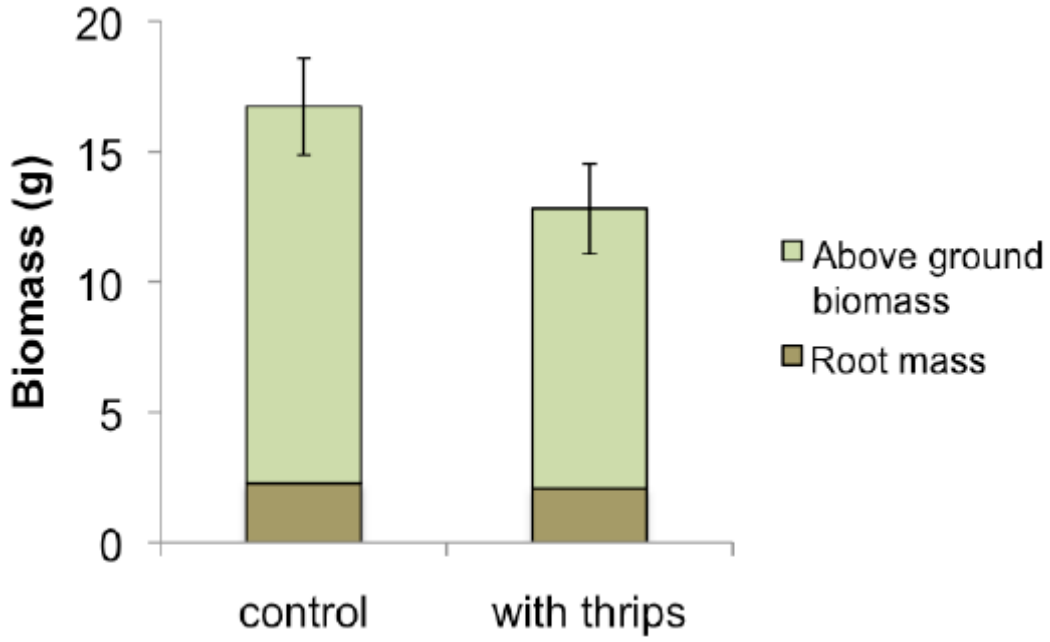

Figure 6. Impact of gorse thrips on final dry biomass of small gorse bushes after 112 days exposure (Grevstad et al., 2012).

3. Uncertainties Regarding the Environmental Release of *S. staphylinus*

Once a biological control agent such as *S. staphylinus* is released into the environment and becomes established, there is a possibility that it could move from the target plants (gorse) to attack nontarget plants. Host shifts by introduced weed biological control agents to unrelated plants are rare (Pemberton, 2000). Native species that are 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 *S. staphylinus*, the resulting effects could be environmental impacts that may not be easily reversed. Biological control agents such as *S. staphylinus* 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, this agent may not be successful in reducing gorse populations in the contiguous 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 gorse by *S. staphylinus* will not be known until after release occurs and post-release monitoring has been conducted (Appendix 3). Although based on research presented in this document, *S. staphylinus* is expected to have an impact on gorse (Grevstad et al., 2012), it has not caused noticeable damage to gorse where it has

been released in Australia, New Zealand, or Hawaii because it has not reached damaging population levels (Ireson et al., 2008a;b).

4. 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).

Other private and public concerns work to control gorse in invaded areas using available chemical, mechanical, cultural, and biological control methods, as described in this document. In North America, gorse is most often a pest of disturbed sites in open wild or less-developed areas, where management is minimal or non-existent. It is most prolific in the maritime climate within a few miles of the ocean, where sandy soils and rocky outcrops are especially vulnerable to invasion. Gorse is known to co-occur with other invasive weeds that may be subject to control such as French broom (*Genista monspessulana*), Scotch broom (*Cytisus scoparius*), and common St. Johnswort (*Hypericum perforatum*), and these species are also targets of weed biological control programs.

Release of *S. staphylinus* is not expected to have any negative cumulative impacts in the contiguous United States because of its host specificity to gorse. Effective biological control of gorse will have beneficial effects for weed management programs, and may result in a long-term, non-damaging method to assist in the control of gorse where it has invaded.

5. 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.

In the contiguous United States, there are 42 plants that are federally-listed or proposed for listing, and 15 candidate or "under review" plants in the family Fabaceae, the same family as the target weed (Appendix 4). Closely related plants to the target weed are those that would most likely be affected by a biocontrol agent. However, based on the host specificity of *S. staphylinus* reported in testing and field observations, APHIS has determined that environmental release of *S. staphylinus* may affect, but is not likely to adversely affect these plant species or their critical habitats.

APHIS has also determined that *S. staphylinus* may affect beneficially the western snowy plover (*Charadrius alexandrinus nivosus*) and its critical habitat, the mission blue butterfly (*Icaricia icarioides missionensis*), and the San Bruno elfin butterfly (*Callophrys mossii bayensis*) because gorse is invading the habitat of these species.

A biological assessment was prepared and submitted to the U.S. Fish and Wildlife Service (FWS) and is part of the administrative record for this EA (prepared by T.A. Willard, Nov. 4, 2016). APHIS requested concurrence with these determinations from the FWS and received a concurrence letter dated October 12, 2018.

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 *S. staphylinus* and 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 *S. staphylinus.*

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…."

APHIS is consulting and collaborating 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 *S. staphylinus* on August 5, 2014. TAG members that reviewed the release petition (Grevstad et al., 2012) included USDA representatives from Forest Service, and Plant Protection and Quarantine; U.S. Department of Interior's Bureau of Indian

Affairs and Bureau of Land Management; Environmental Protection Agency; U.S. Army Corps of Engineers; and representatives from California Department of Food and Agriculture (National Plant Board), SAGARPA-Mexico, and Agriculture and Agri-Food Canada.

This EA was prepared by personnel at APHIS and Oregon State University. The addresses of participating APHIS units, cooperators, and consultants 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
Regulations, Permits, and Manuals
4700 River Road, Unit 133
Riverdale, MD 20737

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Appendix 1. Plants on which *Sericothrips staphylinus* was previously tested in biological control programs in New Zealand, Australia, and Hawaii. Only plants that are present in North America are included. Legend: N=native, I=introduced, O=no-choice oviposition test, R=reproduction (oviposition and development combined), F=no-choice feeding test, S=no-choice survival test, D=no-choice development test, LC=lab choice test (oviposition), FC=field choice test (oviposition) (Grevstad et al., 2012).

					Development no-choice, [lab choice], (field choice)	
Taxon	Species	TAG Cat.	Nativity	Tests performed	F1 Nymphs	F1 Adults
Subclass Rosidae						
Family Fabaceae						
Subfamily Papilionoideae						
Tribe Genisteae [G]						
Subtribe Genistinae	*Ulex europeaus*	1	I	R, S, [LC], (FC)	110, [44.7], (15)	86.6, [4.3], (24)
	Cytisus striatus	3	I	R, S	0	0
	Cytisus scoparius	3	I	R, S, [LC]	2, [0]	0, [0]
	Chamaecytisus palmensis	3	I	R, S, [LC]	5, [0]	1, [10]
	Genista pilosa	3	I	R, S	0	0
	Genista tinctoria	3	I	R, S	0	0
	Genista monspessulana	3	I	R, S	0	0
	Genista hispanica	3	I	R, S	0	0
	Laburnum anagyroides	3	I	R, S	0	0
	Spartium junceum	3	I	R, S	0	0
Subtribe Lupininae	*Lupinus arboreus*	3	N	R, S, [LC]	1, [0]	0, [0]
	Lupinus littoralis	3	N	R, S	0	0
	Lupinus polyphyllus	3	N	R, S	0	0
	Lupinus albifrons	3	N	R, S	0	0
	Lupinus angustifolius	3	I	R, S, [LC]	0, [0]	0, [0]
	Lupinus latifolius	3	N	R, S	0	0
	Lupinus lepidus	3	N	R, S	0	0
	Lupinus sp.	3	I	R, S, (FC)	0, (0.3)	0, (0.3)
Tribe Sophoreae [G]	*Sophora chrysophylla*	3	I	R, S, [LC]	2, [0]	0, [0]
	Sophora microphylla	3	I	R, S	0	0
	Sophora prostrata	3	I	R, S	0	0
Tribe Crotalarieae [G]	*Crotalaria cunninghamii*	3	I	R, F	0	0
Tribe Desmodieae	*Desmodium sp.*	3	I	R, S	0	0
Tribe Galegeae	*Clianthus puniceus*	3	I	R, F	0	0
	Colutea arborescens	3	I	R, S	0	0
Tribe Indigofereae	*Indigofera australis*	3	I	R, F	0	0
Tribe Loteae	*Lotus corniculatus*	3	I	R, S, (FC)	0, (0.3)	0, (0)
	Lotus pedunculatus	3	I	R, F	0	0
Tribe Mirbelieae	*Kennedia prostrata*	3	I	R, F	0	0
	Oxylobium ellipticum	3	I	R, F	0	0
Tribe Phaseoleae	*Erythrina sandwicensis*	3	I	R, S	0	0
	Hardenbergia violacea	3	I	R, F	0	0
	Lablab purpureus	3	I	R, F	0	0
	Macroptilium atropurpureum	3	N	R, F	0	0
	Phaseolus vulgaris	3	I	R, S, [LC]	0, [0]	0, [0]
	Vigna radiata	3	I	R, F	0	0
Tribe Psoraleeae	*Psoralea pinnata*	3	I	R, S	0	0

Taxon	Species	TAG Cat.	Nativity	Tests performed	Development no-choice, [lab choice], (field choice) F1 Nymphs	F1 Adults
Tribe Robinieae	*Robinia pseudoacacia*	3	N			
Tribe Tephrosieae	*Wisteria sinensis*	3	I	R, S	0	0
Tribe Trifolieae	*Medicago sativa*	3	I	R, S, (FC)	2, (0.6)	0, (1)
	Trifolium ambiguum	3	I	R, S	0	0
	Trifolium hybridum	3	I	R, S	0	0
	Trifolium pratense	3	I	R, F (FC)	0, (0)	0, (1)
	Trifolium repens	3	I	R, S, [LC]	0, [0]	0, [0]
	Trifolium subterraneum	3	I	R, F	0	0
	Trifolium sp.	3	I	R, F	0	0
Tribe Vicieae	*Glycine max*	3	I	R, F	0	0
	Glycine max cv. "Evans"	3	I	R, F	0	0
	Lathyrus littoralis	3	N	R, S	0	0
	Lens culinaris	3	I	R, F	0	0
	Pisum sativum	3	I	R, S	0	0
	Vicia faba ∞	3	I	R, S	0	0
	Vicia sativa	3	I	R, S	0	0
Subfamily Mimosoideae						
Tribe Acaciaeae	*Acacia dealbata*	3	I	R, S	0	0
	Acacia mearnsii	3	I	R, F	0	0
	Acacia melanoxylon	3	I	R, F	0	0
Family Myrtaceae	*Eucalyptus sp.*	5	I	R, S	0	0
	Metrosideros collina	5	I	R, S	0	0
	Psidium guajava	5	I	R, S	0	0
Family Proteaceae	*Grevillea robusta*	5	I	R.S.	0	0
	Grevillea rosmarinifolia	5	I	R.S.	0	0
	Macadamia integrifolia	5	I	R, S	0	0
Family Rosaceae	*Rosa sp.*	5	I	R, S	0	0
Other Subclasses						
Family Araceae	*Anthurium andreanum*	6	I	R, S	0	0
Family Aceraceae	*Saccharum officinarum*	6	I	R, S	0	0
Family Brassicaceae	*Brassica sp.*	6	I	R, S	0	0
Family Bromeliaceae	*Ananas comosus*	6	I	R, S	0	0
Family Caricaceae	*Carica papaya*	6	I	R, S	0	0
Family Convulvulaceae	*Ipomea batata*	6	I	R, S	0	0
Family Gramineae	*Pennisetum clandestinum*	6	I	R, S	0	0
Family Musaceae	*Heliconia sp.*	6	I	R, S	0	0
Family Orchidaceae	*Phalaenopsis sp.*	6	I	R, S	0	0
Family Rubiaceaa	*Coffea arabica*	6	I	R, S	0	0
Family Convolvulaceae	*Ipomoea batatas*	6	I	R, F	0	0
Family Zingiberaceae	*Hedychium coronarium*	6	I	R, S	0	0
	Zingiber officinale	6	I	R, S	0	0
Family Asteraceae	*Lactuca sativa*	6, 7	I	R, S	0	0
Family Pinaceae	*Pinus sylvestris*	6, 7	I	R, S	0	0

[G] Tribes within the genistoid alliance.

Appendix 2. Results of no-choice tests of the gorse thrips *Sericothrips staphylinus* on native and economically important plants in North America. These results supplement earlier testing carried out for other biocontrol programs (see Appendix 1). Ten adult gorse thrips were caged onto plants for a 10-day period and the plant was thoroughly searched for nymphs and adults after 35 days. Listed are the mean number of nymphs and adults (plus standard error) found per plant (Grevstad et al., 2012).

Taxon	Species	TAG Cat.	Nativity	Reps.	F1 Nymphs	F1 Adults
Family Fabaceae						
Subfamily Papilionoideae						
Tribe Genisteae[G]						
Subtribe Genistinae	*Ulex europeaus*	1	I	120	11.19 ± 1.30	61.96 ± 3.68
	*Genista canariensis**	3	I	6	12.33 ± 4.43	5.83 ± 2.91
	Genista lydia	3	I	6	0	0
	Genista monspessulana	3	I	6	1.83 ± 1.28	1.00 ± 0.26
	Petteria ramentacea	3	I	6	1.67 ± 0.92	5.50 ± 2.87
	*Cytisus praecox**	3	I	6	0.5 ± 0.34	0.17 ± 0.17
	*Cytisus battandieri**	3	I	5	0.4 ± 0.4 **	0
	*Cytisus nigicans**	3	I	6	0	0
	Cytisus scoparius cv. 'moonlight'	3	I	6	0	0
	Cytisus striatus[R]	3	I	6	0	0
	*Cytisus spachianus**	3	I	6	0	0
Subtribe Lupininae	*Lupinus albicaulis*	3	N	6	0	0
	*Lupinus albifrons**	3	N	6	0	0
	Lupinus arboreus[R]	3	N	6	0	0
	Lupinus argenteus	3	N	6	0	0
	Lupinus bicolor	3	N	6	0	0
	Lupinus caudatus	3	N	6	0	0
	Lupinus littoralis[R]	3	N	6	0	0
	Lupinus perennis	3	N	6	0	0
	Lupinus polyphyllus[R]	3	N	6	0	0
	*Lupinus rivularis** [R]	3	N	6	0	0
	Lupinus sulphureus var. kinc.	3, 4	N	6	0	0
	*Lupinus texensis**	3	N	6	0	0
Tribe Sophoreae[G]	*Sophora leachiana*	3	N	6	0	0
	*Cladastris kentukia**	3	N	9	0	0
Tribe Thermopsideae[G]	*Baptisia australis*	3	N	6	0	0
	Pickeringia montana	3	N	6	0	0
	*Thermopsis montana**	3	N	6	0	0
Tribe Crotolariae[G]	*Crotolaria purshii**	3	N	3	0	0
	*Crotolaria sagitallis**	3	N	6	0	0
Tribe Aeschynomeneae	*Aeschynomene americana*	3, 4	N	6	0	0
Tribe Amorpheae	*Amorpha fruticosa*	3, 4	N	6	0	0
Tribe Cicereae	*Cicer arietinum**	3	I	6	0	0
Tribe Desmodieae	*Lespedeza capitata*	3, 4	N	6	0	0
Tribe Galegeae	*Astragalus tener var. titi*	3, 4	N	6	0	0
	*Astragalus canadensis**	3	N	6	0	0
	Astragalus cicer	3	I	6	0	0
	Astragalus purshii	3	N	6	0	0

Taxon	Species	TAG Cat.	Nativity	Reps.	F1 Nymphs	F1 Adults
	Oxytropis campestris	3, 4	N	6	0	0
Tribe Hedysareae	*Hedysarum boreale**	3	N	6	0	0
Tribe Loteae	*Securigera varia*	3	I	6	0	0
Tribe Phaseoleae	*Vigna unguiculata*	3	I	6	0	0
Tribe Psoraleeae	*Rupertia physodes**	3	N	6	0	0
Tribe Robineae	*Robinia pseudoacacia*	3	N	6	0	0
	Sesbania punicea	3, 4	I	6	0	0
Tribe Fabeae	*Lathyrus japonicus*	3	N	6	0	0
Tribe Loteae	*Lotus unifoliolatus* var. *unifol.*	3	N	6	0	0
	Lotus denticulatus	3	N	6	0	0
	Lotus micranthus	3	N	6	0	0
Tribe Trifolieae	*Medicago sativa*	3	I	6	0	0
	Trifolium willdenovii	3	N	6	0	0
	*Trifolium longipes**	3	N	6	0	0
	*Trifolium wormskioldii**	3	N	6	0	0
Tribe Vicieae	*Vicia americana*	3, 7	N	6	0	0
	Vicia nigricans spp. gigantea	3, 7	N	6	0	0
	Vicia tetrasperma	3, 7	I	6	5.33 ± 1.14	8.50 ± 3.93
Subfamily Caesalpinioideae						
Tribe Cercideae	*Cercis orbiculata*	3	N	6	0	0
Tribe Cassieae	*Chamaetocrista fasciculata*	3, 4	N	6	0	0
Tribe Caesalpinieae	*Hoffmannseggia glauca*	3, 4	N	3	0	0
Family Polygalaceae	*Polygala chamaebuxus*	6	I	6	0	0
Family Ericaceae	*Vaccinium macrocarpon*	6	N	6	0	0
Family Pinaceae	*Pseudotsuga menziesii*	6	N	6	0	0
Family Zygophyllaceae	*Larrea tridentata**	6	N	6	0	0
Family Rubiaceae	*Galium aparine*	6, 7	N	6	0	0

[G] Tribes within the genistoid alliance.

[R] Plant species previously tested, but retested for the North American program.

* Plants added in response to TAG review of proposed test plant list.

** Nymphs did not survive to adulthood.

Appendix 3. Protocol for releasing *S. staphylinus* and post-release monitoring

The researchers will adhere to the International Code of Best Practices for classical biological control of weeds in order to enhance efficacy and safety (Balciunas, 2000). Gorse thrips will be contained and reared in the Oregon State University Quarantine Facility until permits for release are obtained from the USDA and from the States of Oregon, Washington, and California. If the required permits are issued, a sample of 100 preserved thrips will be delivered to a qualified insect pathologist for examination. If the insects are found to be disease and parasite-free, they will be transferred for mass rearing to larger, non-quarantine greenhouse rearing facilities at Oregon State University in Corvallis and the Oregon Department of Agriculture in Salem. The starting culture for the released population will be the same as the culture used in host specificity tests (originating from Hawaii). Close inspection of thrips on gorse in Hawaii and in the quarantine facility has not revealed any closely related cryptic species that might be mixed in with the culture. Releases will be made as early as mid-March to coincide with gorse shoot growth and the onset of gorse thrips reproductive activity as observed in the field in Tasmania (which has a similar climate to Oregon) (Ireson et al., 2008b). If necessary, releases could be made up until early July, which would still allow the thrips one generation before onset of diapause which is expected in mid-August (Ireson et al., 2008b).

No more than five release sites are proposed in the first year in order to carefully monitor their performance and to survey for non-target host use. Releases will be made initially only into the State of Oregon, then subsequently into Washington and California. Releases will be coordinated by the researcher/permittee in collaboration with Oregon Department of Agriculture and Washington State University Extension Service as well as individual land owners and managers.

These initial releases will be made onto relatively isolated gorse bushes that are accessible on all sides to facilitate initial population monitoring. Because dispersal capability in gorse thrips develops only at high densities, population increase can initially be determined by surveying the entire bush. Dispersal away from these initial release points will be monitored using blue sticky traps (blue traps are more attractive for thrips than the usual yellow traps) placed on gorse plants at a range of distances from the initial release point. To confirm host specificity in the field, the researcher/permittee will survey non-target plants in the Fabaceae that happen to occur in the immediate vicinity. These are likely to include *Vicia tetrasperma, V. sativa, Lupinus rivularis, L. litoralis,* and *Cytisus scoparius.*

In the second year, following confirmation of field specificity to gorse, we will use a larger number of releases (~20) throughout the western invasive range of the weed. This larger number of releases will help to ensure that at least some of the gorse thrips establish in the best quality sites for rapid population growth.

Detectible impacts to gorse are not expected during the first year, but the researchers will begin measuring plants in order to detect impacts that may be seen in later years. Transects with permanent quadrats for repeated measures of plants through time will be set up at each release site and at nearby control sites. The size and number of individual plants (seedlings and mature) will be tracked within each quadrat. For each release, an identical transect will be set up at a

nearby site in a similar environment to serve as a control. Photographs of each plot will be made using a camera fixed on a tall pole.

Appendix 4. Federally listed, proposed, candidate, and under review plant species in the plant family Fabaceae in the contiguous United States.

Common Name	Impact/Effects	Conservation measure
San Clemente Island lotus (=broom) Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Aeschynomene americana*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect San Clemente Island lotus.	Monitor for non-target impacts at initial release sites.
Meadow joint-vetch Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Aeschynomene americana*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect meadow joint-vetch.	None
Sensitive joint-vetch Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Aeschynomene americana*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect sensitive joint-vetch.	Monitor for non-target impacts at initial release sites.
Crenulate lead-plant Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Amorpha fruticosa*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect crenulate lead-plant.	Monitor for non-target impacts at initial release sites.
Carolina lead-plant Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Amorpha fruticosa*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Carolina lead-plant.	None
Georgia lead-plant Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Amorpha fruticosa*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Georgia lead-plant.	None
Price's potato-bean Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested in the same Tribe as Price's potato bean (*Vigna unguiculata, Erythrina sandwicensis, Hardenbergia violacea, Lablab purpueus, Macroptilium,*	Monitor for non-target impacts at initial release sites.

	atropurpureum, Phaseolus vulgaris, and *Vigna radiata*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Price's potato-bean.	
Cushenbury milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the recovery plan, critical habitat notice, or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Cushenbury milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Shivwits milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the recovery plan, critical habitat notice, or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Shivwit's milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Applegate's milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Applegate's milk-vetch.	Monitor for non-target impacts at initial release sites.
Guthrie's (=Pyne's) ground-plum Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Guthrie's ground-plum.	Monitor for non-target impacts at initial release sites.
Braunton's milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the recovery plan, or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Braunton's milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Clara Hunt's milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible	Monitor for non-target impacts at initial release sites.

	damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Clara Hunt's milk-vetch.	
Sentry milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect sentry milk-vetch.	Monitor for non-target impacts at initial release sites.
Deseret milk-vetch Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Deseret milk-vetch.	Monitor for non-target impacts at initial release sites.
Holmgren milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the critical habitat listing notice, recovery plan, or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Holmgren milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Mancos milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Mancos milk-vetch.	Monitor for non-target impacts at initial release sites.
Huachuca milk-vetch Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Huachuca milk-vetch.	None
Isely milk-vetch Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Isely milk-vetch.	None
Lane Mountain milk-vetch	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse	Monitor for non-target impacts at

Endangered	(Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the critical habitat listing notice or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Lane Mountain milk-vetch or its critical habitat.	initial release sites.
Coachella Valley milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the critical habitat listing notice or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Coachella Valley milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Fish Slough milk-vetch Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the critical habitat listing notice, recovery plan, or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Fish Slough milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Peirson's milk-vetch Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the critical habitat listing notice or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect, Peirson's milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Skiff milkvetch Candidate	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect skiff milkvetch.	None
Heliotrope milk-vetch Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the recovery plan or listing notice. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect heliotrope milk-vetch or its	Monitor for non-target impacts at initial release sites.

	critical habitat.	
Osterhout milkvetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Osterhout milk-vetch.	Monitor for non-target impacts at initial release sites.
Ash meadows milk-vetch Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the recovery plan or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Ash Meadows milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Ventura Marsh Milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Gorse is not indicated to occur in the habitat of or as a threat to this plant in the critical habitat designation notice or 5-year review. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Ventura Marsh milk-vetch or its critical habitat.	Monitor for non-target impacts at initial release sites.
Jesup's milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Jesup's milk-vetch.	Monitor for non-target impacts at initial release sites.
[Unnamed] milk-vetch (*Astragalus sabulosus*) Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect *Astragalus sabulosus.*	None
Chapin Mesa milkvetch Candidate	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Chapin Mesa milk-vetch.	None
Coastal dunes milk-	*Sericothrips staphylinus* could feed on this plant, affecting its survival	Monitor for non-

vetch Endangered	and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect coastal dunes milk-vetch.	target impacts at initial release sites.
Triple-ribbed milk-vetch Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Astragalus canadensis, A. cecer, A. purshii,* and *A. tener* var. *titi*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect triple-ribbed milk-vetch.	Monitor for non-target impacts at initial release sites.
Hairy rattleweed Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Baptisia australis*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect hairy rattleweed.	Monitor for non-target impacts at initial release sites.
Apalachicola wild indigo Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Baptisia australis*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Apalachicola wild indigo.	None
[Unnamed] wild indigo Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Baptisia australis*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect wild indigo.	None
Big Pine partridge pea Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different subfamily (Caesalpinioideae) and Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Chamaetocrista fasciculata*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Big Pine partridge pea.	Monitor for non-target impacts at initial release sites.
Pigeon wings Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested in the same Tribe as pigeon wings (*Vigna unguiculata, Erythrina sandwicensis, Hardenbergia violacea, Lablab purpueus, Macroptilium, atropurpureum, Phaseolus vulgaris*, and *Vigna radiata*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect pigeon wings.	Monitor for non-target impacts at initial release sites.
Avon Park harebells	*Sericothrips staphylinus* could feed on this plant, affecting its survival	Monitor for non-

Endangered	and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested (*Crotolaria purshii*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Avon Park harebells.	target impacts at initial release sites.
Florida prairie-clover Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested in the same Tribe as leafy prairie-clover (*Amorpha fruticosa*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Florida prairie-clover.	Monitor for non-target impacts at initial release sites.
Leafy prairie-clover Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested in the same Tribe as leafy prairie-clover (*Amorpha fruticosa*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect leafy prairie-clover.	Monitor for non-target impacts at initial release sites.
Small's milkpea Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested in the same Tribe as Small's milkpea (*Vigna unguiculata, Erythrina sandwicensis, Hardenbergia violacea, Lablab purpueus, Macroptilium, atropurpureum, Phaseolus vulgaris*, and *Vigna radiata*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Small's milkpea.	Monitor for non-target impacts at initial release sites.
[Unnamed] bush-pea (*Genistidium dumosum*) Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and *reproduction*. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* on any *Trifolium* species tested (*Trifolium longipes, T. willdenovii, T. wormskioldii, Trifolium ambiguum, T. hybridum, T. pratense, T. repens, T. subterraneum*) the surrogate species in the same Tribe as *Genistidium dumosum* (*Sesbania punicia and Robinia pseudoacacia*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect *Genistidium dumosum*.	None
Slender rush-pea Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different subfamily. No development of *S. staphylinus* occurred on the surrogate (*Lespedeza capitata*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect slender rush-pea.	Monitor for non-target impacts at initial release sites.
Prairie bush-clover Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate (*Lespedeza capitata*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely	Monitor for non-target impacts at initial release sites.

	affect prairie bush-clover.	
Scrub lupine Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), and in the same Tribe (Genisteae), but in a different sub-tribe. No development of *S. staphylinus* occurred on any *Lupinus* species tested (*Lupinus albicaulis, L. albifrons, L. arboreus, L. argenteus, L. bicolor, L. caudatus, L. littoralis, L. perennis, L. polyphyllus, L. rivularis, L. sulphureus var. kincaidii, L. texensis, Lupinus arboreus, L. littoralis, L. polyphyllus, L. albifrons, L. angustifolius, L. latifolius*, and *L. lepidus*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect scrub lupine.	Monitor for non-target impacts at initial release sites.
The Lassics lupine Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), and in the same Tribe (Genisteae), but in a different sub-tribe. No development of *S.staphylinus* occurred on any *Lupinus* species tested (*Lupinus albicaulis, L. albifrons, L. arboreus, L. argenteus, L. bicolor, L. caudatus, L. littoralis, L. perennis, L. polyphyllus, L. rivularis, L. sulphureus var. kincaidii, L. texensis, Lupinus arboreus, L. littoralis, L. polyphyllus, L. albifrons, L. angustifolius, L. latifolius*, and *L. lepidus*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect The Lassics lupine.	None
Nipomo Mesa lupine Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), and in the same Tribe (Genisteae), but in a different sub-tribe. No development of *S. staphylinus* occurred on any *Lupinus* species tested (*Lupinus albicaulis, L. albifrons, L. arboreus, L. argenteus, L. bicolor, L. caudatus, L. littoralis, L. perennis, L. polyphyllus, L. rivularis, L. sulphureus var. kincaidii, L. texensis, Lupinus arboreus, L. littoralis, L. polyphyllus, L. albifrons, L. angustifolius, L. latifolius*, and *L. lepidus*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Nipomo Mesa lupine.	Monitor for non-target impacts at initial release sites.
Kincaid's Lupine Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), and in the same Tribe (Genisteae), but in a different sub-tribe. No development of *S. staphylinus* occurred on any *Lupinus* species tested (*Lupinus albicaulis, L. albifrons, L. arboreus, L. argenteus, L. bicolor, L. caudatus, L. littoralis, L. perennis, L. polyphyllus, L. rivularis, L. sulphureus var. kincaidii, L. texensis, Lupinus arboreus, L. littoralis, L. polyphyllus, L. albifrons, L. angustifolius, L. latifolius*, and *L. lepidus*), and there was no visible damage on plants. Gorse is not a threat to the habitat of this species (FWS, 2010). Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Kincaid's lupine or its designated critical habitat.	Monitor for non-target impacts at initial release sites.
Clover lupine Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), and in the same Tribe (Genisteae), but in a different sub-tribe. No development of *S. staphylinus* occurred on any *Lupinus*	Monitor for non-target impacts at initial release sites.

	species tested (*Lupinus albicaulis, L. albifrons, L. arboreus, L. argenteus, L. bicolor, L. caudatus, L. littoralis, L. perennis, L. polyphyllus, L. rivularis, L. sulphureus var. kincaidii, L. texensis, Lupinus arboreus, L. littoralis, L. polyphyllus, L. albifrons, L. angustifolius, L. latifolius*, and *L. lepidus*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect clover lupine.	
Fassett's locoweed Threatened	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate (*Oxytropis campestris*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Fassett's locoweed.	Monitor for non-target impacts at initial release sites.
Three-nerved scurf-pea Under review	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on the surrogate species tested in the same Tribe (*Rupertia physodes* and *Psoralea pinnata*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect the three-nerved scurf-pea.	None
Showy Indian clover Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* occurred on any *Trifolium* species tested (*Trifolium longipes, T. willdenovii, T. wormskioldii, Trifolium ambiguum, T. hybridum, T. pratense, T. repens, T. subterraneum*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect the showy Indian clover.	Monitor for non-target impacts at initial release sites.
Frisco clover Candidate	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* on any *Trifolium* species tested (*Trifolium longipes, T. willdenovii, T. wormskioldii, Trifolium ambiguum, T. hybridum, T. pratense, T. repens, T. subterraneum*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect the Frisco clover.	None
Running buffalo clover Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* on any *Trifolium* species tested (*Trifolium longipes, T. willdenovii, T. wormskioldii, Trifolium ambiguum, T. hybridum, T. pratense, T. repens, T. subterraneum*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect the running buffalo clover.	Monitor for non-target impacts at initial release sites.
Monterey clover Endangered	*Sericothrips staphylinus* could feed on this plant, affecting its survival and reproduction. This plant occurs in the same family as gorse (Fabaceae), but in a different Tribe. No development of *S. staphylinus* on any *Trifolium* species tested (*Trifolium longipes, T. willdenovii, T. wormskioldii, Trifolium ambiguum, T. hybridum, T. pratense, T. repens, T. subterraneum*), and there was no visible damage on plants. Therefore, APHIS has determined that release of *S. staphylinus* may	Monitor for non-target impacts at initial release sites.

	affect, but is not likely to adversely affect the Monterey clover.	
Ocala vetch Under review	In tests, there was no development and no signs of plant impact on both North American *Vicia* plants tested (*Vicia americana* and *V. nigricans ssp. gigantea*) and on introduced *V. faba,* and *V. sativa*. A small amount of development occurred on the introduced plant *Vicia tetrasperma*. However, the native *Vicia* species are more appropriate surrogates, as *V. tetrasperma* is genetically distinct from all North American *Vicia* species (Schaefer et al., 2012). *Vicia ocalensis* occurs in Florida, and gorse does not occur in Florida. Since the introduction of the gorse thrips in Hawaii and New Zealand, there have been no reports of any impacts on non-target plant species, including *Vicia menziesii*. Therefore, APHIS has determined that release of *S. staphylinus* may affect, but is not likely to adversely affect Ocala vetch.	None

Appendix 5. Response to Comments

Notice of this EA was made available in the Federal Register on August 20, 2019 for a 30-day public comment period. APHIS received 10 comments on the EA by the close of the comment period. Most comments (8) were in favor of the release of the biological control agent. Two commenters were not in favor of and raised concerns regarding the release of the insect. These concerns are addressed below.

1. Why does USDA allow nurseries to sell gorse and then is asking taxpayers for money to control it?

The release of *Sericothrips staphylinus* is not a USDA program or action, although USDA may support and fund various biological control efforts for a wide variety of pests. Through the Plant Protection Act of 2000, the USDA, Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Pests, Pathogens, and Biocontrol Permits (PPBP) has authority to regulate the release of biological control organisms into the environment and thus must issue a permit for this activity. PPBP is not using taxpayer dollars for this proposed action other than the cost of salaries for employees to complete the regulatory work required before the organism is approved for release into the environment.

Gorse was introduced into North America from Western Europe in the late 1800's, before the existence of APHIS (established in 1972), and possibly even the USDA, which was established in 1862. APHIS prohibits the importation and interstate movement of Federal noxious weeds, but they must meet the definition of a quarantine pest. A quarantine pest is defined as "a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled." Gorse does not meet this definition and it is not on the Federal noxious weed list. Because it is not on the Federal noxious weed list, APHIS does not regulate the importation or interstate movement of gorse. However, States can regulate it.

2. The environmental assessment failed to point out that the insect also eats carrots, cucumbers, peas and beans thus exacerbating the situation.

Response: The environmental assessment summarizes the extensive testing that was carried out to determine whether the gorse thrips (*Sericothrips staphylinus*) was capable of using and damaging other plant species. A total of 140 North American plant species were tested including native and economically important species as well as some introduced ornamental and weedy species. In these tests, no native or economically important plant species supported development of the gorse thrips. The commenter may have been confusing information about plants fed on by thrips in general (the insect order Thysanoptera). Certainly there are some thrips species that attack the plants in question, but the particular species of thrips that is proposed for introduction (*Sericothrips staphylinus*) does not feed or develop on the mentioned crop plants or any other native or economically important plants in North America.

3. If the thrips get out of control, they are generally controlled by insecticidal soap or neem oil. Technical thought should be given to how to control an infestation of the insect described here. Normally, that is done through hygienic, biological, chemical or physical eradication.

Response: Although the testing indicated that use of non-target plant species is highly unlikely, the original petition for release submitted to APHIS outlined proposed methods for mitigation as follows: "Any observations of unanticipated use of non-targets by the biocontrol agent following the initial releases will be followed by immediate extermination of the gorse thrips population within the cages and in the vicinity surrounding the cages using the insecticide Spinosad®, which is known to be highly effective against thrips. Sprayed sites will be monitored and resampled weekly until the time for a full generation has elapsed. Any positive samples will result in a retreatment of the site."

4. A better control measure for the plant might be public and property owner education and one or more of the following methods that are nearly always effective: (1) hand pulling or digging, (2) use goats to eat the brush and chickens to eat the seeds, (3) use of herbicides, or (4) cultivation or mowing. Although it is important to be sensitive to environmental concerns, sometimes the Service should be more aggressive in the efforts to eradicate these types of plants.

Response: These control measures are beyond the scope of this environmental assessment. APHIS involvement in this proposed action is the permitting of the release of the biological control organism *Sericothrips staphylinus.* As indicated on page 2 of this environmental assessment, "[a]lthough PPBP's alternatives are limited to a decision on whether to issue permits for release of *S. staphylinus*, other methods available for control of gorse are also described. These control methods are not decisions to be made by PPBP, and their use is likely to continue whether or not permits are issued for environmental release of *S. staphylinus*, depending on the efficacy of *S. staphylinus* to control gorse."

Decision and Finding of No Significant Impact
for
Field release of the the thrips *Sericothrips staphylinus* (Thysanoptera: Thripidae) for biological control of gorse, *Ulex europaeus* (Fabaceae), in the contiguous United States.
October 2019

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) is proposing to issue permits for environmental release of the insect *Sericothrips staphylinus* (Thysanoptera: Thripidae). This agent would be used for the biological control of gorse, *Ulex europaeus* (Fabaceae), in the contiguous United States. Before permits are issued for release of *S. staphylinus*, APHIS must analyze the potential impacts of its release into the contiguous 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
Pests, Pathogens, and Biocontrol Permits
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 *S. staphylinus*: (1) no action, and (2) issue permits for the release of *S. staphylinus* for biological control of gorse (preferred alternative). 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, mechanical, cultural, and biological controls for the management of gorse. These control methods described are not alternatives for decisions to be made by APHIS, but are presently being used to control gorse in the United States and may continue regardless of permit issuance for field release of *S. staphylinus.* Notice of this EA was made available in the Federal Register on August 20, 2019 for a 30-day public comment period. APHIS received 10 comments on the EA by the close of the comment period. Eight commenters were in favor of the release of *S. staphylinus*. Two commenters were not in favor of and raised concerns regarding the release of the agent. These comments are addressed in appendix 5 of the EA.

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

- *Sericothrips staphylinus* is sufficiently host specific and poses little, if any, threat to the biological resources, including non-target plant species, of the contiguous United States.

- *Sericothrips staphylinus* is not likely to adversely affect federally listed threatened and endangered species or their critical habitats in the contiguous United States.

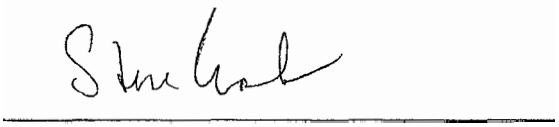
- *Sericothrips staphylinus* poses no threat to human health.

- No negative cumulative impacts are expected from release of *S. staphylinus.*

- 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 *S. staphylinus* 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 and, therefore, no Environmental Impact Statement needs to be prepared.



10/30/2019

Steven Crook, Director
Permitting and Coordination Compliance
U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine

Date