United States Department of Agriculture

Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Plant Protection and Quarantine

Reviewer's Manual for the Technical Advisory Group for Biological Control Agents of Weeds

Guidelines for Evaluating the Safety of Candidate Biological Control Agents

First Edition December 2000

TAG Reviewer's Manual

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Preface

Biological control is usually defined as using natural organisms to control weeds, insect, or pathogen pests. Classical biological control of weeds consists of returning to the native range of the weed, identifying its complex of natural enemies, testing extensively, and releasing a complex of host specific, natural enemies in the areas of introduction to control the target weed. Go to *"Biological Control of Weeds" on page 4-1-1* for basic information.

Many organizations are involved in searching for and introducing potential biological control agents for weeds. Some of these organizations include the Agricultural Research Service, Forest Service, the Biological Resources Division of the U.S. Geological Survey, State departments of agriculture, universities, Agriculture and Food Canada, and the International Institute of Biological Control. However, the Animal and Plant Health Inspection Service (APHIS) has the responsibility for permitting the importation and release of biological control agents for weeds in the United States.

The Technical Advisory Group for Biological Control Agents of Weeds (TAG) was established to help researchers and evaluate potential biological control agents. Also, TAG advises APHIS on the suitability of agents proposed for release in the United States.

Therefore, the primary intent of the TAG Reviewer's Manual is to provide members of TAG with information about the advisory group, and to provide guidelines and technical information useful in reviewing and evaluating petitions for agent release. See *"Technical Advisory Group" on page 2-1-1* for more information about TAG. See *"Petitions for Field Release" on page 5-1-1* for more information about the evaluation guidelines for petitions for release, and see *"Test Plant Lists" on page 5-2-1* for more information about the evaluation guidelines for test plant lists.

Users

The primary users of the TAG Reviewer's Manual are the members of TAG. Parts of this manual may be referenced by others, such as experts within the Federal agencies represented on TAG, petitioners, researchers, external reviewers, university experts, foreign nationals, and members of international organizations, such as the North American Plant Protection Organization (NAPPO).

Purpose

The TAG Reviewer's Manual serves as follows:

- A reference guide for reviewing and evaluating petitions for field release of biological control agents of weeds in the United States, and test plant lists
- A training tool for orienting TAG members
- General information for other users, such as guidelines for petitioners and researchers

Scope

The TAG Reviewer's Manual is written specifically for TAG members responsible for reviewing and evaluating submitted petitions and test plant lists.

How to Use This Manual

As a reference guide, the chapter titled *"Evaluation Guidelines" on page 5-1-1* provides checklists for TAG members to follow as they review petitions for release and test plant lists. The evaluation guidelines are organized the same as the suggested format for petitions and test plant lists. Throughout the guidelines, TAG members are prompted to record their comments on a Reviewer's Comment Sheet. There are samples of the comment sheets in *Appendix G*.

As a training and orientation tool, the chapter titled *"Technical Advisory Group" on page 2-1-1* provides new members with a history of the advisory group, its charter, and insight into the process TAG follows. Also, the chapter titled *"Biological Control of Weeds" on page 4-1-1* provides basic information about topics such as identification and characterization of agents, host specificity, and testing methods. *Appendix H* provides a comprehensive listing of references.

As general information for other users, *Appendix D* and *Appendix E* contain a suggested format for field release petitions and for test plant lists, respectfully. These formats should be shared with petitioners and researchers to facilitate the review, evaluation, and approval processes.

Because this manual is the first of its kind to guide such an advisory group, it could be of benefit to other Federal agencies, members of international organizations, external reviewers, university experts, and foreign nationals who are involved in evaluating biological control agents.

Reporting Problems or Suggestions

If you find problems or have suggestions to improve the content, please use the *Comment Sheet* at the end of the manual to record your concerns or improvements. Send the Comment Sheet to the Executive Secretary for TAG at the following address:

USDA APHIS PPQ
4700 River Road, Unit 133
Riverdale, Maryland 20737-1236
FAX: 301-734-4300 or 301-734-8700

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Technical Advisory Group

History

For the past 40 years, technical review groups have assisted researchers and regulatory agencies in evaluating the safety of insect or pathogen introductions for the biological control of weeds in the United States. The Subcommittee on Biological Control of Weeds was the first group established in 1957. The initial membership included representatives from the U.S. Department of the Interior's (USDI) Bureau of Reclamation, Bureau of Land Management, and Fish and Wildlife Service; and from the U.S. Department of Agriculture's (USDA) Forest Service and Agricultural Research Service. The initial responsibilities of the Subcommittee were as follows:

- Advise whether certain plants targeted for biological control are universally regarded as weeds and recommend a course of action for situations involving conflicts of interest
- Recommend plants to be tested against the phytophagous organisms proposed for introduction

Through the 1960's the Subcommittee communicated primarily through correspondence, only meeting periodically to discuss topics about the biological control of weeds. An informal, reciprocal review of proposals began in 1962 between the United States and Canada. In 1969 the membership of the Subcommittee was expanded to include specialists in plant taxonomy, ornamentals, and plant quarantine. At that time, the Bureau of Reclamation dropped its membership.

In 1971 the Subcommittee's name was changed to Working Group. At this time, the Working Group began contacting Mexican officials concerning U.S. proposals. Canadian and Mexican comments were invited because the Working Group knew that an introduced organism recognizes no political boundaries and its introduction needed to be considered on a continental basis. Membership changed over the years because of reorganizations and the need to add members from the Environmental Protection Agency, USDA's Cooperative State Research, Education, and Extension Service, and the U.S. Army Corps of Engineers. Responsibilities and procedures of the Working Group also changed over the years.

Important **additional** responsibilities taken on by the Working Group were as follows:

- Review proposals to introduce candidate organisms into quarantine facilities
- Review the adequacy of documentation showing safety of a proposed field release

In January 1987, the Working Group was replaced by TAG. Then and now, TAG functions under Plant Protection and Quarantine of APHIS (APHIS-PPQ). Its membership continues to be voluntary and now must be in accordance with the Federal Advisory Committee Act. TAG is facilitated by an Executive Secretary from APHIS-PPQ who is not a voting member. The TAG Chair is elected by its members for a 3-year, renewable term. Membership is indefinite until members retire or their agencies name someone else.

Over the years, the technical review group has adapted to the needs of both researchers and regulatory agencies to better serve them when proposing to introduce an exotic organism into the United States for the biological control of weeds. In the beginning, the Subcommittee and Working Group were formed to provide advice primarily to the researchers, but their comments could also be used by APHIS-PPQ in making decisions about issuing permits for importation or release.

At present, TAG is charged with recommending action to APHIS-PPQ when deciding to issue permits and with advising researchers about the safe use of biological control agents in the environment. The expectations of TAG are to get involved with researchers early in a program, to suggest including certain test plants, to identify conflicts of interest, and to assess risk associated with a release.

What TAG does not do is make final decisions on the release of biological control agents of weeds in North America. TAG only *recommends* to APHIS-PPQ that an agent be approved or denied permission for release, and *recommends* to petitioners specific action before they apply for a formal permit; TAG does not *approve* petitions or permits.

In summary, TAG continues to provide APHIS-PPQ with a process in which petitions and test plant lists are reviewed by uninvolved parties from varying perspectives and concerns and varying scientific disciplines. It is important for TAG to continue serving as a science-based link between the research community and regulatory agencies, providing input from stakeholders.

References

Coulson, Jack R. 1992. The TAG: development, functions, procedures, and problems. In: Regulations and guidelines: critical issues in biological control, Proceedings of a USDA/CSRES national workshop; 53–60.

Drea, John J., Jr. 1991. The philosophy, procedures, and cost of developing a classical biological control of weeds project. Natural Areas Journal 11(3); 143–147.

Klingman, Dayton L.; Coulson, Jack R. 1983. Guidelines for introducing foreign organisms into the United States for the biological control of weeds. Bull. of the Entomological Society of America 29(3); 55–61.The Biological Control Documentation Center (BCDC), ARS, has been an archive of information since 1982. Mr. Jack R. Coulson is the Director of the BCDC.

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Technical Advisory Group

Charter

The charter for TAG is in ***Figure 2-2-1 on page 2-1-1***. The charter provides the following for TAG:

- Mission
- Objectives
- Expectations
- Standard Operating Procedures

Charter

Technical Advisory Group for Biological Control Agents of Weeds

October 1997

MISSION

To facilitate biological control of weeds in North America by providing guidance to researchers and recommendations to regulating agencies for or against the release of non-indigenous biological control agents, based on considerations of potential nontarget impacts and conflicts of interest.

OBJECTIVES

1. Incorporate member agencies' concerns and perspectives into planning biological control programs.
2. Provide an exchange of views, information and advice for individuals who plan to ask various Federal and State regulatory agencies for permission to release these agents into the environment.
3. Provide recommendations to regulatory agencies for permitting decisions.

EXPECTATIONS

Individuals planning a release of a non-indigenous biological control agent should contact TAG early in the research program, particularly when a plant is targeted for the first time for biological control in North America. TAG members review two types of documents, the host test list [test plant list] and the petition for first-time field release of a non-indigenous organism. TAG members suggest inclusion of certain test plants, identify conflicts of interest, and assess risks associated with a release. The person seeking permission to release the agent to the environment addresses these different perspectives. The exchange of scientific information helps Federal regulatory officials evaluate potential effects of the biological control agent on target and nontarget plants in North America.

FIGURE 2-2-1 TAG Charter

STANDARD OPERATING PROCEDURE

1. **Duties of TAG Members**
   - **A.** Represent employer's interest by reviewing petitions from that agency's perspective.
   - **B.** Review each petition to evaluate risk to agriculture, human health, and the environment, compared with expected benefits.
   - **C.** Identify and consult subject matter specialists who are familiar with the taxonomy, biology, ecology, and other aspects of the organisms being considered for release and the target weed.
   - **D.** Provide a written response consolidating agency comments to the Executive Secretary **within the deadline**.
   - **E.** Participate in the annual TAG meeting.
   - **F.** Appoint an alternate within the agency to serve in the absence of the official member.
2. **Duties of the Chair** (The Chair is a TAG member, elected by the membership for a 3-year term. The Chair may serve an unlimited number of terms.)
   - **A.** Review all recommendations of TAG members and provide consolidated recommendations to the petitioner, TAG members, appropriate officials in Canada and Mexico, the APHIS TAG Executive Secretary, and other interested parties.
   - **B.** Help build consensus among reviewers with divergent viewpoints. The Chair may call meetings or telephone conferences including outside specialists and the involved researcher.
   - **C.** Maintain records of TAG recommendations.
   - **D.** Arrange and preside over meetings of TAG.
3. **Duties of the Executive Secretary**. (An APHIS employee)
   - **A.** Request appointments of members from agency administrators.
   - **B.** Maintain file system for TAG.
   - **C.** Serve as contact for TAG manual maintenance.
   - **D.** Maintain the TAG web site on the Internet, including APHIS permit decisions. (The web site is located at <http://www.aphis.usda.gov/ppq/permits/tag>)

FIGURE 2-2-1 TAG Charter Standard (continued)

4. **Duties of APHIS, PPQ**
   - **A.** Consider TAG recommendations, evaluate permit requests for movement of biological control agents of weeds.
   - **B.** Assure compliance with applicable statutes and regulations.
   - **C.** Maintain the PPQ-APHIS permit process for movement of biological control agents of weeds.
   - **D.** When the TAG recommendation is to release an agent, invite the researcher to submit a permit application and draft environmental assessment.
   - **E.** Conduct training workshops when needed.
5. **Annual meeting.** The Chair calls an annual meeting to evaluate the effectiveness of TAG, and to discuss controversial issues relating to biological control of weeds in North America. Every 3 years, the membership elects a Chair.
6. **Administration.** PPQ-APHIS will be responsible for the administrative maintenance of Federal Agency representation.
7. **Federal Advisory Committee Act (FACA).** TAG must conduct meetings that do not violate FACA. The law, as amended (P.L. 104-4, Sec. 204), states:

   > Meetings between State, Local, Tribal and Federal Officers - The Federal Advisory Committee Act (5 U.S.C. App.) shall not apply to actions in support of intergovernmental communications where:
   >
   > (1) Meetings are held exclusively between Federal officials and elected officers of State, local, and tribal governments (or their designated employees with authority to act on their behalf) acting in their official capacities
   >
   > (2) Such meetings are solely for the purposes of exchanging views, information, or advice relating to the management of implementation of Federal programs established pursuant to public law that explicitly or inherently share intergovernmental responsibilities or administration.

   FACA does not apply to meetings of TAG whose members are Federal officials and designated State officials. The members may contact non-Federal, State, Local, or Tribal parties to obtain information. Therefore, Canada, Mexico, researchers, industry, and professional or other societies may be contacted on an ad hoc basis.

   TAG focuses primarily on providing assistance to the individuals who will seek permits. Secondarily, TAG provides a communication conduit within a scientific framework for APHIS.

FIGURE 2-2-1 TAG Charter Standard (continued)

8. Membership

A. APHIS will solicit one representative from the following Agencies:

USDA, APHIS
USDA, Agricultural Research Service
USDA, Cooperative State Research, Education, and Extension Service
USDA, Forest Service
USDA, Natural Resources Conservation Service
USDI, Bureau of Land Management
USDI, Bureau of Reclamation
USDI, U.S. Fish and Wildlife Service
USDI, National Park Service
USDI, U.S. Geological Survey
USDI, Bureau of Indian Affairs
US Environmental Protection Agency
DOD, US Army Corps of Engineers

APHIS may solicit members who are State or Federal government employees, [one each] from:

The National Plant Board
The Weed Science Society of America
ARS Biological Control Documentation Center
Other Federal agencies expressing interest in participating

B. APHIS interprets a solicited Agency's lack of response [to evaluating petitions and test plant lists] as acknowledgment that they have no need to be involved in the present considerations of the movement of organisms for weed biological control, or that they wish to be involved only in the **formal** regulatory review of permit applications.

C. If an agency's representative does not provide comments or request an extension to the designated deadline, APHIS interprets this to mean the agency does not oppose the petition.

D. APHIS may initiate a request for immediate appointment of another Agency representative if the Agency representative fails to provide comments for two consecutive applications.

FIGURE 2-2-1 TAG Charter (continued)

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APHIS' Permitting Process for Biological Control Agents

Contents

Introduction

Since TAG's entire review process is driven by APHIS' permitting process, **Figure 3-1-1 on page 3-1-7** illustrates the documentation flow of petitions, test plant lists, permit application, and environmental assessments for the introduction of biological control agents of weeds. Use **Figure 3-1-1 on page 3-1-7** as an overview of who is involved and what they do. The bold boxes represent TAG's involvement. All initials and acronyms are listed in the "Glossary" on page 6-1-1 of this manual.

Note that in **Figure 3-1-1 on page 3-1-7** other sections of this manual are italicized in parenthesis. These sections provide more information about the specific activity. For example, the TAG Chair consolidates recommendations that are received from TAG members. *Appendix B* provides an understanding of how the Chair reaches a final TAG recommendation.

Figure 3-1-2 on page 3-1-8 is an overview of the procedures for environmental assessment finalization and public notification of a finding of no significant impact (FONSI).

Approval Process for Weed Biocontrol Agents

The Plant Protection Act of 2000 (7 U.S.C. 7701 *et seq.*) provides the Secretary of Agriculture with the authority to regulate "any enemy, antagonist or competitor used to control a plant pest or noxious weed". However, other legislation such as the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*), the Endangered Species Act (ESA) (16 U.S.C. 1531 *et seq.*), the Coastal Zone Management Act (16 U.S.C. 1451 *et seq.*), and Executive Order 13112 (64 FR 6183) for Invasive Species may affect the decision to release a nonindigenous weed biological control agent into the environment. The approval process can be very complicated and difficult to navigate without guidance. Steps in the approval process follow.

Step 1: Early Input

Whether or not a candidate biological control agent has yet been identified, researchers should submit a proposed test plant list to the Technical Advisory Group (TAG) for Biological Control Agents of Weeds. This interagency group was established to advise weed biological control researchers and provide the USDA-APHIS-Plant Protection and Quarantine (PPQ) Permit Evaluation Unit with a recommendation on the proposed action. At this early stage of the approval process, the TAG makes recommendations on the target weed choice and comments on the proposed test plant list for host specificity testing.

In addition to submitting a TAG petition, researchers should contact the Department of the Interior to be sure that threatened and endangered species are considered in the test plant list. Candidate species should also be considered because they may be listed at any time. The appropriate agency is usually the U.S. Fish and Wildlife Service (FWS). But sometimes the National Marine Fisheries Service (NMFS) within the Department of Commerce must be consulted, depending on the nature of the proposed action. Both these agencies have the responsibility of enforcing the ESA. Although an FWS representative participates on the TAG, this does not substitute for the ESA consultation process. Separate and direct contact with these agencies will facilitate the consultation process. Although not required, receiving input on a weed biological control project at an early stage from the TAG, FWS, and NMFS can reveal problems or concerns that can be addressed at an early stage, potentially saving years of delays.

Step 2: Permits for U.S. Importation

Once potential biological control organisms have been discovered in a foreign country, the researcher must apply for a PPQ permit (PPQ Form 526, Application & Permit to Move Live Plant Pest or Noxious Weeds) to import them into the United States for further host specificity testing. It usually takes 4 to 6 weeks from submission of the

application to receive a permit. Permitted agents can be imported only into an adequate containment facility in the United States. Designated labels provided by PPQ must be affixed to all packages shipped into the United States to the containment facility. The label identifies the package as entering the United States under permit, facilitates the package's movement through customs and directs the package to PPQ Inspectors at the port of entry. Labels are not required if the permittee is authorized to hand-carry organisms, although a copy of the permit and proper identification must be provided at the port of entry.

Step 3: Maintain the Permit for Importation

Permittees are responsible for safeguarding authorized organisms throughout the duration of the permit, as specified by the permit condition requirements. The permit must be kept valid as long as the organisms are in the permittee's possession, whether or not more movement of the organism takes place.

If the permittee plans to leave the institution where the organism is maintained, he or she **must** do **one** of the following:

- Designate a qualified, new individual to assume responsibility for the continued maintenance of the organism and the designee must then obtain a new permit prior to the permittee's departure
- Apply for a new permit to move the organism to a new facility
- Destroy the organisms

In any case, the permittee **must** notify APHIS and the original permit will be revoked.

Step 4: Environmental Documentation in Support of Permit for Release

Issuance of permits by PPQ for the environmental release of nonindigenous weed biological control organisms is considered a Federal action and triggers compliance with the NEPA and the ESA. Although PPQ is ultimately responsible for compliance with those environmental statutes, the applicant can lessen the turnaround time by preparing draft documents for PPQ to finalize and may begin to prepare them during the host specificity-testing phase of the project.

Environmental Assessment (EA)

The document required for NEPA compliance is the Environmental Assessment (EA), a concise public document that provides sufficient evidence and analysis to determine if a Finding Of No Significant Impact (FONSI) can be reached or if an Environmental Impact Statement (EIS) must be prepared. The EA provides the public with the potential positive and negative environmental impacts (direct and indirect) that may occur as a result of the release of a nonindigenous

biological control organism into the environment. Applicants from other Federal agencies must also consider their own NEPA implementing procedures specific to any proposed actions.

Biological Assessment (BA)

The document required for compliance with the ESA is the Biological Assessment (BA). This document is usually submitted to the FWS. The BA should include several elements, as follows:

1. Description of the action to be considered.
2. Description of the specific area that may be affected by the action.
3. Description of any listed species or critical habitat that may be affected by the action.
4. Description of the manner in which the action may affect any listed species or critical habitat and an analysis of any cumulative effects.
5. Relevant reports, including any EIS or EA.
6. Any other relevant available information on the action, the affected listed species, or critical habitat.

Step 5: TAG Recommendation

After host specificity testing is completed, the researcher must submit a petition for release of the biological control agent to the TAG for recommendation. All proposed first-time releases of nonindigenous weed biological control agents must be reviewed and recommended by the TAG.

Step 6: Permit for Release

When a recommendation from the TAG for the release of a weed biological control organism has been received, the researcher must submit another application (PPQ Form 526) to PPQ, requesting release of the biological control agent into the environment. The draft EA and BA prepared by the researcher should also be submitted to PPQ at this time. To speed the review process, it is important to submit documents as close to complete as possible.

Step 7: Section 7 Consultation

According to the ESA, any action that is authorized, funded or carried out by a Federal agency must comply with the consultation requirements of Section 7 of the ESA. This compliance may be achieved through formal or informal consultation. Although the researcher should have been in contact with FWS and/or NMFS from the beginning, PPQ determines if formal consultation with those agencies must be conducted at this point in the process. Formal consultation involves the submission of the BA to FWS and/or NMFS and is required when there are concerns that the proposed release may adversely affect endangered, threatened or candidate species or

designated critical habitat. Informal consultation occurs when the release of the biological control organism "is not likely to adversely affect endangered, threatened or candidate species or their critical habitats." For weed biological control releases, both formal and informal consultations are conducted between FWS and/or NMFS and PPQ. However, applicants from any Federal agency are strongly encouraged to conduct and complete the consultation prior to applying to PPQ for an environmental release permit. Non-Federal applicants may conduct informal consultations but first must be designated as a non-Federal representative by PPQ. In any case, early, open communication between the applicant, PPQ, FWS, and/or NMFS is essential to ensure efficient movement through this portion of the approval process.

Step 8: Public Comment

Once the Section 7 consultation is complete, PPQ incorporates the response from FWS and/or NMFS (either Letter of Concurrence or Biological Opinion) into the EA and makes any final changes necessary. The USDA Office of General Counsel (OGC) reviews the EA to be sure it meets all legal standards. Once the EA has been approved by OGC, PPQ publishes a 30-day (or longer) notice of availability of the EA in the *Federal Register* to allow the public to comment on the proposed action. After considering the comments, PPQ either reaches a FONSI and issues the release permit, advises the applicant that an EIS must be prepared (a document prepared in compliance with NEPA when significant impacts are expected from the proposed action), or advises the applicant to discontinue the project. If PPQ issues a permit for environmental release, specific conditions are placed on the permit including release area limitations, notification requirements, submission of monitoring reports, etc.

Step 9: Environmental Protection Agency

For researchers working with pathogens for weed biological control, it is important to contact the United States Environmental Protection Agency (EPA), Office of Pesticide Programs, Biopesticides and Pollution Prevention Division. All microbial pathogens for weed biological control must proceed through the approval process described previously and USDA maintains regulatory authority over all interstate movement and release of these organisms. However, the EPA regulates microbial pathogens, as biological pesticides, under the Federal Insecticide, Fungicide, and Rodenticide Act of 1972 (FIFRA) (7 U.S.C. s/s 136 *et seq*.). EPA has authority to regulate releases of these organisms in areas greater than 10 and less than 50 acres (cumulative in the United States); however, a release area greater than 50 acres requires an experimental use permit. EPA registers biological pesticide products intended for commercial use. The EPA approval process for pathogens for biological control of weeds is in addition to and not a

substitute for the PPQ approval process. For weed biological control agents that are commercialized under EPA registration, USDA regulations for that agent will be re-examined on a case by case basis.

Step 10: Interstate Movement of Approved Weed Biological Control Agents

Once a weed biological control organism has been approved for environmental release, land managers are often interested in distributing the agent into new states where the target weed occurs. Currently, interstate movements of all arthropods and non-commercial pathogens for weed biological control must be authorized by a PPQ permit. However, permits for environmental release will only be approved for States that have been covered under an EA and consultation with FWS and/or NMFS. A supplemental EA and another Section 7 consultation must be conducted before releases into any additional States can be approved by PPQ. Although generally not as time-consuming as the original approval process, supplemental approvals can create a considerable delay for land managers anxious to implement a release program. Therefore, as a weed biological control researcher, it is wise to consider broad areas for release when preparing the TAG release petition and environmental documentation for initial approval.

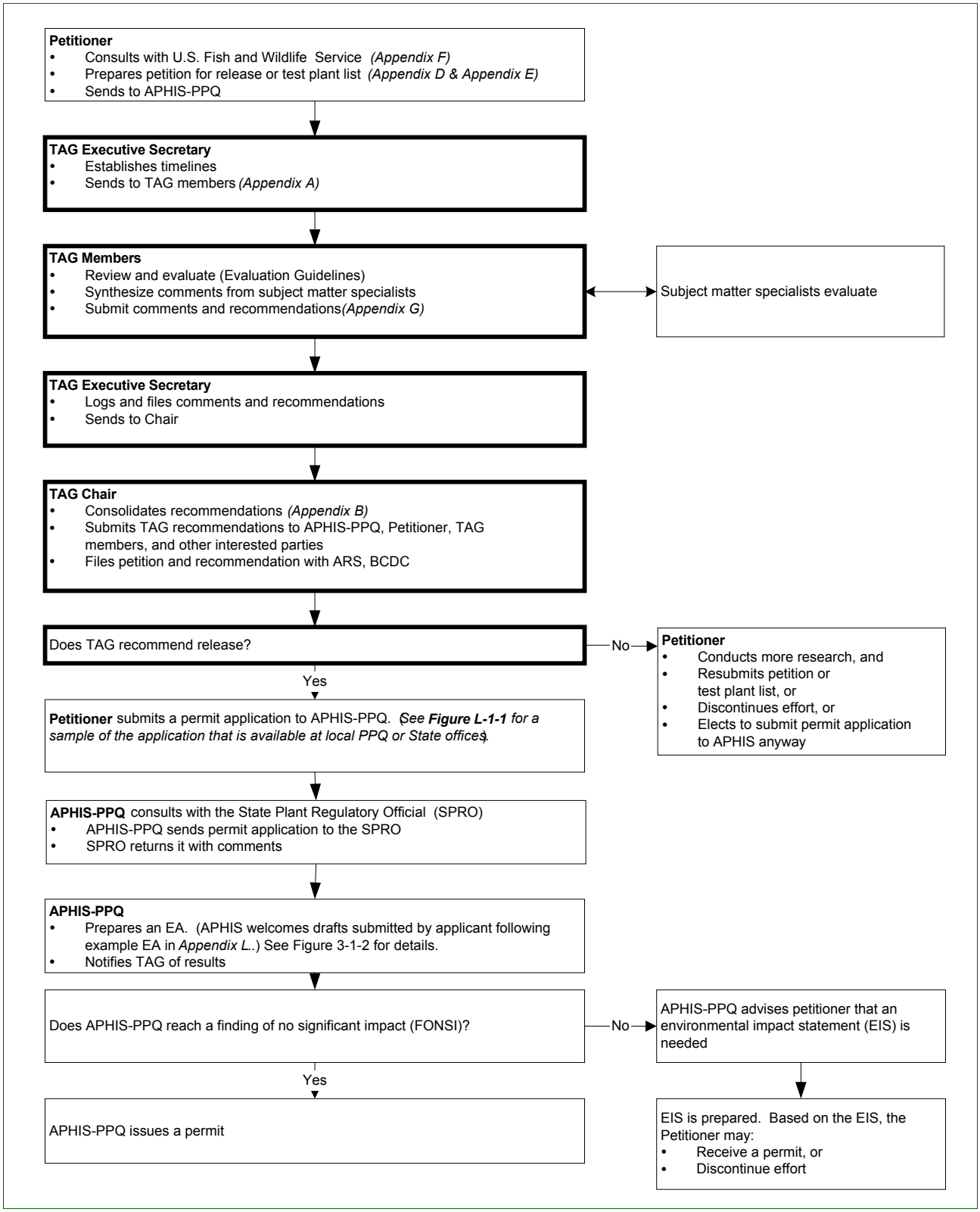

FIGURE 3-1-1 APHIS' Permitting Process for Biological Control Agents

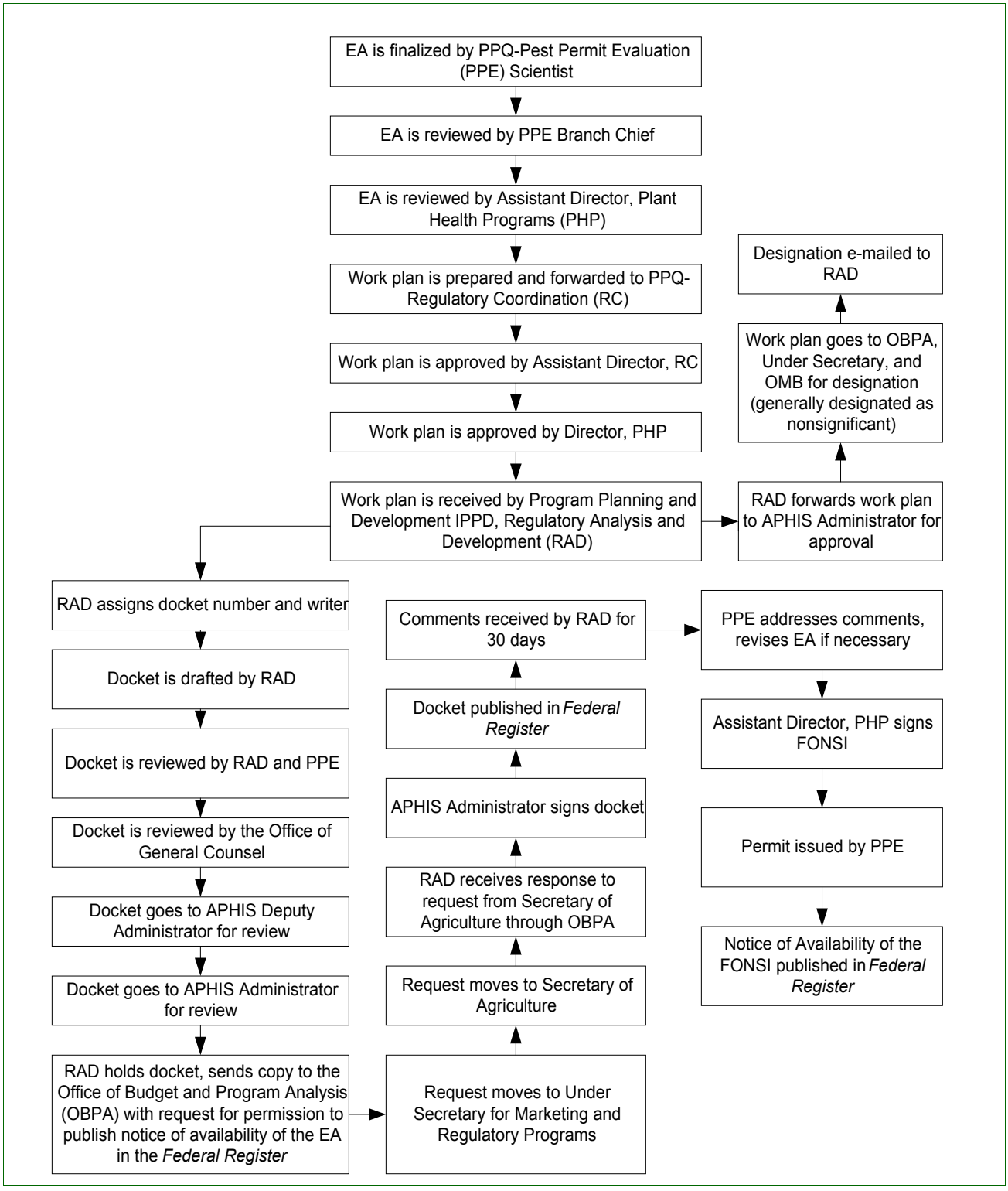

FIGURE 3-1-2 APHIS Procedures for Environmental Assessment Finalization and Public Notification

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TAG Reviewer's Manual

Biological Control of Weeds

Overview

Biological control is one of many approaches or strategies to weed control that has a minimal adverse effect on the environment. Historically, biological control works best on large infestations of a single weed species. It has been most successful on weeds that have been introduced into areas where their specialized natural enemies do not occur.

Biological control has several advantages over other types of weed control (Washer, et al., 1989). These advantages include long-term management of the target plant, limited side effects, attack of only one or a few related weeds, self-perpetuating agents, nonrecurring costs, and known levels of risk identified and evaluated before agent introduction. The latter is where TAG plays a role—evaluating the safety of introducing an exotic organism to control weed infestations.

Usually, biological control is used along with other methods of weed control. In fact, many land managers, ranchers, and farmers use integrated weed management systems, combining more than one method to control weeds while keeping the ecosystem intact.

The article listed under References entitled "Recent Developments in Biological Control of Weeds" provides a review, examples, and a discussion about advantages and disadvantages of different approaches to control weeds using biological methods. These are as follows:

- Inoculative
- Augmentative
- Conservative
- Broad-spectrum

References

For more information about biological control of weeds, refer to the following listed references as well as those listed in *Appendix H* under *Biological Control of Weeds*.

Charudattan, R.; Walker, H.L. 1982. Biological control of weeds with plant pathogens. New York, NY: John Wiley & Sons, Inc.

TeBeest, D.O., ed. Microbial control of weeds. New York, NY: Chapman and Hall.

Wapshere, A.J.; Delfosse, E.S.; Cullen, J.M. 1989. Recent developments in biological control of weeds.
Crop Protection 8: 227–250.

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TAG Reviewer's Manual

Biological Control of Weeds

Identification and Characterization of Agents

Contents

Preface

The following information is from discussion notes delivered by Harold W. Browning at the TAG Training Workshop held February 25-27, 1997. The information is intended for and is pertinent to plant pathogens, arthropods, and nematodes—all classes of agents.

Introduction

Appropriate identity and characterization (the biological, chemical, and ecological qualities) of the candidate biological control agent is as important to biological control of weeds as any other issue. Identity and characterization of target and agent are critical to the following:

- Provide a gateway to knowledge through published literature and reports
- Preclude introduction of unapproved organisms
- Influence future assessments of risk
- Affect future evaluation processes

Therefore, both petitioners and TAG reviewers should consider the following questions when describing an agent:

- What is the agent?
- What do you need to know about it?
- Why do you need to know this?
- What kind of information about the identification and characterization of the agent needs to be documented in the petition?
- How best can the pertinent information be conveyed to others?

There are many complex questions associated with the identification and characterization of an agent. These are technical areas and not every TAG member will have the expertise in the terminal identification and the biological, chemical, and ecological qualities of all organisms. Therefore, TAG members may consult with experts for additional help in verifying information in petitions.

Some of the complex questions associated with the identity and characterization of an agent are as follows:

- What is the identity of the agent?
- At what taxonomic level is this important?
- How did the petitioner identify the organism?
- Is the taxonomy known with confidence?
- How does TAG verify the findings in the petition? Who are the specialists cited in the petition, or those within your agency who can verify the findings?
- How critical is it to have the specific knowledge of characterization?
- Does the agent (or a close relation) already occur in the target area?
- How does the agent relate to other taxonomic groups? Can it be differentiated? Is there the capacity to discriminate its presence later?
- How does the agent impact the target weed?

Approaches, Methods, and Tools

Researchers use a variety of approaches, methods, and tools to identify and characterize an agent. Therefore, a critical challenge for TAG when reviewing petitions is assessing the level of confidence

conveyed about identification and characterization. What is the evidence? How is it conveyed? Do you have a sense of what the researchers have done? Following is a brief summary of some common approaches and tools used by researchers.

Traditional Zoological and Botanical Taxonomic Approaches

What level of taxa is appropriate? For insects, often the taxonomic information will be described to the species level. Is species level enough?

For many microbial groups, sexual and asexual forms exist for a given species. Therefore, the taxonomy may be based on spore forms or other reproductive characteristics. For other groups, biotypes, geotypes, strains, pathotypes, and subspecies exist. These sub-taxa are characterized in different ways, some use isolates. *Isolates* are often limited collections made from a specific location, and thus may not represent the entire genetic base of the species.

Conventional Morphological Methods

Conventional morphological methods are used first to determine the taxa. Where individual characters are not diagnostic, morphometric analysis of a suite of characteristics can be useful.

Functional Analysis

Functional analysis of characteristics such as diapause can also be incorporated into the identification of an agent.

Biological or Chemical Characterization

Other methods for characterizing an agent involve biological or chemical characterization using a range of available tools. Biological and chemical characterizations are conducted as follows to go beyond taxonomy when assessing an agent as follows:

- Hybridization studies and other evaluations of reproductive strategy employed by an agent
- Biological traits such as growth on selective media (microbes)
- Enzymatic reactions and other chemical analyses
- Host indexing for characterizing pathogens
- Improved techniques for suborganismal, chemical, or biochemical analysis
- Range location and relationship to other ecotypes

Molecular or Genetic Tools

A final approach to identification and characterization of an agent is determination using molecular or genetic tools. Proteins and nucleic acids can be analyzed, and differences between populations or species

can be derived from these analyses. Furthermore, genetic constitution can be defined through purification, amplification, and sequencing. Genetic markers have the capacity to label agents for later verification.

Challenges

Following are challenges for TAG to accurately assess the identity and characterization of an agent. There is a chance that an identification or characterization may be incorrect. When this occurs, there are several implications including the following:

- Loss of effort thus far invested toward biologically controlling weeds
- Misguided sense of confidence using a knowledge base that is inappropriate to the agent being studied
- Potential to improperly assess the risk factors

Cryptic or Sibling Species

The presence of cryptic or sibling species in insect material received in quarantine may go unnoticed depending upon the status of the taxonomy of the group involved. The presence of these species can cause problems in host plant testing where inaccurate feeding responses may result. Also, the presence of these species can cause problems in quarantine operations after the research has been completed and the agent has been approved for release. In this situation, the wrong or untested insects may be included in the release. This problem has occurred in biological control programs. Therefore, the researcher and the reviewer can prevent this problem by questioning whether such possibilities might exist in the identification process.

Experts

What is an expert? What is the range of expertise? Who are the world authorities? What expertise does the person have who is describing the characterization? Not all experts agree, so there is even some possible confusion in relying on experts. Since world authorities are not always accessible, and often lacking for certain groups, definitive identification is not always possible or necessary.

Reference Collections

What is the role of reference collections in supporting biological control? Reference collections often hold specimens of candidate agents that have been studied by taxonomists. In some cases, access to reference collections is limited since the collections may be located in foreign museums. Reference collections and hands-on experience are limited to geographic regions and if these regions fall outside of the

main region studied by taxonomic experts, the experts may have limited capacity to identify exotic agents. For example, agents from the Southern Hemisphere and from locations in the Old World may not be represented in U.S. reference collections; therefore, definitive identification may not be possible by U.S. taxonomists. Similarly, literature associated with exotic agents from the Old World or Southern Hemisphere may be difficult to access, and may be unknown to U.S. taxonomists.

Name Versus Characteristics

Taxonomists often may be reluctant to go on record with determinations unless they have a high level of confidence in their assessment, which leads to incomplete names. This is not necessarily a limitation, since much of the assessment is based on biological information obtained after collection. However, it may hamper access to published information. This is in contrast to the perceived need to put a name on it. The name is not as important as characteristics (biological, chemical, ecological).

Has the person done historical research on identification? Minor irritations occur in assessing the knowledge base because of synonymies, revisions to new genera, and other changes in the names by which information on agents is retrieved.

References

For more information about identification and characterization of agents, refer to *Appendix H*.

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TAG Reviewer's Manual

Biological Control of Weeds

Host Specificity Testing of Insects

Contents

Preface

Following are guidelines for host specificity testing of insects that are proposed as biological control agents of weeds. The guidelines were prepared by Dr. George Markin, USDA-FS, Montana State University, to be reviewed by new TAG members before reviewing and evaluating submitted petitions.

Note that the sequence of tests described here is an example, not a checklist. Also, details of any test depend on the biology and life history of each particular agent. When reviewing the methods section of a petition, evaluate if the petitioner used the appropriate method of studying the host range of the target agent.

Introduction

Host specificity testing is the process of evaluating an insect to determine its host range. A host range consists of those plants on which an insect can normally develop and complete its life cycle in nature. Host specificity testing begins in the field studies of an insect when it is first discovered and is being considered as a potential biological control agent.

Once a potential agent has been found feeding on the target weed in the field, the first step is usually to survey the surrounding plants, particularly those in the same family as the target weed. The survey can tell a researcher whether the insect is a generalist. Similarly, once an insect is identified, a literature search of the species will often indicate if the insect is already known to have too broad of a host

range to be considered as a candidate biological control agent. Once the general feeders and those with broad host range have been discarded, a researcher undertakes the process of evaluating the more promising insects under controlled conditions. This evaluation determines if the insects' host ranges are limited enough to make them usable as a biological control agent.

There is no set protocol or standard procedure that is used routinely for host range testing. Different tests must be developed and implemented for each insect, depending upon its feeding behavior or the part of the plant on which it feeds.

The insects used in host range testing may be from either wild populations collected in the field or from laboratory-reared colonies. Both sources have advantages and disadvantages that can ultimately affect the results of host testing.

Field-collected material is often much more readily attainable and cheaper to use than trying to establish and maintain a laboratory colony. Field-collected material also is often more vigorous and can exhibit more natural feeding behavior than laboratory-reared ones. The disadvantage of field-collected insects is they may be contaminated with diseases or parasites which could ultimately affect their behavior. The biggest disadvantage, however, is that similarly appearing, closely-related species might be accidentally collected and used in the host test which can affect the results of the test.

Laboratory-reared colonies, by contrast, provide a genetic uniform population to work with that is free of diseases or parasites. Unfortunately, laboratory colonies can often undergo genetic drift which can result in behavioral changes or loss of vigor, particularly if they are reared on artificial diets. Often natural populations of the target test insects are quite small or available only for very limited periods of time, while laboratory-reared colonies can provide a large and constant year-round supply of insects.

Rigidity of Insect Behavior: Its Importance to Host Specificity Testing

As insects select host plants and feed on them, they appear to move smoothly from one behavior to another—walking, stopping, and feeding—just as mammals do. Nonetheless, insect behavior is generally much more rigid than that of mammals. Insects select and feed on hosts in a series of discrete steps, each step mediated by a particular physical or chemical stimulus. For example, a flying adult insect may first be attracted to a broken horizon signaling that it has arrived in an area where host plants are located. Specific volatile leaf chemicals borne on the wind may then cause the insect to turn so that wind speed detectors on each side of the body are stimulated equally. This orientation will bring the flying insect to the source of the odor—

the prospective host plant. The insect may land on the plant and begin walking. Chemicals called **arrestants** may signal the insect to stop walking. The insect may then taste the plant, and if chemicals called **feeding** incitants are present, the insect will begin to feed.

In some cases, chemicals called **feeding maintenants** must be present for the insect to sustain its feeding behavior. If any stimulus is lacking, host selection or feeding is aborted and a different behavior is triggered, such as flying away to search for another host.

Not all insects have the same sequence of behaviors. Certain steps displayed by one species may not be displayed by another. Nevertheless, insect behavior is generally rigid, and this rigidity constitutes an important basis for scientists' confidence in the results of host specificity tests. In natural conditions and in many test conditions, genetically determined behavioral programs prevent insects from **skipping over** steps in order to satisfy their need for food.

Usually, immature insects have their host plants selected for them by the ovipositing adult female. Hence, immature insects often have relatively feeble powers of discrimination. If, for any reason, an adult deposits its eggs on a plant that is unsuitable as a host, its larval progeny may (or may not) still feed. If the host plant is of poor nutritional quality, or if it possesses defensive chemicals, larvae may grow and develop for a time but fail to complete development. Or, they may complete development but emerge as undersized adults. Usually, the production of undersized adults indicates severe physiological disturbances, and the adults may be sterile.

Preliminary Screening Tests

During the initial stage of evaluation, a large number of host plants are selected as possibly being at risk of attack by the agent. Therefore, the first level of testing usually concentrates on a quick, simple test to evaluate the response of the insect to the selected plants. This preliminary testing is referred to by several different names—first-phase host testing, no-choice testing, starvation testing, or single-plant testing—but usually follows the same general procedure. There are published strategies for preliminary testing. See *Appendix H* under *Testing Methodology for Biological Control Operations* for a list of publications.

In general, small numbers of agents are placed on small portions of the plant in a container, such as a petri dish or on small, enclosed, potted plants. As a positive control, a similar number of insects are placed on the same part of the target weed. They are allowed to either feed on the plant or starve to death. The response of the insects to the plants often is quite variable.

Often the insects will taste the plant in an effort to identify if it is a suitable host. Generally, small amounts of tasting are not considered to be feeding, and results can be regarded as nonfeeding. On other plants, the insects will ingest enough material that they can produce droppings and the life span of the insects will be extended, but the insects show little or no development. These plants can also be discarded as potential host plants.

The final category are those plants on which the insect readily feeds, grows, and appears to undergo natural development. These plants are potential hosts, and must be targeted for further studies.

Whole Plant Tests

The next level of feeding is usually aimed at creating a more natural condition where the insect can select the part of the plant on which it will feed, and, if necessary, complete its development. This second level of testing usually requires live, potted plants or plant parts (at least large healthy bouquets of foliage, flowers, seeds, fruit, roots, or stems) which are changed regularly as the agents grow. Like with the initial stage, the results of the second stage of feeding can be quite variable.

The insect may complete its development, but take significantly longer than the insects on the target weed being used as a positive control. Or, the insects will complete their development on the test plant and become adults; but the adults will be smaller than those produced on the normal host and are sterile or likely to produce less eggs.

The main purpose of these secondary feeding tests, like the first stage, is to eliminate more of the plants that are not at risk, thereby identifying those plants on which the insect is able to develop normally.

Oviposition Testing

Even if an insect can complete normal development on a nontarget plant, it does not mean that the nontarget plant would be used as a host in the natural environment. That is, if the adult female does not recognize the plant as a potential host and lay her eggs on it, the plant would not be used as a host in the field. Therefore, suitability for oviposition is often included in host testing.

Oviposition testing requires larger cages in which the mated female can freely move around and choose between the test plants and the target weed. If ovipositing is observed, the plants are held to see if the larvae will complete their development and produce normal adults.

Like most tests under laboratory conditions, oviposition tests are subject to many limitations. The confined space in the cage, or mixing of the odors from the enclosed plants can confuse the female into laying eggs on what otherwise would be unsuitable hosts. Or, if the foliage of the test plant and the positive control are intertwined, the female can accidentally deposit eggs on the wrong plant. Also, some insects can tell if eggs have already been laid on a plant, and if a certain number are present, they will automatically move on to search for an egg-free place. Because of the short life span of most insects, most females lay their eggs in a fairly short period of time. If they do not find a suitable host in time, they will deposit their eggs on any available surface—the cage walls, flowerpots, and on what would normally be unsuitable plants. Some insects, e.g., gypsy moth and many phycitid moths, routinely deposit eggs on inanimate objects and let the larvae do the searching and host selection. Therefore, results of ovipositing testing must be analyzed carefully.

Oviposition tests are another way to eliminate additional plants from further testing. These tests also can provide useful information on the specificity of an insect, but they may not be the ultimate answer.

Field Testing

It is generally accepted that the most accurate information on the host range of an insect is from tests conducted under natural field conditions. Ideally, plants to be tested are planted intermixed with the target weed where there is a natural population of the insect. The insects from the surrounding population are then allowed to select between the test plant and target weed for oviposition and subsequent larval development. While this is a much more definitive test, it also has its disadvantages.

Often the foreign country where the tests are to be conducted will not allow North American plants to be introduced and planted because of the chance of their escaping and becoming weeds. Also, after planting the test plants, the insect population in the area may be too low to allow a realistic test. Sometimes this situation can be overcome by enclosing the plants in large cages, collecting the insects from the surrounding area (or rearing them artificially in a laboratory), and releasing relatively large numbers in the cage. This situation can reproduce the cage test biases described above.

Experimental Design

Because of the large variability in behavior and life cycle that each species of insect demonstrates, it is impossible to use a standard design for all host testing. Each host test for a different species

requires a slightly different experimental design. The design used, however, should be critically reviewed to determine if high experimental standards were used and if adequate quality control was followed. Each design should be reviewed to determine adequacy of:

- Quality of host plant
- Quality of test insects
- Number of plant species tested
- Number of plant species used adequate to represent a genus
- Number of insects tested
- Stage of the insect used in the test
- Replication of tests

Conclusion

The general process used in host testing begins with field studies of the insect when it is first found and being considered as a potential biological control agent.

The next step is to screen a large number of test plants to eliminate those species or groups that are not at risk.

This is followed by further testing under more natural conditions that eliminate more plants and identify those that are possibly at risk of attack by the candidate agent.

At this point only a few plant species remain, but usually require much more complex and comprehensive tests to determine which can support natural development of the insect and would possibly be selected by females as a suitable host.

The results of host testing are easy to evaluate if under several different test arrangements, the insects can feed and develop only on the target weed. In this case, there is usually no question about host specificity. This situation is usually quite rare. If a realistic selection of test plants is used, including many related species, the insect is almost always found to have a host range of several species.

In the past, if other plants in the host range tests on which the insect fed and developed were weeds or were accidentally introduced plants of no known value, the release of the insect was usually approved. However, if the plant is a native species or a desirable agricultural or ornamental plant, the researcher must demonstrate (based on

phenology, climatic limits, or geographic range) why the candidate agent will not utilize or at least not significantly harm the population of the desirable plants.

Therefore, the most important parts of host specificity testing are how the petitioners explain and interpret their results, and how they extrapolate the results to the potential damage the insects may cause nontarget plants, should they be released.

References

For more information about host specificity testing of insects, see the following listed references as well as those listed in *Appendix H* under *Testing Methodology for Biological Control Operations*. Cullen, J.M. 1988. Current problems in host-specificity screening: proceedings of the VII International Symposium of the Biological Control of Weeds: 27–36.

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TAG Reviewer's Manual

Biological Control of Weeds

Host Range Tests of Pathogens

Contents

Preface

Following are guidelines for host range tests of pathogens that are proposed as biological control agents of weeds. The guidelines were prepared by Dr. Tom Bewick, Director of Cranberry Experiment Station, University of Massachusetts, to be reviewed by TAG members before reviewing and evaluating submitted petitions.

Introduction

Host range testing of pathogens proposed as biological control agents of weeds (hereafter referred to only as pathogens) must initially take place under controlled environmental conditions. Frequently these studies are done in greenhouses, but may also be done in growth chambers. The use of dew chambers is commonplace.

A wide range of problems are encountered in raising plants under such conditions that might complicate the analysis of test results. Frequently, the waxy cuticle found on plant leaves is thicker in plants grown under field conditions than it is in plants grown under controlled conditions. Since the cuticle is the primary barrier to infection from foliar pathogens, this may confound results.

Many greenhouse coverings exclude ultra-violet light (UV). UV has been demonstrated to trigger the production of enzymes in plants that are involved in the immune response of plants to pathogen attack. Field grown plants do not have UV protection, and so they are often pre-adapted to ward off pathogenic attack. In addition, there is evidence that UV is detrimental to many pathogens.

Epidemiology

It is very important to ascertain prior to initiating host range studies, those controlled conditions that lead to optimum infection in the target weed. The determination of the optimum conditions leading to infection is termed **epidemiology** and can be a very lengthy process. Factors that need to be considered include the following:

- Carrier and adjuvants for inoculum application
- Concentration of inoculum in the carrier
- Total volume of carrier plus inoculum to be applied
- Requirement of the pathogen for free water on the leaf surface (dew period)
- Temperature during the dew period, and length of dew period
- Temperature of the growth chamber after the dew period

Physiological Conditions

The physiological condition of the test plants at the time of application is also an important consideration and should be described in the petition. This is often described by the number of leaves at the time of application. Size of the plant, especially height, is a poor indicator since young plants that are exposed to low light levels might be taller than older plants that were grown under high light conditions. Reproductive status of the plants (phenological stage) may also be useful to note.

Positive Control

It may not be necessary for the petition to contain the details of how all the preceding experiments were carried out, as long as it is clear that these factors have been considered.

When the researcher uses a positive control in the host range tests, the reviewer can be certain that the researcher is striving for optimal conditions. A positive control is one that is reasonably expected to give

a positive response. In the case of a host range test, the target weed must be included in all tests. If the pathogen is a good agent, the target weed will exhibit a strong reaction to the pathogen. It may also be desirable to include several genotypes of the target in all host range tests to demonstrate that the chosen environmental conditions represent the true optimum.

Host Plant Selection

A strategy, based on the Wapshere centrifugal method, for selecting plants for host range testing is covered in *Appendix E*. Other systems may be used in addition to the Wapshere method. Suffice it to say that the identity of the plants must be confirmed; the person identifying the plants must be named; and the source of propagative material must be clearly stated. Note that centrifugal testing approach may not be appropriate for all organisms, particularly facultative saprophytes (i.e., culturable organisms).

Condition of Test Plants

The petitioner should thoroughly describe the conditions under which the test plants were grown. Actively growing plants that are free of arthropods and diseases should be used.

The petitioner should describe the phenological stage of test plants (seedlings, vegetative buds, flowers, fruit, seeds). Watering and fertility regimes should be discussed, as well as the type and size of containers used. The type of soil used in the pots should be adequately described. Large plants in small containers often experience nutrient and water stress if application of these factors is not frequent enough. Plants that have undergone such stress have enzyme systems activated that can be part of the immune response to pathogenic attack.

Growing Conditions

The growing conditions in the growth facility should be monitored and reported in an appendix to the petition. Critical factors are maximum and minimum air temperatures, duration of these temperatures, and periodic (hourly if possible) reporting of relative humidity. Again, it may not be essential that all of these values are reported in the petition as long as the petition indicates that these factors were considered.

Techniques Used for Rating Disease

Another important aspect of host range testing is a thorough description of the techniques used for rating disease. Disease incidence and severity should be considered. Incidence is the presence or absence of visual symptoms. Severity involves qualitative and quantitative measures of extent of disease presence.

Since there are qualitative factors that must be considered, it should be clearly stated what those factors are and how the researcher made the evaluations. Qualitative determinations should be confirmed by some quantitative measure. This measurement may be as simple as determining lesion density by counting the number of lesions per leaf and dividing by the size of the leaf. Qualitative terms such as small, medium, and large should be defined in quantitative terms (e.g. 0 to 5mm, 6 to 10 mm, and >10 mm, respectively). Whatever measures are used, the technique should be thoroughly described.

In judging whether the rating system is adequate, the reviewer should determine whether the petition describes the techniques in enough detail that the reviewer could repeat the procedure. The reviewer should then visualize the procedure and make a determination as to whether the techniques employed would yield an accurate picture of the presence and severity of disease. The use of long accepted techniques, described in a significant body of literature, can help satisfy the reviewer that the techniques are adequate. When well documented techniques have been used, they should be described in the petition in enough detail to allow those unfamiliar with the literature to visualize what was done. Citations should also be given for those who want to read more.

Disease Symptoms on Nontarget Hosts

In many cases, plants other than the target weed will exhibit some disease symptomatology when challenged with a pathogen under ideal environmental conditions. Those that do not can be dropped from further testing. If some infection does occur, it is important for the petition to describe the persistence of the disease on the nontarget host.

Infection may occur, but pathogen reproduction may not. This is probably acceptable risk, depending on the plant species. If the plant so affected is an endangered or threatened species, it would be desirable to determine if the infection has significant physiological consequences for the plant. Such consequences might be reduction in growth rate, reduction in flowering, or reduction in viability of dispersal organs, such as seeds.

Another scenario is that a small amount of pathogen reproduction may occur, with little or no secondary infection taking place. This may also be acceptable risk, but further experimentation is probably indicated in this situation. Inoculum can be collected from this type of infection and used in studies to determine whether the inoculum is infective. If the inoculum is not infective, then the risk is probably acceptable.

It may also occur that there is measurable secondary infection on nontarget hosts. In this situation, further experimentation is obviously needed. Frequently, field trials can be used to determine whether these limited types of infection have serious environmental implications for nontarget hosts.

Field Trials

Field trials should be conducted under conditions that favor the growth of the test plants. These conditions should be completely described and should include the following:

- Time of year
- Location of the test site
- Soil type
- Fertility and irrigation regimes
- Rainfall data
- Planting methods (including between row and within row spacing)

In the case of exotic pathogens, these trials are conducted overseas, if done before approval for release from quarantine.

Environmental Conditions

Environmental conditions during the growth of the test plants, at the time of application and during the evaluation period, should be monitored and reported. Factors that are important include the following:

- Maximum and minimum air temperature
- Atmospheric humidity
- Soil temperature
- Solar radiation (indications of photoperiod and cloud cover)
- Wind speed

Physiological Stage of Test Plants

The physiological stage of all test plants at the time of application should also be indicated.

Controls

As with controlled environment studies, positive controls should be included. The procedure for evaluating disease should be defined as for controlled environment studies.

References

For more information about host range testing of pathogens, refer to the following listed references as well as those listed in *Appendix H* under *Testing Methodology for Biological Control Operations*.

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TAG Reviewer's Manual

Evaluation Guidelines

Petitions for Field Release

Contents

Introduction

The guidelines in this section are for TAG members to follow when reviewing and evaluating petitions for the release of biological control agents of weeds. Use the guidelines as a checklist to see how much of this information was addressed and how thoroughly each topic was covered in the petition.

The guidelines are organized the same as the suggested format for petitions (see ***Appendix D*** on page **D-1-1**). At the end of each section of the petition, TAG members record their comments on a Reviewer's Comment Sheet. After reviewing all sections, TAG members should develop an overall evaluation and recommendation concerning the proposed action from their agency's perspective. See ***Appendix G*** on page **G-1-1** for a sample of the Comment Sheet. Guidelines for recording overall recommendations are under ***Reviewer's Recommendation*** on page **5-1-11**.

Agency's Perspective

TAG members should fully understand their agency's perspective on biological control activities. If you do not know your agency's point of view, see ***Appendix C*** on page **C-1-1** for brief summaries.

During Review and Evaluation

If you have questions or concerns that only the petitioner could answer or resolve, feel free to contact the petitioner directly. Notify the TAG Chair of your question(s) and the petitioner's answer(s) so the other TAG members can be kept informed in case they have similar questions.

Sending Petitions Out for Additional Comments

Formulate as follows:

1. Establish time lines for additional reviews. **Keep in mind that the time frame for reviewing and evaluating petitions is 6 weeks. Therefore, allow time for any subject matter specialist to review and evaluate the petition, as well as for you to synthesize comments and recommend action**
2. Decide whether to send the entire petition or a portion of the petition
3. Prepare a cover note giving the following information:
   - **A.** Specific guidance on what part of the petition you need them to review
   - **B.** To contact you if they have questions or concerns. As a TAG member, you should remain the individual who directly contacts the petitioner

C. A time line when you expect a reply

Recording Your Comments

Record synthesized comments on the Reviewer's Comment Sheet for the Release of Biological Control Agents of Weeds (see ***Appendix G*** on page **G-1-1** for a sample). List the names and area of speciality of the additional reviews under Section 2, Summary Comments, of the Comment Sheet.

Cover Page

Check for the following information:

- ❒ Who is submitting the petition?
- ❒ What target weed is involved?
- ❒ What is the biological control agent?
- ❒ Where have the studies been conducted?
- ❒ What quarantine facilities will be used to rear or house agents for initial field release?
- ❒ Where will the initial release occur?
- ❒ Who will conduct release and monitoring in the United States?

Petition Introduction

The introduction of the petition should provide a quick overview of the nature of the problem and the petitioner's proposed action. After reviewing this overview, determine if you will need additional reviews by subject matter specialists within your agency in order to formulate an informative recommendation from your agency's perspective.

- ❒ Are there issues about the taxonomy for either the target weed or the biological control agent? Will you need a specialist to validate the taxonomic information—entomologist, biologist, botanist?
- ❒ Are there issues about the biological control agent?
- ❒ Are there issues about the location of the release?

At this time, determine if you will need help beyond your own knowledge of the problem and proposed action to adequately evaluate the risk of the release from your Agency's perspective. Refer to ***Table 5-1-1***. Develop and share a list of Agency contacts.

Table 5-1-1 Determine if You Need Additional Reviews

If you determine that you:	Then continue on to:

Table 5-1-1 Determine if You Need Additional Reviews

Need additional reviews	***Sending Petitions Out for Additional Comments*** on page **5-1-2**
Do not need additional reviews	1. Review the petition following these guidelines beginning with ***Target Weed Information*** on page **5-1-4** 2. Use a Reviewer's Comment Sheet to record your comments, evaluation, and recommendation (see *Appendix G* for a sample)

Target Weed Information

Table 5-1-2 Where to Find More Information About Target Weeds

If you need to review basic information or research additional references about:	**Then go to the following page(s) or section(s) in this manual:**
Economic Botany	*Appendix H* under Economic Botany
Protected Species	*Appendix H* under Protected Species
Host Specificity	◆ For insects, page 4-3-1 ◆ For pathogens, page 4-4-1 ◆ *Appendix H* under Testing Methodology for Biological Control Operations
Plant Classification Systems	*Appendix I*
Plant Taxonomy and Distribution	*Appendix H* under Plant Taxonomy and Distribution
Submitted Petitions	◆ For historical list, Appendix J ◆ For current list, go to <http://www.aphis.usda.gov/ppq/permits/tag/petition.html>

❒ Has this weed been targeted previously—either a previously submitted petition or test plant list? If so, how does the discussion of weed information compare with previous discussions?

Taxonomy

❒ Does the classification go far enough to address any concerns?
❒ Is the person who identified the target weed listed (name and location) and qualified?
❒ Is there any problem in the present taxonomy?
❒ Is the location of the herbarium containing voucher specimens listed, including date of depository?

Description

❒ Is the general physical description of the target weed complete enough that you could identify it in the field?

Distribution of the Target Weed

This section should provide you with a sense of where the target weed will spread in North America. There should be an adequate description of the following:

- ❒ Native range
- ❒ The areas of introduction throughout the world, pattern of movement, and apparent limits
- ❒ Present distribution in North America
- ❒ Potential spread in North America
- ❒ Genetic variability
- ❒ Habitats or ecosystems where the weed is found in North America

Taxonomically Related Plants

- ❒ Has the petitioner identified economically and environmentally important plants that are closely related to the target weed?
- ❒ Has the petitioner identified endangered or threatened plants that are closely related to the target weed?
- ❒ Has the petitioner identified how closely these plants relate to the target weed?

Distribution of Taxonomically Related Plants

- ❒ Is there an adequate description of the distribution in North America of taxonomically related plants?

Life History

- ❒ Explanation of life history of the target weed
- ❒ Explanation of general biology of the target weed

Impacts

Information about the impacts made by the target weed would be helpful in evaluating the safety of releasing the candidate agents. Use the following areas of impact as a guide when reviewing a petition. Not all areas are applicable to all petitions.

- ❒ Beneficial uses— honey bees, forage, ground cover, fruit, etc
- ❒ Social and recreational uses—valued as an ornamental or as a pest.
- ❒ Threatened and endangered species.
- ❒ Economic losses, including direct control costs.
- ❒ Health—poisonous, allergens.
- ❒ Regulatory—noxious weed, restricts trade.
- ❒ Native plant and animal populations.
- ❒ Weed control on nontarget plants.
- ❒ Ecosystem functions and ecological relationships.
- ❒ Other impacts (e.g., aesthetics).

Alternative Management Options

- ❒ Historical options—what has been done before and its effectiveness.
- ❒ Current options—biological, chemical, cultural; and effectiveness.
- ❒ Potential options—new herbicides, biological control agents used or released in other countries. Note, the petitioner may not have information on new chemicals being developed.

Recording Your Comments

Check off on the Reviewer's Comment Sheet whether the information in the petition is complete and comprehensive, or that there is information lacking. If information is lacking, comment about any concern you have.

Biological Control Agent Information

Table 5-1-3 Where to Find More Information About Biological Control Agents

If you need to review basic information or research additional references about:	Then go to the following page(s) or section(s) in this manual:
Biological Control Agents	◆ page 4-2-1 ◆ *Appendix H*
Identification and Characterization of Agents	
Host Specificity	◆ For insects, page 4-3-1 ◆ For pathogens, page 4-4-1 ◆ *Appendix H* under Testing Methodology for Biological Control Operations

- ❒ Has a petition concerning this agent been previously submitted? If so, have the previous TAG concerns been adequately addressed?

Taxonomy

- ❒ Has petitioner given a general description of the agent?
- ❒ Has petitioner provided the proper framework and enough detail for assessing identification? Look for reference of an authoritative identification. **For insects**: look for species, genus, family, order. **For pathogens**: look for strain, race, type.
- ❒ What is the level of the determination? Is it appropriate to the taxonomic group?
- ❒ Does the taxonomic group involve a complex or problem group? If so, more detail may be needed.
- ❒ Was a reason given for choosing this agent?
- ❒ Are the authorities used in identification/characterization appropriate?
- ❒ **For insects and pathogens:** Are the methods used to identify life stages listed?

- ❒ Is there evidence that the agent was identified by a qualified taxonomist? If not listed, you may require additional evaluation and validation by a specialist.
- ❒ **For pathogens**: How are they preserved? Are they appropriate for DNA analysis or other molecular evaluation? (Useful when differentiation among close taxonomic groups is difficult using standard morphometric techniques.) Are the voucher methods appropriate to the taxa or level of science involved?
- ❒ **For insects:** Is the location of the voucher specimens listed? (Recognized taxonomic institutes are the best sources for information about voucher specimens.)
- ❒ **For pathogens**: Was identification/characterization information used to confirm the determination during evaluation processes (additional collections, long-term rearing, etc.), and during field colonization efforts overseas?
- ❒ How can the agent be distinguished in the field? Is there a question of how the agent will be discriminated from existing, related organisms in the field and in quarantine or from sibling and cryptic species?

Geographical Range

This section should provide you with a good understanding of the potential range of the biological control agent. There should be an adequate description of the following:

- ❒ Is the native range listed?
- ❒ Does the petitioner show countries where the agent has been introduced, its present range, and its effectiveness?
- ❒ Does petitioner show the potential spread outside the area proposed for the initial release in North America (a continental view) based on climatic, environmental, and vegetative parameters?

Known Host Range (Specificity)

This section should give you a good sense of what other plants the agent utilizes in its native land. Does the petitioner:

- ❒ List literature records indicating other host plants the agent is known to attack?
- ❒ List records of field host-plant collections and observations including maps and data?
- ❒ List the known range of host plants of organisms closely related to the agent?

Life History

The information provided here will be specific to the agent, and the importance of an agent's life history will vary.

- ❒ Is the basic biology and life history of the agent provided in enough detail to explain its role in the new environment?

- ❒ To what extent does the agent damage or control the target weed?
- ❒ To what extent does the agent damage or control nontarget plants?
- ❒ What are the known mortality factors

Population of the Agent Studied

This section should provide adequate information to ensure compatibility in the conditions between the locations of the study site and of the potential release site.

- ❒ Are the collection sites for the population described?
- ❒ Can you trace the source of the agents that were used in the studies?
- ❒ Is the agent targeted for the initial release from the same population used for the studies, or is it identical to the original (DNA or other means)?
- ❒ Are the locations of the field studies and quarantine facilities listed?
- ❒ Are the conditions of the study sites compatible with the potential release site?

Recording Your Comments

Check off on the Reviewer's Comment Sheet whether the information in the petition is complete and comprehensive or if information is lacking. If information is lacking, comment about any concern you have.

Experimental Methodology and Analysis

The description (method and data) should be sufficient for someone who is qualified to repeat the experiment.

Table 5-1-4 Where to Find More Information About Methods and Approaches Commonly Used by Researchers

If you need to review basic information or research additional references about:	Then go to the following page(s) or section(s) in this manual:
Host Specificity	◆ For insects, page 4-3-1 ◆ For pathogens, page 4-4-1 ◆ *Appendix H* under Testing Methodology for Biological Control Operations
Testing methodology for biological control operations	*Appendix H* under Testing Methodology for Biological Control Operations

Test Plant List

A test plant list shows the species of host plants on which the agent was tested and it explains why the plants were chosen to determine the agent's potential feeding range. Refer to ***Evaluation Guidelines*** on page **5-1-1** for *Test Plant List*.

Design

Does the petitioner provide the following information about the design of the tests?

- ❒ If the weed has been targeted previously, how does the design compare with the previous test designs including plant species tested?
- ❒ Is there a list of part or stage of the plants tested?
- ❒ Is there a list of source of population of plant (and weed) used in the test?
- ❒ Is there a list of number of replicates and number of individual agents, target weeds, and test plants? (These numbers may be synonymous depending on the test design, i.e., in no choice tests the number of individual plants of a species is the number of replicates.)
- ❒ Did the petitioner properly design the tests using the appropriate positive controls? (Positive control is where the target is present at every step in the test process, i.e., treatment on which you would expect a positive response.)
- ❒ Did the petitioner explain why the procedures were selected and how appropriate they are for the biology of the agent?

Recording Your Comments

Check off on the Reviewer's Comment Sheet whether the information in the petition is complete and comprehensive, or if information is lacking. If information is lacking, comment about any concern you have.

Results and Discussion

- ❒ Are results discussed in relation to what has been previously reported? Are results discussed in relation to host specificity and environmental safety?
- ❒ Was the method of presentation appropriate to show the results? If not, directly contact the petitioner to ask for the results in another way that would help you better understand them.
- ❒ Do you reach the same conclusion as the petitioner through your interpretation of the data? Note that the interpretation and significance of the results are done differently between insects and pathogens.
- ❒ Does the petitioner have a well-thought out plan for releasing the agent? Consider your agency's concerns when evaluating this section of the petition.
- ❒ Is there a plan for post-release monitoring? Does the monitoring plan adequately describe how the spread and impact of the agent on target weed and nontarget plants will be determined; the monitoring techniques to be used; and the groups to best perform monitoring?

- ❒ Has the petitioner included a composite statement of benefit and risk about releasing the agent—weighing the probable benefits of releasing the agent against the unknowns and possible negative impacts? Reference ***Appendix H*** on page **H-1-1** for additional information about risk assessment.

Recording Your Comments

Check off on the Reviewer's Comment Sheet whether the information in the petition is complete and comprehensive, or if information is lacking. If information is lacking, comment about any concern you have.

Potential Environmental Impacts

This information should go beyond the risk associated with attack on a few closely related species of plants, as indicated in the results of the host specificity testing. This discussion should look at the overall potential impact of populations of this insect building up on the weed in a large variety of different habitats. The petitioner should present as clear a picture as possible of the long-term ecological consequences that could possibly result from the successful establishment of this agent in the North American environment. Note that the petitioner may speculate, without quantifying, about potential ecological, economic, social, biological, health regulatory, and environmental impacts.

- ❒ **Human Impacts:** Has the petitioner considered either positive or negative results on humans, or discussed ways to overcome negative effects of either the target weed or alternative management methods?
- ❒ **Potential Economic Impacts:** Has the petitioner addressed potential economic impacts regarding the ecological, social, aesthetic, and biological impacts?
- ❒ **Plant Impacts:** Has the petitioner described the value of introduction on target populations against impacts on nontarget plants including potential impacts on agricultural, horticultural, threatened and endangered plants?
- ❒ **Nonplant Impacts:** Has the petitioner described the value of the release to organisms (other than plants) that depend on the target weed or that are affected by the target plants?
- ❒ **Proposed Methods for Mitigation:** Has the petitioner identified any mitigative measure that relates to the safety of introducing the agents? If there is a potential problem, is there a way of controlling the agent?
- ❒ **Abiotic and Edaphic Effects:** Has the petitioner considered potential effects on water, soil, and air resources?
- ❒ **Outcome of No Action:** Has the petitioner addressed what the outcome is if the agent is not released?

Recording Your Comments

Check off on the Reviewer's Comment Sheet whether the information in the petition is complete and comprehensive, or information is lacking. If information is lacking, comment about any concern you have.

Petitioner's Conclusion

- ❒ Does the petitioner offer conclusions about the potential risks and benefits of releasing this agent and its successful establishment in the environment throughout the range of its target weed and susceptible nontarget hosts?
- ❒ Was a quantitative risk assessment available? (not necessary)

Reviewer's Recommendation

Record your overall recommendation on the Reviewer's Comment Sheet under Section 2, Summary Comments. Provide an overall assessment of the following:

- ❒ Completeness and comprehensiveness in completing the sections of the petition?
- ❒ Did you review the evaluation and comments you made about each section of the petition as well as those comments made by other specialist?
- ❒ What was your major focus when reviewing the petition?
- ❒ What areas did you not evaluate and why, i.e., lack of expertise
- ❒ If you received input from additional experts, list their names and area of expertise?
- ❒ Thoroughness in addressing your agency's concerns. Were your concerns met? If not, provide a summary of your agency's concerns and the reasoning behind them.
- ❒ What is your confidence level about the safe use of the biological control agent of the weed in the environment? If you have concerns regarding the risk of releasing this agent in North America, provide specific comments and feelings.
- ❒ Did you list the recommendation of your agency?
- ❒ Provide the name, affiliation, telephone, FAX, and E-mail numbers of the reviewer. Also include the names of other specialists who provided comments
- ❒ Did you sign and date the Comment Sheet?
- ❒ Send the Comment Sheet to the Chair through the Executive Secretary of TAG. The address is on the Reviewer's Comment Sheet.

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TAG Reviewer's Manual

Evaluation Guidelines

Test Plant Lists

Contents

Introduction

Test plant lists are developed by researchers and petitioners for determining host specificity of biological control agents of weeds in North America. See *Appendix E* for a suggested format. Usually, test plant lists are submitted early in the study when a researcher or petitioner is proposing a new weed for biological control. When the petitioner submits a petition for field release of a particular agent, the petition will include the test plant list. At that time, the petitioner must give complete information on the target weed and the biological control agent, and have made improvements on the list of plants actually tested based on TAG's evaluation of the original list.

When a test plant list is submitted to TAG, it is important for TAG members to attend to it as if it were a petition. It is also important to thoroughly justify additions to a test plant list. Starting off a biological control program with the best test plant list possible will ultimately save valuable time, money, and patience of both government and public supporters of biological control.

These guidelines provide a strategy for TAG members to evaluate test plant lists for determining host specificity. The suggested strategy is based on A. J. Wapshere (1974), *A Strategy for Evaluating the Safety of Organisms for Biological Weed Control*, published in Annals of Applied Biology. The strategy is based on the phylogenetic approach, where closely-related species are theorized to be at greater risk of attack than are distantly-related species.

Use these guidelines along with a Reviewer's Comment Sheet for Test Plant Lists. See *Appendix G* for *Reviewer's Comment Sheet for Test Plant Lists for the Release of Biological Control Agents of Weeds Technical Advisory Group (TAG)* for a sample of the Comment Sheet.

Cover Page

- ❒ What is the submitting date?
- ❒ Who is submitting the test plant list?
- ❒ What target weed is involved?
- ❒ Where are the studies to be conducted and who is to conduct them?
- ❒ What agencies are supporting and conducting the studies?

Introduction to the Test Plant List

The introduction of the test plant list should provide a quick overview of the nature of the problem and the researcher's proposed action. After reviewing the overview, determine if you will also need a subject

matter specialist within your agency to review the list in order to formulate an informative recommendation from your agency's perspective.

If you need additional reviews, follow the guidelines for sending petitions out for additional comments beginning on *"Sending Petitions Out for Additional Comments" on page 5-1-2*.

Target Weed Information

Table 5-2-1 Where to Find More Information About Target Weeds

If you need to review basic information or research additional references about:	Then go to the following page(s) or section(s) in this manual:
Economic Botany	*Appendix H* under Economic Botany
Protected Species	*Appendix H* under Protect Species
Host Specificity	◆ For insects, page 4-3-1 ◆ For pathogens, page 4-4-1 ◆ *Appendix H* under Testing Methodology for Biological Control Operations
Plant Classification Systems	*Appendix I*
Plant Taxonomy and Distribution	*Appendix H* under Plant Taxonomy and Distribution
Submitted Petitions	◆ For historical list, *Appendix J* ◆ For current list, go to <http://www.aphis.usda.gov/ppq/permits/tag/petition.html>

❒ Has this weed been previously targeted where there would be either a previously submitted petition or a test plant list? If so, how does the current discussion of weed and test plant information compare with previous discussions?

Taxonomy

❒ Who is submitting the petition?
❒ Does the classification go far enough to address any concerns? Is there evidence that the identification needs to go beyond species?
❒ Is the person who identified the target weed listed (name and location) and qualified?
❒ Is there any problem in the present taxonomy?
❒ Are the locations of the voucher specimens listed, including date of depository?

Description

❒ Is the general physical description of the target weed complete enough?

Distribution of the Target Weed

This section should provide you with a sense of where the target weed is distributed and will potentially spread in North America. There should be an adequate description of the following:

- ❒ Native range
- ❒ The areas of introduction throughout the world, pattern of movement, and apparent limits
- ❒ Present distribution in North America and the potential spread in North America
- ❒ Genetic variability
- ❒ Habitats or ecosystems where the weed is found in North America

Taxonomically Related Plants

- ❒ Has the petitioner identified economically and environmentally important plants that are closely related to the target weed?
- ❒ Has the petitioner identified endangered or threatened plants that are closely related to the target weed?
- ❒ Has the petitioner identified how closely the plants relate to the target weed?

Distribution of Taxonomically Related Plants

- ❒ Is there an adequate description of the distribution in North America of taxonomically related plants?

Life History

- ❒ Explanation of life history of the target weed
- ❒ Explanation of general biology of the target weed

Impacts

Information about the impacts made by the target weeds would be helpful in preparing a risk assessment and evaluating the risk and safety associated with releasing the candidate agents. Use the following areas of impact as a guide when reviewing a test plant list. Not all areas will apply to all plants selected for testing.

- ❒ Beneficial uses—honey bees, forage, ground cover, fruits, etc.
- ❒ Social and recreational uses—valued as an ornamental
- ❒ Threatened and endangered species
- ❒ Economic losses, including direct control costs
- ❒ Health—poisonous, allergens
- ❒ Regulatory—noxious weed, restricts trade
- ❒ Native plant communities
- ❒ Weed control on nontarget plants
- ❒ Other impacts (e.g., aesthetics)

Alternative Management Options

- ❒ Historical options—what has been done before
- ❒ Current options—biological, chemical, cultural

❒ Potential options—new herbicide, biological control agents used or released in other countries. Note that the researchers may not have information on new chemicals being developed

Known Host Range of Candidate Biological Control Agent(s)

The petitioner may not have addressed this topic since it is early in the research when a test plant list is submitted.

❒ Literature records indicating what other plants have been attacked
❒ Field collections and observations, including maps and data
❒ Literature on host range of closely-related species to the candidate agent

Recording Your Comments

Check off on the Reviewer's Comment Sheet for Test Plant Lists under *Appendix G* whether the information in the list is complete and comprehensive, or that information is lacking. If information is lacking, comment about any concern you have.

Test Plant List

Review the list to see if it covers the following categories of test plants. The species chosen for each category are representative species to be tested.

Category 1: Genetic Types of the Target Weed Species (varieties, races, forms, genotypes, apomicts, etc.)

❒ Did the petitioner provide information on the genetic variability of the target weed?
❒ Did the petitioner justify the genetic types selected for testing from those identified?
❒ Did the petitioner discuss how the selected types may or may not enable the petitioner to make inferences about effects on untested types?
❒ **In the event that many types exist**, did the petitioner justify the number selected for testing?
❒ Did the petitioner provide references or, if none are available, discuss the lack thereof?

Category 2: Species in the Same Genus as the Target Weed, Divided by Subgenera (if applicable), Including Economically and Environmentally Important Plants of North America

- ❒ Did the petitioner provide detailed information on what is known about the phylogenetic relationship of the target weed to other species in the same genus?
- ❒ Did the petitioner provide information on which species are most likely to be found in the same range and habitat as the target weed?
- ❒ Did the petitioner include information on any economically important species found in the genus?
- ❒ Did the petitioner justify species selected for testing from those identified as in the same genus as the target weed?
- ❒ Did the petitioner discuss how the selected species may or may not enable the petitioner to make inferences about effects on untested species?
- ❒ **In the event there are many species in the genus**, did the petitioner justify the number selected for testing?
- ❒ Did the petitioner provide references?

Category 3: Species in Other Genera in the Same Family as the Target Weed, Divided by Subfamily (if applicable), Including Economically and Environmentally Important Plants of North America

- ❒ Did the petitioner provide detailed information on what is known about the phylogenetic relationship of the target weed to other groups (i.e., species, genera, subfamilies) in the same family?
- ❒ Did the petitioner include information on which groups (i.e., species, genera, subfamilies) are most likely to be found in the same range and habitat as the target weed?
- ❒ Did the petitioner include information on any economically important species found in the family?
- ❒ Did the petitioner justify the species selected for testing from those identified as Category 3?
- ❒ Did the petitioner discuss how the selected species may or may not enable the petitioner to make inferences about effects on untested species?
- ❒ **In the event that there are many genera in the family**, did the petitioner justify the number selected for testing?
- ❒ Did the petitioner provide references?

Category 4: Threatened and Endangered Species in the Same Family as the Target Weed, Divided by Subgenus, Genus, and Subfamily

- ❒ Did the petitioner provide a table of all known threatened or endangered species in the same family as the target weed, which includes full scientific name, status, and range within the continental United States? (See *Appendix H*, references for protected species.)
- ❒ Did the table include all species in the same genus as the target weed which are listed by the U.S. Fish and Wildlife Service as threatened or endangered or candidates? (See *Appendix F*, the process for Section 7 Consultations and *Appendix H*, references for protected species.)
- ❒ Did the table include all species within the same genus as the target weed that are identified as sensitive on designated lists such as Natural Heritage Program lists, Canadian Province lists, or Mexican State lists? Note that what may be considered sensitive in a State or province may not be continent wide. The Conservation Directory is a good resource to identify organizations that maintain such lists. (See *Appendix H*, references for protected species.)
- ❒ Did the table include all species in the same family as the target weed listed as threatened or endangered or candidate by the U.S. Fish and Wildlife Service? (See *Appendix F*, the process for Section 7 consultations and *Appendix H*, references for protected species.)
- ❒ Did the petitioner include information on which groups (threatened or endangered species) are likely to be found in the same range and habitat as the target weed?
- ❒ Did the petitioner justify the species selected for testing from those identified as Category 4 or select surrogates since seeds/plants of threatened and endangered species can be hard to obtain and may further threaten populations?
- ❒ Did the petitioner justify the surrogates based on phylogenetic, morphological, and/or biochemical similarities?
- ❒ Did the petitioner discuss how the selected species may or may not enable the petitioner to make inferences about effects on untested species?
- ❒ **In the event that many threatened and endangered species exist**, did the petitioner justify the number selected for testing?
- ❒ Did the petitioner provide references of threatened and endangered lists consulted?

Category 5: Species in Other Families in the Same Order That Have Some Phylogenetic, Morphological, or Biochemical Similarities to the Target Weed or That Share the Same Habitat, Including Economically and Environmentally Important Plants of North America

- ❒ Did the petitioner outline the families in the same order as the target weed?
- ❒ Did the petitioner use *Cronquist's System of Angiosperm Classification* under *Appendix I* and include any additional families listed as in the order by both Thorne and Dahlgren or other taxonomists?
- ❒ If the petitioner used an alternate system of classification, did the petitioner justify the selection?
- ❒ Did the petitioner provide information on which families in this order are most closely related to the target weed's family according to phylogenetic studies?
- ❒ Did the petitioner discuss any morphological or biochemical relationship the target weed or its family has with any group (i.e., species, genus, family) in this order?
- ❒ Did the petitioner include information on which groups (i.e., species, genus, family) are likely to be found in the same range and habitat as the target weed?
- ❒ Did the petitioner include information on any economically important species in these groups (i.e., species, genus, family)?
- ❒ Did the petitioner justify the species selected for testing from those identified as being in Category 5?
- ❒ Did the petitioner discuss how the selected species may or may not enable the petitioner to make inferences about effects on untested species?
- ❒ **In the event there are many groups** (i.e., species, genus, family), did the petitioner justify the number selected for testing?
- ❒ Did the petitioner provide references?

Category 6: Species in Other Orders That Have Some Morphological or Biochemical Similarities to the Target Weed or That Share the Same Habitat, Including Economically and Environmentally Important Plants of North America

- ❒ Did the petitioner discuss any morphological or biochemical relationship the target weed has with any group (i.e., species, genus, family) in other orders?
- ❒ Did the petitioner include information on which groups (i.e., species, genus, family) are likely to be found in the same range and habitat as the target weed?
- ❒ Did the petitioner include information on any economically important species in these groups (i.e., species, genus, family)?
- ❒ Did the petitioner justify the species selected for testing from those identified as being in Category 6?

- ❒ Did the petitioner discuss how the selected species may or may not enable the petitioner to make inferences about effects on untested species?
- ❒ **In the event there are many groups** (i.e., species, genus, family), did the petitioner justify the number selected for testing?
- ❒ Did the petitioner provide references?

Category 7: Any Plant on Which the Biological Control Agent or Its Close Relatives (Within the Same Genus) Have Been Previously Found or Recorded to Feed and/or Reproduce

Important

The petitioner may not have addressed this category since a potential biological control agent may not have been identified yet. The petitioner will need to address this category when a potential biological control is identified.

- ❒ Did the petitioner provide detailed information including full scientific name and range of any plant on which the biological control agent or its close relatives (within the same genus) have been previously found or recorded to feed and/or reproduce?
- ❒ Did the petitioner propose to test all species on which the biological agent has been found or recorded to feed and/or reproduce?
- ❒ Did the petitioner select species for testing from the plants on which any close relatives have been recorded to feed and/or reproduce?
- ❒ Did the petitioner justify the species selected from those identified?
- ❒ Did the petitioner discuss how the selected species may or may not enable the petitioner to make inferences about effects on untested groups?
- ❒ **In the event that many species have been fed/reproduced on by the agents' close relatives**, did the petitioner justify the number for testing?

Summary Table

- ❒ Did the petitioner summarize all the species recommended for testing in table format (in phylogenetic order, i.e., distantly to closely related to the target weed)?

Perspective of Risk

- ❒ Did the petitioner briefly discuss how the selected species should enable the petitioner to make inferences about risk of attack on untested species?
- ❒ Did the petitioner perceive the limits of allowable attack within the phylogenetic hierarchy of the test plant list, and explain why?

Reviewer's Recommendation

- ❒ Review the evaluation and comments you have made, as well as those comments made by other specialists.
- ❒ Recommend that the test plant list be approved or it be returned for revision and additions. Provide reasons for revision and additions.
- ❒ Provide the name, affiliation, telephone, FAX, and E-mail numbers of the reviewer. Also, include the names of other specialists who provided comments.
- ❒ Sign and date the Comment Sheet.
- ❒ Send the comment sheet to the Chair through the Executive Secretary of TAG. (The address is on the Reviewer's Comment Sheet.)

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TAG Reviewer's Manual

Glossary

Abiotic Not pertaining to life or specific life conditions.

APHIS Animal and Plant Health Inspection Service, USDA.

ARS Agricultural Research Service, USDA.

BA Biological assessment. Under the Endangered Species Act, the evaluation of a proposed action's potential effects on listed and proposed species and designated/proposed critical habitat.

BCDC Biological Control Documentation Center.

BIA Bureau of Indian Affairs, USDI.

Biological control agents Organisms that suppress or kill weedy plants without significantly injuring desirable plants (Andres, 1977).

Biotype A group of organisms having identical genetics but varying characteristics.

BLM Bureau of Land Management, USDI.

BR Bureau of Reclamation, USDI.

COE Army Corps of Engineers.

Cryptic or sibling species Sexually isolated populations with few or no tangible recognition characters to set them apart from the general species populations.

CSREES Cooperative State Research, Education, and Extension Service, USDA.

Diapause Period of arrested morphological development or suspended animation.

DOD Department of Defense.

EA Environmental Assessment. A concise, public document that briefly provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI).

Edaphic Of or pertaining to soil, especially as it affects living organisms.

EIS Environmental Impact Statement. APHIS prepares an EIS to meet its National Environmental Policy Act (NEPA) responsibilities. An EIS serves as a broad, comprehensive reference evaluating anticipated environmental effects of alternative planned causes of action.

EPA Environmental Protection Agency.

ESA Endangered Species Act. ESA as amended, was established in 1973 providing the policies and procedures for protecting endangered and threatened species of fish, wildlife, and plants. An objective of ESA is to provide ways to conserve endangered and threatened species and their habitats. Also, ESA requires APHIS to consult with the U.S. Fish and Wildlife Service (FWS) to ensure that any anticipated program is not likely to jeopardize the survival of listed species, or is not likely to adversely modify or destroy their critical habitat.

FACA Federal Advisory Committee Act. TAG must conduct meetings that do not violate FACA.

FONSI Finding of No Significant Impact. A public document that presents the reasons a proposed action would not have a significant impact on the environment. Based on the results of an EA.

FS Forest Service, USDA.

FWS Fish and Wildlife Service, USDI.

Host range That group of plants on which a biological control agent can survive and complete its life cycle.

Isolates Limited taxonomic collections of pathogens made from a specific location, and thus may not represent the entire genetic base of the species.

Morphometric Relating to measurement of external form.

NAPPO North American Plant Protection Organization. International organization consisting of representatives from Canada, Mexico, and the United States.

NBCI National Biological Control Institute, USDA, APHIS, PPQ.

NEPA National Environmental Policy Act. Congress enacted NEPA in 1969 to ensure that Federal agencies assess the impact of potential environmental consequences before undertaking major programs or

projects. Detailed information on the NEPA process is contained in "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," 40 CFR Parts 1500–1508.

NPS National Park Service, USDI.

NRCS Natural Resources Conservation Service, USDA.

Polyphagous Feeding on or utilizing a variety of plants.

PPQ Plant Protection and Quarantine.

Replicate A discrete subset of a population on which experiments are performed.

SPRO State Plant Regulatory Official. Contact information for these officials can be found on the National Plant Board's web page at: <http://www.aphis.usda.gov/npb/>. There is also a list of these officials in *PPQ's Emergency Programs Manual* and the *Postentry Quarantine Manual for State Cooperators*. These manuals are available from APHIS Distribution, 4700 River Road, Unit 1, Riverdale, Maryland 20737-1229.

Test plant list A representative list of plant species that will be subjected to host specificity tests. (Drea, 1991, p. 144)

USDI U.S. Department of the Interior.

USGS U.S. Geological Survey, USDI.

Voucher specimens Those preserved individuals used to make definitive identifications.

A

TAG Reviewer's Manual

Appendix A

TAG Membership Directory

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B

TAG Reviewer's Manual

Appendix B

TAG Chair's Concept

The current Chair for TAG is Dr. Al Cofrancesco; he has held this role since 1992. Below is his general understanding and ideas about how TAG helps facilitate the safe use of biological control agents of weeds in the environment, and specifically about his role as Chair of TAG.

1. Before evaluating a petition, as the Chair of TAG, I review it from the perspective of a member representing my agency, the U.S. Army Corps of Engineers.
2. I begin evaluating a petition, as the Chair, by looking over all the responses other members of TAG have submitted. First, I determine how many responses were submitted, and what the recommended action of each member is—recommend without reservations, recommended with reservations, or not recommended.
3. Some reviews are easy. Everyone agrees that an agent is safe and should be released, or everyone agrees that an agent is not safe and should not be released. The petitions that receive mixed recommendations are the hardest to evaluate. **Often this situation is compounded when only a few members have reviewed the petition and submitted a recommendation**.
4. I examine each Reviewer's Comment Sheet, and make notes on the key points each reviewer has made—both negative and positive. I look for similarities in the comments among reviewers.
5. I review the notes of negative and positive points made by all the reviewers, examine each point in detail, and verify the comments made (i.e., "four larvae developed into adults when feeding on a particular plant," or "No endangered plant species from the Northwest were tested"). I eliminate comments that are invalid or inconsistent with the data presented. I often discuss these points with the reviewer to ensure that I fully understand his/her comments.

    A. The majority of points and concerns raised by reviewers are related to **host range tests** and the **impact on nontarget plants**. Usually, I address these comments first, along with **safety issues**.

    B. When correct and valid points are made about a particular test, I examine the petition to determine if additional information has been presented that would explain the

comment (i.e., "feeding on a nontarget plant only occurred when the larvae were artificially placed inside the stem of the plant").

C. **Taxonomic** issues are always of concern. The TAG members need to know what agent is being tested and what weed is being targeted. When there is a concern about the taxonomic information, I usually seek additional reviews from a recognized authority. Often, taxonomic issues are raised by a taxonomic authority on the particular group. Sometimes, taxonomic issues develop when the researcher is substituting one plant for a threatened or endangered one, which often requires that I get additional information to validate the concern.

D. Comments on petitions for release that address points outside of TAG's charge, hold little weight (i.e., "since research funding for biological control is scarce, I feel that the researcher should devote his efforts to studying another target plant"). That is, TAG is concerned with the safe use of the agent; it is not concerned with setting research priorities.

6. If a reviewer's comments are partially correct and may not be completely valid, I attempt to have the reviewer and the researcher discuss the concern. If some of the points cannot be resolved after deliberations and discussions between the researcher and the reviewer, I begin weighing the factors that are in contention. Often, it is useful to review the entire petition when there are mixed views from the researchers.

- ❖ Is it a point on safety?
- ❖ Does the host range test cover all the plants identified on the test plant list?
- ❖ Is there a problem with taxonomy?
- ❖ Has this agent been reviewed previously? If so, what were the points that caused it not to be recommended?
- ❖ Has the researcher addressed previous TAG questions?
- ❖ Does the researcher appear to be concerned and conscientious in the studies?

7. After re-examining all the significant questions that are unresolved, I recommend an action from TAG that I feel I can justify. I write a letter to APHIS-PPQ providing copies to the researcher, TAG members, and other interested parties.

If the recommendation is to release, then in the letter to APHIS-PPQ I either include key points about the reason for the recommendation, or I identify the minor points or problems that the researcher should address with the reviewer or APHIS before a release is made.

If the recommendation is not to release, I include key reasons for recommendation and often identify tests that may answer and resolve the questions raised. I often attempt to develop a list of major concerns or questions that resulted in this recommendation and usually indicate that the researcher and the reviewers should discuss the points further.

8. In general, TAG should take a conservative stance in its recommendations. Safety is the key issue. Once an agent is released it is difficult to control or manage the organism, should the need arise. Also, TAG's response to APHIS is just a recommendation, not the final decision. The recommendation is based on an evaluation process, not a voting process. That is, if eight reviewers recommend release and four reviewers recommend not to release, TAG's recommendation is not necessarily to release. By the same concept, unresolved comments from a single reviewer who recommends that an agent not be released does not mean that TAG will recommend against release.

9. The overall concept that I use to make the final TAG recommendation is:

'How confident are we in the testing that was conducted and the information presented, to recommend that an agent is safe to release?'

C

TAG Reviewer's Manual

Appendix C

Agencies' Perspectives

Contents

Introduction

This appendix contains a brief summary about biological control of weeds from the perspective of each agency that has a representative on TAG. Members are responsible for reviewing and evaluating submitted petitions for release and test plant lists, and for recommending action based on their agency's perspective about biological control of weeds in North America.

U.S. Department of Agriculture (USDA)

Animal and Plant Health Inspection Service (APHIS)

In 1992, APHIS adopted a philosophy on the use of modern biological control as an environmentally safe and desirable form of long-term pest management. Though not a solution for all pest problems, biological control is the preferred method of management when used in appropriate situations and when correctly applied and monitored.

APHIS' commitment to biological control is long-standing. In the early 1980's, APHIS-PPQ implemented biological control programs for agricultural pests. With experts based in headquarters and regions, and through a national network of plant protection laboratories, the agency cooperates with Federal and State agencies in the biological control of pests of economic and environmental importance. Programs involve the mass-production and release of both native and exotic natural enemies for the biological control of insects, mites, and weeds.

Through its Permits and Risk Assessment unit, APHIS addresses customer needs for the importation and interstate movement of biological control agents.

The Agency also established the National Biological Control Institute (NBCI) in 1990 to help promote, facilitate, and provide additional leadership for biological control. NBCI serves as a clearinghouse of information on biological control and enhances cooperative action by leveraging resources and empowering cooperators through its competitive grants program.

Jointly, all Agency units engage with cooperators and customers to develop appropriate Agency legislation and regulations covering the nation's needs for efficient, effective, economical, and safe biological control programs.

Agricultural Research Service (ARS)

ARS conducts research using classical and augmentative approaches to discover and develop arthropods and microbes as biological control components for integrated weed management systems in rangelands, croplands, noncroplands, and aquatic sites. ARS searches for and characterizes candidate host-specific biological control agents from foreign sites of origin of invading exotic target weeds. The agency also discovers and develops endemic and foreign pathogens for inundative or inoculative releases against target weeds. It is ARS policy to work with regulatory agencies such as APHIS, Fish and Wildlife Service, and the Environmental Protection Agency to ensure that all of the Agency's releases/applications are in accordance with existing laws and regulations.

ARS Biological Control Documentation Center (BCDC)

Biological control of weeds involving the introduction and release of exotic organisms (invertebrate or microbial) in the United States requires careful documentation of the following:

1. Research regarding the environmental safety of proposed introductions leading to USDA and other agency approval for release of the organisms in North America.

2. All information regarding the foreign collection, shipment, quarantine study, field release, establishment and recolonization of the organisms in the United States. These kinds of data, much of which are generated by TAG activities, are maintained in the BCDC and are available to scientists, regulatory agencies, and the general public. Retention of voucher specimens of the organisms studied and released in recognized taxonomic collections in North America for potential later taxonomic study or identification verification are also important.

Cooperative State Research, Education, and Extension Service (CSREES)

The Land Grant University System and the Cooperative State Research, Education and Extension Service have fundamental responsibility for discovering, developing, implementing, and extending technology in support of American agriculture and in concert with America's natural resources. With Congressional mandate in each State to support agriculture in cooperation with USDA and other agencies, scientists within the Land Grant University System are greatly involved in development of pest management strategies and programs for implementation in agricultural, forest, pasture, rangeland, aquatic and urban environments, including natural and modified systems. This diverse mission also includes the conduct of biological and ecological research in these environments, which often serves as the baseline for development of applied problem-solving research and education efforts.

Among the assets in research expertise which reside within the CSREES-supported Agricultural Experiment Station System are disciplines that directly support biological control of weeds. Botany, plant ecology, land conservation, taxonomic studies in plants, animals, and microbes are among the many components of that expertise.

An additional component of CSREES is development and delivery of information in support of biological control and other IPM strategies. This educational and implementation system provides support to the public and private sectors who are affected by biological control of weeds, as well as the weed problems themselves.

Forest Service (FS)

FS is charged with the management of approximately 190 million acres of national forests and national grasslands. FS recognizes that the invasion of exotic species of plants is one of the major threats to continued existence of these native North American habitats. These weeds also are a major problem interfering with our effective management and the public's use of these lands.

To control these invaders, vegetation management personnel have available to them a wide range of tools from which they must select those that best fit the area, the targeted weed, and the local management goals. However, FS recognizes that once a weed has become widely distributed, most conventional management tools provide only local relief or a method of containment. FS policy is that biological control is usually the only effective long-term solution for many major weed problems. Therefore, FS actively encourages its vegetation management personnel to evaluate the feasibility of using biological control in all weed problems, and where suitable biological control agents already exist to develop programs to release, redistribute, and monitor them as a control measure.

Where outside researchers are testing new biological control agents for weeds that are also a pest in the forest, FS actively encourages and supports their research through funding, providing experimental release plots, and participation in joint development programs. Where forest weeds are not being targeted by other research agencies, it is the FS policy that they initiate their own search for, testing, and importation of biological control agents.

U.S. Department of the Interior (USDI)

Bureau of Land Management (BLM)

The BLM uses biological controls of weeds as part of its overall approach to integrated weed management. As such, biological control is a significant part of the BLM's overall strategy. The policy and use of biological controls are in BLM Manual 9014 where BLM's policy is stated as the following:

- Encourage the use of parasites, predators, and pathogens in integrated pest management programs to reduce pest organism populations to meet management objectives. This may include domestic livestock to manage vegetation
- Participate in cooperative integrated pest management programs in area-wide efforts
- Support efforts to develop new biological control agents to the level possible as one of the tools in a balanced, integrated, pest management program
- Collect and quantify all inventory and monitoring data for all pest management efforts, and evaluate the success or failure of them

Bureau of Reclamation (BR)

Aggressive and noxious non-native plants with scant and insufficient natural predators have developed extensive, pure stands across BR lands and waterways in the Western United States. Pesticide control

alternatives are precluded due to the extensive areas of coverage, great operational expense, and associated environmental risks. Biological control agents are the only feasible weapon available for reclamation to reduce many of these non-native weeds in vigor, allowing indigenous vegetation to successfully compete for resources and return the environment to a more natural condition. Increased numbers of host-specific, biological control agents are urgently needed to control these aggressive weeds on reclamation facilities.

Fish and Wildlife Service (FWS)

FWS strongly supports the development, and legal and responsible use of appropriate, safe, and effective biological control agents on nuisance nonindigenous or invasive species. As the basis for approval, biological control organisms and strategies for their use must have undergone careful, comprehensive, and transparent testing and evaluation throughout their potential range. This is to ensure their host specificity and determine their effects on all nontarget organisms, especially federally listed species or those considered for designation under the Endangered Species Act. Biocontrol organisms imported into, transported within, and released into the United States should be free of pathogens or parasites, so as not to unintentionally introduce other nonindigenous species. Additionally, the media used to ship them must not include other nonindigenous organisms. Approval must also involve open public review, as well as scientific peer review of test results, environmental risk assessment, and other applicable analyses. If biocontrol organisms are the most effective and appropriate means available, they should be used on National Wildlife Refuges and other lands and waters under the jurisdiction of the FWS.

National Park Service (NPS)

The National Park Service relies on an Integrated Pest Management (IPM) approach to managing pest species. The NPS considers biological control an important tool in an IPM strategy. In addition, the NPS management policies recognize the use of biological control agents on NPS lands as one of the limited reasons for releasing non-native organisms on NPS lands. However, the use of biological control agents should be targeted towards non-native species. In that regard, biological control agents must be thoroughly and scientifically tested as to their host specificity, safety, and potential effects upon nontarget organisms before release. Biological control agents should be free of parasites and pathogens to reduce the risk of introducing additional non-native species into the United States and creating additional pest management problems. The results of prerelease testing of biological control agents must receive critical scientific peer review as well as public review and comment before agents are released.

U.S. Geological Survey (USGS)

USGS conducts investigations of non-native invasive plants, animals, and disease organisms, including their biology and ecology, vectors and factors in their spread, and their effects on terrestrial and aquatic ecosystems and native biota. The USGS has capabilities in the development and evaluation of methodologies and technologies for early detection of non-native invasive species (NIS), monitoring of invasions, assessment of alternative control methods, and management of NIS, including restoration of impacted habitats. Particular emphasis is on improving the capabilities of Federal land managers to address threats from NIS.

Through its research centers and cooperating universities, USGS conducts research on potential biocontrol agents for selected non-native plants that are highly invasive in natural ecosystems (e.g., Miconia and strawberry guava in Hawaii). This research frequently includes international collaboration in locating, testing, and assessing potential biological control agents.

In reviewing petitions for release of biocontrol agents, USGS focuses on the appropriateness of the research methodology, post-release monitoring, and the potential biological and ecological effects of proposed control agents. In reviewing test plant lists, the emphasis is on helping to ensure adequate screening of nontarget native species.

Bureau of Indian Affairs (BIA)

The Bureau of Indian Affairs (BIA) has responsibility for approximately 54 million acres of Indian trust land (land held in trust by the United States for various Indian tribes and individuals) in the lower 48 States. These trust lands are located within 290 reservations, pueblos, rancherias, communities, etc. Approximately 351 tribes, bands, colonies, or pueblos are Federally recognized throughout the United States (not including Alaska).

Indian lands exist in all major ecosystems, from the Florida Everglades to the Alaskan Tundra, from hardwood forests to the Pacific rainforest, from the Sonoran Desert scrub to the Great Plains grassland, and include irrigated and dry cropland. These lands have been affected by the entire range of invasive species known in North America.

The BIA and/or tribal governments operate a noxious weed control program on a number of these Reservations. Currently, herbicides are the tool of greatest use. However, the use of herbicides is judicious due to Native American concerns regarding their environment. More recently integrated noxious weed control has been emphasized, including the use of biological control agents. Although success using biological control agents has been noted, insurance of host specificity remains a concern of tribal governments and their constituents.

Biological control is a welcome addition to other noxious weed control tools. Nonetheless, plants of economic, cultural, and medicinal value must be protected from off-target damage by biological control agents.

Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) perceives the biological control of weeds as valuable in reducing risks from pesticides. EPA also views the biological control of weeds as a vital part of integrated pest management.

Department of Defense (DOD)

Army Corps of Engineers (COE)

One of the main missions of the Army Corps of Engineers (COE) is to maintain navigable waterways in the United States. This requires not only overseeing the actual channels, but water bodies influencing navigable waterways. Exotic vegetation often impedes the operation of the waterways and requires extensive management operations. Biological control technology is a key component utilized in our integrated management approach for these waterways. In addition, DOD and COE are stewards of a wide range of habitats found on their installations and facilities. Maintaining these natural plant communities is a high priority since many are unique habitats. Petitions are reviewed to ensure that the missions of DOD organizations are not negatively impacted by introductions of plant biological control agents.

National Plant Board

The National Plant Board is made up of the principal plant pest regulatory officials of each of the 50 states. State officials review proposed introductions of live insects, including biological control agents. USDA's permit (PPQ Form 526) requires approval from both the receiving State and USDA. Therefore, representation on TAG facilitates this approval process, and keeps all stakeholders involved from the beginning.

Weed Science Society of America

Members of the Weed Science Society of America (WSSA) are committed to the reduction of herbicide use through adoption of integrated weed management. WSSA views all forms of biological control as important tools for prevention of economic loss due to

weeds. Although profitable agriculture is the major focus, reduction of negative impacts on the environment due to agriculture is an important consideration in the selection of weed management tools.

Canadian/Mexican Contacts

Canadian Contact

Agriculture's trend toward alternative solutions to chemical pesticides has led to an increasing use of biocontrol agents. Agriculture and Agri-Food Canada has a long-term commitment to sustainable agriculture via the safe importation and release of biocontrol agents of weeds. This commitment has produced several success stories which in turn have lessened Canada's dependency on chemical pesticides, and taken it in the direction of a cleaner environment. Part and parcel with Canada's success and safety record is its continuing association with TAG.

Mexican Contact

Mexican participation in TAG has been very useful because biological control of weeds is under development in Mexico. Sanidad Vegetal is now in the process of publishing a national standard for the introduction and release of biological control agents of weeds. That also, under the North American Plant Protection Organization (NAPPO), will help Mexico and North America have a harmonized way to regulate and improve biological control for the region. We must avoid that agents released in the USA become pests in Mexico. Mexican native plants should be included in the host range testing when appropriate.

The National Center for Biological Control has the role of seeking and testing new agents and transferring to different areas of Mexico as well as being aware of other introductions made by researchers in universities and research agencies in Mexico.

D

TAG Reviewer's Manual

Appendix D

Suggested Format for Field Release Petitions

Contents

Introduction

This appendix provides a guide for petitioners and researchers to follow when preparing petitions. **It is recognized that for some situations petitioners will provide more information, while for others not all points will be addressed.**

TAG members use evaluation guidelines that parallel this format when reviewing and evaluating petitions. The information requested in this suggested format is felt to best demonstrate the safety of the agent being considered, the potential risks that might be involved in its release, and the long-term ecological consequences of a successful release. The suggested format contains main sections that are listed in the on *page D-1-1*.

Cover Page

Prepare a cover page for the petition with the following information. This information provides TAG with a contact point for questions and with references for tracking, as follows:

1. Date of petition and mailing
2. Name of petitioner with affiliation and a contact point within North America including an address, telephone number, FAX, and E-mail address
3. Nature of the petition: Proposed field release of a [biological control agent] of a [target weeds]—include species, genus, family, order, author, and geographical origin. Note if this petition represents additional information requested by TAG for a previously submitted petition. If it does, record the number of the previous petition assigned by TAG. Only address those sections of this suggested format that were of concern
4. List where the studies have been conducted
5. If at least part of the study has been conducted in a U. S. quarantine facility, then list the location of the quarantine facility. Also list the quarantine facilities the candidate agents intend to pass through for initial releases. Note that different quarantines are required for insects and pathogens
6. Identify the States or Provinces for the initial release in the following:
   - ❖ Canada
   - ❖ Mexico
   - ❖ United States

7. List who will conduct the release and monitoring in the United States

Petition Introduction

Nature of the Problem

Give a brief summary (one to two paragraphs) of the problem caused by the weed. Topics to consider including in the summary are as follows:

1. History of introduction and/or spread of the target weed
2. The weed's present distribution in North America
3. Sectors affected and magnitude of program (e.g., agricultural, natural, rangeland)
4. Pending issues about the taxonomy of the candidate agents or the target weeds, about the agents, about the location of the release

Proposed Action

Provide a statement of proposed action. For example, to introduce a [biological control agent] from [a foreign area] for field release in [a specific area] to control [target weed] in [Canada, Mexico, the United States].

Target Weed Information

Often detailed information will have been provided in previously submitted test plant lists or release petitions. This information can be repeated, with any additional information, in subsequent release petitions.

Taxonomy

1. Full classification, synonymy, and common name including species, genus, family, and order.
2. Who identified the target weed including names, organizations, and locations. Was DNA analysis used?
3. Problems in identification or taxonomy of the group.
4. Origin and location of herbarium containing voucher specimens, and the date of depository. (The voucher specimens referred to here are the ones used as representative of the population that occurs in the area where the researcher has conducted the studies.)

Description

Provide a general description of the target weed, complete enough that a person encountering it in the field could identify it.

Distribution of the Target Weed

Describe the distribution of the target weed using maps, as appropriate. Include the following information:

1. Native range (map)
2. Areas of introduction throughout the world (map), pattern of movement, and apparent limits
3. North American distribution (map)
4. Range areas of the present distribution and the potential spread in North America (a map is useful)
5. Genetic variability
6. Habitats or ecosystems where this weed is found in North America

Taxonomically Related Plants

Identify economically and environmentally important plants that are closely related to the target weed. These are crops, ornamentals, and native plants including threatened and endangered species and those with cultural or aesthetic value. If possible, identify how closely these plants relate to the target weed.

Distribution of Taxonomically Related Plants

Describe the distribution and habitats in North America of the closely-related plants—those identified under the previous heading, *Taxonomically Related Plants*.

Life History

Explain the life history and general biology of the target weed. Discuss the factors that are believed to contribute to the plant's weediness.

Impacts

Indicate any and all impacts. Use the following list as a guide; not all areas listed below are applicable to all petitions.

1. Beneficial uses—honey bees, forage, ground cover, fruit, etc.
2. Social and recreational uses—value as ornamentals
3. Impact on threatened and endangered species
4. Economic losses, including direct control costs
5. Health—poisonous, allergenic

6. Regulatory—noxious weed, restricts trade
7. Effects on native plant and animal populations
8. Impact of weed control on nontarget plants
9. Effects on ecosystem functions and ecological relationships
10. Other, e.g., aesthetic

Alternative Management Options

Describe alternative options for managing the target weed as follows:

1. Historical options—what has been done before and effectiveness
2. Current options—biological, chemical, cultural, etc., and effectiveness
3. Potential options—new herbicides or biological control agents used or released in other countries

Biological Control Agent Information

Taxonomy

1. Full classification (species, genus, family, and order), synonymy, and common name. [For pathogens, include strain, race, type.]
2. Reason for choosing the agent and a general description of the agent, including helpful morphology and general characteristics that could be used to identify it in the field.
3. The taxonomist who identified the agent, including names and organizations with locations. Was DNA analysis used?
4. For pathogens, description of the methods used to identify life stages.
5. Problems in identification or taxonomy of the genus.
6. Origin and locations of voucher specimens for insects [or type cultures for pathogens] including date of depository, and how they are preserved.

Geographical Range

1. Origin—maps and literature citations describing the native range of the agent.
2. If the agent is being used in other countries, give countries of introduction and present range and effects.
3. Expected, attainable range in North America—based on climatic, environmental, and vegetative parameters.

Known Host Range (Specificity)

1. Literature records indicating what other plants have been attacked.
2. Field collections and observations, including maps and data.
3. Literature on the host range (specificity) of organisms closely related to the agent, no matter where the organism occurs.

Life History

1. Biology, i.e., diapause, life cycle, dispersal capability, etc. from literature, field observations, and laboratory studies.
2. Known mortality factors.
3. Extent of damage or control of the target weed.
4. Extent of damage or control of nontarget plants.

Population of the Agent Studied

1. Geographical source, including maps and site description, if available. Be as accurate as possible so that the same population could be located, if needed.
2. How pest-free populations of the agents were obtained and maintained in quarantine, if applicable.
3. Site of field and lab studies (the location if in a foreign country, if available, or the location of U.S. quarantine facility used).

Experimental Methodology and Analysis

Test Plant List

A test plant list shows the species of host plants on which the agent was tested to determine its potential feeding range.

If a test plant list has not already been prepared and reviewed by TAG, list the test plants and provide the rationale for selecting them. Often a new biological control agent will require alteration of a previously approved test plant list. If this is the case, note here and explain the rationale and changes.

Include considerations given to threatened and endangered plant species and economic important plants. See *Suggested Format for Test Plant Lists* under *Appendix E* for a strategy for developing test plant lists. Following this strategy can ensure a thorough investigation of the biological control agent. See *Appendix F* for guidelines to comply and to expedite any review necessary because of protected species.

Design

1. Part or stage of plants tested.
2. Source of population of plant (and weed) used in test.
3. Number of replicates.
4. Number of individual agents, target weeds, and test plants in each replicate. May be synonymous with number of replicates depending on test design, i.e., in no choice tests the number of individual plants of a species is the number of replicates.
5. How results were measured, recorded, and evaluated.
6. If the weed has been previously targeted, compare this design with previous test designs including plant species tested.

Positive Control

Were adequate positive controls used in all tests? For example, the target weed should be challenged with the agent during each testing procedure (except in no choice testing for insects).

Reason for Decisions

Explain why you selected the test procedures and how they are appropriate for the biology of the agent being tested.

Results and Discussion

Summary of Results

Provide a summary about the safety of this organism as a biological control agent and any risk associated with its release. Include literature, results of host specificity testing, and field observations. Present results in a manner that supports your conclusion (tables, graphs, narratives).

Protocol for Releasing the Agent

1. Method to ensure pure cultures and correct identification of the agent to be released. Including the following:
   - **A.** For insects: species, genus, family, and order [for pathogens: strain, race, type]
   - **B.** Names and organizations with locations of identifier
   - **C.** Description of identification methods
   - **D.** Problems in identification
   - **E.** Date and place of depository containing voucher specimens

2. General release protocol to ensure the absence of natural enemies and cryptic or sibling species
3. Specific location of rearing or culturing facility
4. Intended sites for initial release. Timing of release. Release methods to be used. For insects, number to be released, if known. For pathogens, method of preparing inoculum and inoculum concentration

Post-Release Monitoring

Provide an explanation of the post-release monitoring plan. Include the following information:

1. When the anticipated initial release of the agents will occur
2. Groups to best perform monitoring
3. Monitoring techniques to determine if the agents become established
4. Monitoring techniques to determine the spread and impact on target and nontarget plants

Benefit/Risk

Offer your perspective about weighing the probable benefits of releasing the agent against the unknowns and possible negative impacts.

Potential Environmental Impacts

Discuss the potential ecological, economic, social, biological, health regulatory, and environmental impact. Present as clear a picture as possible of the long-term ecological consequences that could possibly result from the successful establishment of this agent in the North American environment.

This information should go beyond the risk associated with attack on a few closely-related species of plants, as indicated in the host testing results. This discussion should look at the overall potential impact of populations of this insect building up on the weed in a large variety of different habitats. This information will be critical in preparing an environmental assessment, which will be the next step in the approval process if the TAG recommends that this agent should be released in North America.

Human Impacts

Include positive and negative impacts to humans. For example—health, recreational, aesthetics, nuisance, poisonous, allergens. Discuss ways to overcome negative effects.

Potential Economic Impacts

Provide the potential gains and losses regarding the ecological, social, aesthetic, and biological impacts.

Plant Impacts

Describe the direct and indirect impacts (positive and negative) of the organism on the local plant populations. Cover the intended effects on the target weed and on nontarget, including potential impacts on agricultural, horticultural, and threatened and endangered plants.

Nonplant Impacts

Describe the indirect effects (positive and negative) on organisms (other than plants) that depend directly or indirectly on the target weed or affected nontarget plants based on test results.

Proposed Methods for Mitigation

Identify proposed methods (management and other alternatives) to mitigate potentially undesired effects.

Abiotic and Edaphic Effects

Identify the potential abiotic and edaphic effect, i.e., water, soil, air.

Outcome of No Action

Provide a statement of the outcome if no release was made.

Petitioner's Conclusion

Offer your conclusions on the potential risks and benefits regarding the consequences of the release of this agent and its successful establishment in the North American environment throughout the range of its target weed and susceptible nontarget hosts. Summarize all the results of your study of this agent, its host testing, and your evaluation of the potential environmental impact. Include a quantitative risk assessment, if available.

E

TAG Reviewer's Manual

Appendix E

Suggested Format for Test Plant Lists

Contents

Introduction

This appendix provides a suggested format for test plant lists for biological control agents of weeds in North America. Note that the preliminary information about a target weed and a candidate agent may be incomplete at this point in the research. The proposed list will be the bulk of the submitted information.

Cover Page

Prepare a cover page for the test plant list with the following information, which provides TAG with a contact point for questions and with references for tracking:

1. Date submitted to TAG
2. Name of researcher or petitioner with affiliation and a contact point within North America including an address, telephone number, FAX number, and E-mail address

3. Target weed including its species, genus, family, and common names. Identify if the weed is targeted for the first time. If not, include the number of the previous petition assigned by TAG
4. Identify proposed agent(s), if any
5. State where the studies will be conducted—list both foreign and U.S. quarantine facilities

Introduction to the Test Plant List

Nature of the Problem

Give a brief summary (one to two paragraphs) of the problems caused by the weed. Items to consider are as follows:

1. History of introduction and spread of the target weed
2. The weed's present distribution in North America
3. Sectors affected and magnitude of program (e.g., agricultural, natural, rangeland)
4. Consensus that the weed is a suitable target for control

Proposed Action

This host plant list is to notify TAG of our intent to begin a biological control program for the control of [weed]. [Weed] has been declared a noxious weed in [list states] and is considered a target for biological control. Your comments on the accuracy, appropriateness, and thoroughness of this list would be appreciated.

Target Weed Information

Taxonomy

1. Full classification (including species, genus, family, and order), synonymy, and common name.
2. The taxonomist who identified the target weed, including names, organizations, and locations.
3. Problems in identification or taxonomy of the group.
4. Origin and location of herbarium containing voucher specimens and the date of depository. (The voucher specimen referred to here is the one used as representative of the population that occurs in the area where the researcher has conducted the studies.)

Description

Provide a general physical description of the target weed. Make it complete enough that a person encountering it in the field could identify it.

Distribution of the Target Weed

Describe the distribution of the target weed using maps, as appropriate. Include the following information:

1. Native range (map)
2. Areas of introduction throughout the world, pattern of movement, and apparent limits (map)
3. Present distribution in North America (map)
4. Range areas of potential spread in North America (map)
5. Genetic variability
6. Habitats or ecosystems where this weed is found in North America

Taxonomically Related Plants

Identify the economically and environmentally important plants that are closely related to the target weed. These are crops, ornamentals, and native plants including threatened and endangered species. If possible, identify how closely these may be related to the target weed.

Distribution of Taxonomically Related Plants

Describe the distribution and habitats in North America of the closely-related plants—those identified under the previous heading, *Taxonomically Related Plants*.

Life History

Explain the life history and general biology of the target weed. Discuss the factors that are believed to contribute to the plant's weediness.

Impacts

Indicate any and all impacts. Use the following list as a guide; not all areas listed below are applicable to all weeds.

1. Beneficial uses—honey bees, forage, ground cover, fruit, etc.
2. Social and recreation uses (value as ornamentals)
3. Impact on threatened and endangered species
4. Economic losses, including direct control costs
5. Health—poisonous, allergens
6. Regulatory—noxious weed, restricts trade

7. Effects on native plant and animal populations
8. Impact of weed control on nontarget plants
9. Effects on ecosystem functions and ecological relationships
10. Other, e.g., aesthetic

Alternative Management Options

Describe alternative options for managing the target weed as follows:

1. Historical options—what has been done before
2. Current options—biological, chemical, cultural, etc.
3. Potential options—new herbicides or biological control agents used or released in other countries

Known Host Range of Candidate Biological Control Agent

This information is optional. If known, provide the following:

1. Name(s) and taxonomic classifications
2. Literature records indicating what other plants have been attacked
3. Field collections and observations, including maps and data
4. Literature on host range of closely-related species to candidate agent

Test Plant List

Categories of Test Plants

The usual strategy for developing a test plant list for evaluating biological control agents of weeds in North America is based on A. J. Wapshere (1974), *A Strategy for Evaluating the Safety of Organisms for Biological Weed Control*, published in Annals of Applied Biology. The strategy is based on the phylogenetic approach, where closely-related species are theorized to be at greater risk of attack than are distantly-related species.

Category 1 Genetic types of the target weed species (varieties, races, forms, genotypes, apomicts, etc.) found in North America.

Category 2 Species in the same genus as the target weed, divided by subgenera (if applicable). Include information on economically and environmentally important plants of North America.

Category 3 Species in other genera in the same family as the target weed, divided by subfamily (if applicable). Include information on economically and environmentally important plants of North America.

Category 4 Threatened and endangered species in the same family as the target weed divided by subgenus, genus, and subfamily. **Be sure to include all endangered and threatened species in the genus of the target weed. Consult the U.S. Fish and Wildlife Service very early in the project**. See *Suggested Format for Test Plant Lists* under *Appendix E* for guidelines to comply and to expedite any review necessary because of protected species.

Category 5 Species in other families in the same order that have some phylogenetic, morphological, or biochemical similarities to the target weed. Include information on economically and environmentally important plants of North America.

Category 6 Species in other orders that have some morphological or biochemical similarities to the target weed or that share the same habitat. Include information on economically and environmentally important plants of North America.

Category 7 Any plant on which the biological control agent or its close relatives (within the same genus) have been previously found or recorded to feed and/or reproduce.

Suggested Strategy for Developing a Test Plant List

The following steps are only a suggested strategy for developing a test plant list. Follow this strategy along with the scheme developed by Cronquist *(Appendix I)* and the references listed in ***Table E-1-1***.

1. Outline the families in the same order as the target weed using Cronquist's System of Angiosperm Classification beginning on *page I-1-2* of *Appendix I.*
2. Examine the placement of the target weed family in the classification systems of Thorne and Dahlgren which are available in a concordance of plant family names as per Cronquist, Dahlgren, Reveal, Takhtajan, and Thorne. This concordance has been prepared by James Reveal, Norton-Brown Herbarium, University of Maryland, College Park, Maryland. The USDA-APHIS Concordance of Family Names is found on the Internet at: <http://www.inform.umd.edu/pbio/usda/usdaindex.html>.
3. If both Thorne and Dahlgren place a new family in the order of the target weed, consider that family when developing a list of Category 5 plants. If only one of the systematists places a new family in the order of the target weed, consider that family when

developing a list of Category 6 plants. Look for economically or environmentally important species in the new families that occur in the target areas.

4. In developing a list of test plants for each category, the references listed in ***Table E-1-1*** may be useful**.**

Table E-1-1 Helpful References for Developing a Test Plant List

Helpful References:[1]	**For Categories:**
Vascular Plant Nomenclature, Three classification systems: Cronquist's System of Angiosperm Classification, Thorne's and Dahlgren's. See *Appendix I* for Cronquist's system. All systems are available on the World Wide Web at: <http://www.inform.umd.edu/pbio/usda/usdaindex.html>	5, 6
Andersen Horticultural Library's Source List of Plants and Seeds. Isaacson, R.T. (1993 or later edition)	1, 2
Hortus Third, A Concise Dictionary of Plants Cultivated in the United States and Canada. Bailey, L.H. and Bailey, E.Z. (1976)	1, 2, 3, 5
A Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland. Kartesz, J.T. (1994)	1, 2, 3, 5
Dictionary of Economic Plants. Uphof, J.C.Th. (1968)	2, 3, 5
Manual of Cultivated Plants. Bailey, L.H (1951)	2, 3, 5
The Plant Book. Mabberley, D.J. (last printing 1996)	2, 3, 5, 6
Families and Genera of Spermatophytes Recognized by the Agricultural Research Service. ARS Technical Bulletin 1796	3, 5
The Germplasm Resources Information Network (GRIN). Database that is available at: <http://www.ars-grin.gov/npgs/tax/index.html>	1, 2, 3
The Plant List of Accepted Nomenclature, Taxonomy, & Symbols (PLANTS database that is available at: <http://plants.usda.gov>	2, 3
List of Endangered and Threatened Species, including candidate species. Fish & Wild-life Service. Available at: <http://endangered.fws.gov/> or <http://ecos.fws.gov/webpage/>	2, 3, 4
Gray's Manual of Botany. Fernald, M.L. (1970)	2, 3, 5
North American floras that include the release areas	2, 3, 5, 6

1 Full references are listed in *Appendix H.*

Summary Table

Summarize in a table format, all the species being considered for testing. Include pertinent literature references that are helpful in describing rationale. List the species in phylogenetic order, i.e., distantly to closely related to the target weed.


Important

In actual host testing of potential biological control agents, not all these plants are expected to be used. Depending on the feeding behavior or life cycle of the agent, the researcher would select representative plants from each category with physical features similar to those on which the agent normally feeds. For example, if the agent's larvae overwinters in a large tap root, annual plants or those with fibrous roots could be disregarded.

Perspective of Risk

Briefly discuss how the selected species should enable you to make inferences about risk of attack on untested species. Indicate the limits of allowable attack within the phylogenetic hierarchy of the test plant list, and why. Include pertinent literature references that are helpful in describing rationale.

F

TAG Reviewer's Manual

Appendix F

Process for Section 7 Consultations

Contents

Preface

Provided by Bryan Arroyo, USDI, Fish and Wildlife Service representative on TAG.

Introduction

The Endangered Species Act (the Act) is one of the nation's most comprehensive and important environmental laws. Developing and implementing this landmark environmental legislation has placed the United States in the forefront of imperiled species and habitat conservation. The Act has served as a model for other nations to develop natural resource conservation programs and legislation. Throughout its history, the core purpose of the Act is to conserve endangered and threatened species and to ensure the ecosystems on which these species depend remains the same.

An overview of Section 7 of the Act that addresses interagency cooperation is presented here. The overview covers what the Act requires of Federal agencies (in this case APHIS) and how petitioners can participate in the Section 7 process. This overview is not all encompassing concerning the intricacies of the Section 7 process. However, it provides a general blueprint to help petitioners facilitate necessary compliance and expedite the Act reviews. TAG reviewers and petitioners are encouraged to read the Act and its implementing regulations under Title 50 of the Code of Federal Regulations (implementing regulations for the Act's section 7 are located in 50 CFR Part 402).

A brief overview of the Fish and Wildlife Service's (FWS) role on TAG is also presented. FWS can assist, lead, and provide for the prudent use of biological control agents to minimize risks to natural ecosystems.

Section 7—Interagency Cooperation (50 CFR Part 402)

Section 7—Interagency Cooperation is one of the most flexible, proactive, and important provisions of the Act; in fact, of most environmental regulations. Section 7(a)(1) requires all Federal agencies to carry out programs for the conservation of endangered and threatened species. It provides those agencies the authority to allocate funds for such programs, but does not mandate expenditures.

Section 7(a)(2) requires all Federal agencies to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any listed or proposed species or destroy or adversely modify designated or proposed critical habitat.

The scope of Federal actions and authorizations includes granting any Federal permit (such as an importation permit, a quarantine permit, and a release permit), granting a right-of-way to cross Federal lands, or any other Federal-private nexus where the Federal government has a degree of discretionary authority.

Accordingly, although section 7 is specific to Federal actions, private interests (in this case, release of biological control agents into the environment) are affected whenever a Federal action is required to authorize such an action.

Consultation is the process where FWS advises Federal agencies on whether their actions are likely to affect listed species or critical habitats. When a class of listed marine species or certain anadromous fish are affected, the National Marine Fisheries Service (NMFS) gets involved. Where adverse effects are anticipated, FWS or NMFS determines whether the proposed Federal action under review is likely to **jeopardize the continued existence** *of* a listed or proposed species or **destroy or adversely modify** designated or proposed critical habitat.

The consultation process can be broken into two major parts: informal and formal.

Informal consultation is comprised of all communications between an action agency (e.g., USDA/APHIS) and FWS that serve to determine whether the proposed action is likely to affect any listed species and, if so, whether there is likely to be an adverse effect (for implementing regulations please refer to 50 CFR 402.13). FWS frequently assists an action agency in determining if any listed species or critical habitat is in the action area by providing the agency with a list of species and critical habitats. FWS has 30 days to respond to a request for a species list. If species or habitats are present, FWS can assist the agency by recommending project modifications that will avoid adverse impacts on species, thus avoiding the need for **formal** consultation.

Where the action is **a major construction activity** as defined in the National Environmental Policy Act, the agency must provide FWS with a **biological assessment** that determines whether the action is likely to adversely affect listed species or critical habitats. The biological assessment is frequently prepared using a chapter on the effects of the action from a draft environmental impact statement.

A Federal action agency may designate a non-Federal representative (in this case the petitioner) to conduct informal consultation or prepare a biological assessment by giving written notice to the Director of FWS. Note that if a permit or license applicant is involved and is not the designated non-Federal representative, then the applicant and the Federal agency must agree on the choice of the non-Federal representative (50 CFR §402.08).

Should a Federal agency determine that their anticipated actions may adversely affect a listed species, that agency is required to initiate **formal consultation** (50 CFR 402.14) with the FSW or NMFS. The agency must provide the FWS with a description of the proposed action and the area to be affected. Also, they must include an analysis of the action's effect on listed or proposed species and/or designated or proposed critical habitats. Section 7 regulations (50 CFR §402.14(c) and (d)) require that the Federal agency is responsible for providing the best scientific and commercial data available. The scope of what is included will likely be determined by the scope of the proposed project. Where a permit applicant or other non-Federal party is involved, the Federal action agency will frequently require that another party (in this case the petitioner) develop the required background information.

After initiation, the Federal action agency and applicant must not reverse or retrieve commitment of resources that have the effect of foreclosing the formulation of alternatives, which would avoid jeopardy to a listed or proposed species or adverse modification of designated or proposed critical habitat (50 CFR §402.09). Only a very small class of actions involving true emergencies (50 CFR §402.05)—e.g., forest fires, threats to life, and natural disasters—are exempt from consultation prior to action. Consultation is, however, required soon after the emergency has passed. FWS works closely with the agency responsible for responding to the emergency to provide any technical advice on alternative actions that could be taken during the emergency response to minimize any effects to listed species, while effectively and efficiently handling the emergency.

For non-emergency situations, FWS has up to 90 days to complete formal consultation, and up to an additional 45 days to complete a biological opinion, for a total of up to 135 days. A biological opinion states whether the activity is likely to jeopardize listed or proposed species and/or is likely to destroy or adversely modify designated or proposed critical habitats. During this period, FWS reviews all relevant

data, evaluates the current status of the listed species or critical habitats, and formulates a biological opinion of jeopardy or no jeopardy and/or is or is not likely to destroy or adversely modify designated critical habitat.

To jeopardize the continued existence of means to engage in an action that is reasonably expected to appreciably reduce the likelihood of survival and recovery of species (in the wild). To destroy or adversely modify critical habitat means a direct or indirect alteration of physical or biological features by a Federal action that diminishes the value of critical habitat for both the survival and recovery of listed species. In reaching these determinations, FWS considers the status of the species, the environmental baseline (essentially, the overall health and distribution of the species prior to undertaking the proposed action), the direct and indirect effects of the action, and the cumulative effects of other anticipated actions that may affect the species.

Where a determination of jeopardy or adverse modification is made, FWS must develop reasonable and prudent alternatives that are as follows:

- Avoid jeopardy and/or adverse modification
- Can be implemented consistent with the intended purpose of the action
- Are within the agency's authority
- Are economically and technologically feasible

These alternatives are developed in cooperation with the Federal agency and the applicant (if any).

Where an applicant for a Federal permit or other Federal authorization is involved, the Federal action agency is still the entity that initiates formal consultation; and FWS still produces the biological opinion. However, the applicant can review drafts of the opinion and can require that consultation not be extended more than 60 days beyond the normal 90-day consultation period.

Should an agency receive a jeopardy opinion, and should there be no reasonable and prudent alternatives that avoid jeopardy, the agency can apply for an exemption to section 7(a)(2). This process is described at section (7)(e). In the 23-year history of the Act, exemptions have only been granted twice: for the Grayrocks water diversion project in Nebraska and for portions of the Northwest Forest Plan. FWS has been extremely successful in working with Federal agencies to identify conflicts with listed species in the early phases of project planning; developing practical solutions that allow the projects to go forward

with (for the most part), only minor modifications in project design or timing; and aiding Federal agencies in their mandate to conserve listed species.

In summary, consultation is the process by which FWS advises Federal action agencies on how to ensure that their actions do not jeopardize the continued existence of listed species. All Federal agencies are required to consult on any action they fund, authorize, or carry out that may adversely affect listed species or critical habitats.

Technical Advisory Group (TAG)

TAG's mission statement is, in part *"To facilitate biological control of weeds in North America... based on considerations of potential nontarget impacts and conflicts of interest."* The use of biological control agents is an alternative to the use of historical or conventional weed control methods (e.g., chemical and mechanical). However, agents are most often used in association with and supplemental to conventional control methods. It is important to note the words **facilitate** and **considerations of potential nontarget impacts** in the mission statement, because these words frame the current discussions and concerns in the biological control arena. The control of an exotic[1] species with a control agent as exotic as its target must be thoroughly examined before adoption. In the past, whenever such an approach was not thoroughly studied, the long-term results have proven disastrous. This has been especially true with the use of vertebrate control agents (e.g., mongoose). However, this concern must be measured against the price of inaction. As long as the impacts are evaluated adequately and reasonably, concerns regarding the use of biological control agents should be adequately addressed.

One of TAG's objectives is quite clear. *"To provide an exchange of views, information, and advice for individuals who plan to ask various Federal and State regulatory agencies for permission to release these agents into the environment."* Although TAG has no legal mandates or authorities, it carries a lot of weight in the minds of decision makers. Through the years, TAG has provided scientifically credible reviews of petitions for different kinds of authorizations. However, these reviews do not serve as a compliance mechanism for the Act. However, FWS, through its representative on TAG, is delineating ways to facilitate compliance to the Act with agencies involved in biological control regulation.

1 In this context, "exotic" means alien to the specific ecosystem under consideration.

However, the problems are not merely inadequate compliance with the Act. There are many unanswered questions about the permanence of agents, host specificity, habitat range, behavioral traits, and biological interaction, among others, that require careful consideration from all stakeholders in the evaluation of control agents.

In some cases, what is considered acceptable by the biological control community is not acceptable from a point of view of the Act. An agent is said to be host specific if it can only complete its entire life cycle on the targeted weed species. As desirable as this may sound, such an agent (at least theoretically), could result in the extinction of a species. For illustrative purposes let's assume that there are only two individuals of species X left within the release site of a control agent found to be host specific as described earlier. However, this agent will also occasionally feed on the reproductive structures of species X. This occasional feeding may not eliminate these individuals, but it will certainly leave the species especially vulnerable to a catastrophic event. Although the species was already vulnerable to a catastrophic event, the occasional feeding of the host specific control agent has also eliminated any chance of reproduction of those last individuals. Unfortunately, we are faced with the challenge of trying to control a weed that may eventually eliminate and significantly change the landscape where species X occurs, while trying to ensure that control efforts do not cause more harm to the very species and ecosystems we are trying to conserve.

It is only through the proactive participation of FWS on the TAG and through the development of effective and efficient ways for the regulatory agencies to comply with Section 7 of the Act, that the current problems hindering the development and implementation of biological control programs will be resolved and more importantly avoided in the future. Petitioners can and should contact FIRS's regional offices (contacts provided below) as early in the evaluation process as possible. This would allow FWS to raise any concerns known, and also provide for the exchange of necessary information to facilitate communications throughout the biological control program. In the end, conflicts between listed species and biological control agents would be reduced to the critical few, thus providing a basis to engage in the necessary decision-making process to resolve those few conflicts and ensure adequate conservation of listed species, while providing for the development of safe biological control programs.

FWS Regional Offices

Region 1 (California, Hawaii, Idaho, Nevada, Oregon, Pacific Islands, Washington)

Ecological Services
911 NE 11th Avenue
Portland, OR 97232-4181
Phone: 503-231-6151

Region 2 (Arizona, Oklahoma, New Mexico, Texas)

Ecological Services
P.O. Box 1306
Albuquerque, NM 87103-1306
Phone: 505-248-6920

Region 3 (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin)

Division of Endangered Species
BHW Federal Building
1 Federal Drive
Fort Snelling, MN 55111-4056
Phone: 612-713-5360

Region 4 (Alabama, Arkansas, Commonwealth of Puerto Rico, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, U.S. Virgin Islands)

Division of Endangered Species
1875 Century Boulevard, Suite 200
Atlanta, GA 30345
Phone: 404-679-7085

Region 5 (Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia)

Division of Threatened and Endangered Species
300 Westgate Center Drive
Hadley, MA 01035-9589
Phone: 413-253-8615

Region 6 (Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, Wyoming)

Ecological Services
P.O. Box 25486, DFC
Denver, CO 80225
Phone: 303-236-7400

Region 7 (Alaska)

Division of Endangered Species
1011 East Tudor Road
Anchorage, AK 99503
Phone: 907-786-3544

Appendix G

Reviewer's Comment Sheets

Introduction

The Comment Sheets in this appendix are samples of those used by TAG members to comment, evaluate, and recommend action about petitions for field release and test plant lists. The Comment Sheets can be used along with the evaluation guidelines for "Petitions for Field Release" on page 5-1-1 and evaluation guidelines for "Test Plant Lists" on page 5-2-1.

In the event a reviewer's Comment Sheet gets lost, use the samples printed on the following pages in regular size, with no headers or footers so they can be removed, photocopied, and reused.

Reviewer's Comment Sheet for Petitions for the Release of Biological Control Agents of Weeds Technical Advisory Group (TAG)

Section 1: To be completed by the TAG Executive Secretary

Designation Number: _____ Date Request Received: _____
Date Sent to Reviewers: _____ Review Due Date: _____
Biological Control Agent: _____
Target Weed:_____
Petitioner's Name and Affiliation: _____

Return Form to:

Polly Lehtonen, Botanist
USDA, APHIS, PPQ
4700 River Road, Unit 133
Riverdale, MD 20737-1236

Section 2: To be completed by the TAG Reviewers. (If needed, use additional sheets.)

A. Accuracy, Completeness, Comprehensiveness	Acceptable	Unacceptable*	Not Evaluated
◆ Target Weed Information Comments: _____	❑	❑	❑
◆ Biological Control Agent Information Comments: _____	❑	❑	❑
◆ Experimental Methodology and Analysis Comments: _____	❑	❑	❑
◆ Test Plant List Comments: _____	❑	❑	❑
◆ Results and Discussion Comments: _____	❑	❑	❑
◆ Potential Environment Impacts Comments: _____	❑	❑	❑
◆ Petitioner's Conclusion Comments: _____	❑	❑	❑

*If checked, comments are required.

(continued on back)

Section 2: To be completed by the TAG Reviewers—(continued)	
B. Thoroughness of Addressing Agency Concerns Comments: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	Concerns Met ❑ Concerns Not Met* ❑ Not Evaluated ❑ Acceptable ❑ Unacceptable* ❑ Not Evaluated ❑
C. Recommendation of Your Agency Comments/List of additional specialists: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____	Recommended Without Reservations ❑ Recommended With Reservations* ❑ Not* Recommended ❑ [*If checked, comments are required.]

Reviewer's Name: _____

Affiliation: _____

Telephone: _____

FAX: _____

Signature: _____ **Date:** _____

Reviewer's Comment Sheet for Test Plant Lists for the Release of Biological Control Agents of Weeds
Technical Advisory Group (TAG)

Section 1: To be completed by the TAG Executive Secretary

Designation Number: _____ Date Request Received: _____
Date Sent to Reviewers:_____ Review Due Date: _____
Target Weed: _____
Petitioner's Name and Affiliation: _____

Return Form to:

Polly Lehtonen, Botanist
USDA, APHIS, PPQ
4700 River Road, Unit 133
Riverdale,MD 20737-1236

Section 2: To be completed by the TAG Reviewers. (If needed, use additional sheets.)

B. Accuracy, Completeness, Comprehensiveness	Acceptable	Unacceptable*	Not Evaluated
◆ Target Weed Information Comments: _____	❑	❑	❑
◆ Test Plant List Comments: _____	❑	❑	❑
◆ Summary Comments: _____	❑	❑	❑
◆ Perspective of Risk Comments: _____	❑	❑	❑

B. Thoroughness of Addressing Agency Concerns	Concerns Met	Concerns Not Met*	Not Evaluated
Comments: _____	❑	❑	❑

*If checked, comments are required.

(continued on back)

Section 2: To be completed by the TAG Reviewers—(continued)	
B. Safety of Release **Comments:**_____ _____ _____ _____ _____	Acceptable ❑ Not Acceptable* ❑ Not Evaluated* ❑
B. Recommendation of Your Agency **Comments:** _____ _____ _____ _____ _____	Recommended Without Reservations ❑ Recommended With Reservations* ❑ Not* Recommended ❑

B. Summary Comments

What was your major focus while reviewing this petition? What areas did you not evaluate and why? If you received input from additional specialists, list their names and specialty. *If checked, comments are required.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Reviewer's Name: _____

Affiliation: _____

Telephone: _____

FAX: _____

Signature: _____ **Date:** _____

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Appendix H

References

Contents

Biological Control of Weeds

Books

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USDA, APHIS, PPQ
<http://www/aphis.usda.gov/ppq/>

USDA, APHIS, PPQ, National Biological Control Institute
<http://www.aphis.usda.gov/ppq/nbci>

USDA, APHIS weed
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Recognized Taxonomic Institutions

USDA, ARS, Plant Sciences Institute
Systematic Entomology Laboratory
Building 046, BARC-West
10300 Baltimore Boulevard
Beltsville, MD 20705-2350

USDA, ARS
Systematic Botany and Mycology Laboratory
(Dr. Amy Rossman, Mycology)
(Dr. John Wiersema, Plant Taxonomy)
Building 011 A, Room 304
BARC-West
Beltsville, MD 20705-2350

Data Bases

Releases of Beneficial Organisms in the United States and Territories (ROBO).

Compact Disks

In development by the Oregon Department of Agriculture and ARS with information from the Biological Control Documentation Center is a compact disk with petitions, TAG responses, environmental assessments, and permits issued for approved and released biological control agents in Western United States.

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I

TAG Reviewer's Manual

Appendix I

General Plant Classification Systems

Introduction

There are several plant classification systems in common use today. Most specialists will agree that the standard was developed by Arthur Cronquist (1919-1992), New York Botanical Gardens, Bronx, New York. Some other notable systems include those developed by Dahlgren, Reveal, Takhtajan, and Thorne. A concordance of plant family names (as per Cronquist, Dahlgren, Reveal, Takhtajan, and Thorne) has been prepared by James Reveal, Norton-Brown Herbarium, University of Maryland, College Park, Maryland. It is entitled "The USDA-APHIS Concordance of Family Names." It can be found on the Internet at: <http://www.inform.umd.edu/pbio/usda/usdaindex.html>.

To help TAG reviewers, Cronquist's system and an index to the plant names in the system have been reproduced in this appendix, courtesy of James L. Reveal. Note the entries that are boldfaced. These are families containing weeds that have been targeted for biological control in the United States. Below is an example that may serve as a practical guide for using Cronquist's plant classification system as outlined in this appendix.

Example Format

If a biological control target is determined to be in the **"family" *Saururaceae*** (the lizardtail's), then determine the relative relationship between *Saururaceae* and other plant families or higher ranks by doing the following.

Find the family name in the alphabetical index beginning on page I-1-12. *Saururaceae* is listed alphabetically as a plant family:

Saururaceae: C-1-1-3-2

Each listed "number series" is preceded by the letter "C," referring to Cronquist's plant classification system. Cronquist's system has four ranks; class, subclass, order, and family (descending ranks). Going to this Appendix and following **Cronquist's** number series for ***Saururaceae***, namely "**C-1-1-3-2,"** you can determine the relationship of this family to others, as per Cronquist:

- Ignore the rank that reads "**1. Magnoliophyta Cronquist, Takht. & Zimmerm. Ex Reveal (1996)."** This is a "division" rank above class; remember the classification system used here (e.g., "C-1-1-3-2" = *Saururaceae*) begins at the next lower rank; **"class."**

- The first number after the "C" for *Saururaceae* is a **"1**"; follow the list down to the first **"1,"** namely **".1. Magnoliopsida Brongn. (1843)."** This is the **"class."**
- The second number is a **"1,"** continue down the list to the next lower rank and seek the first **"1,"** namely **".1. Magnoliidae Nova'k ex Takht. (1967)."** This is the **"subclass."**
- The third number is a **"3,"** continue down the list to the next lower rank and seek the first **"3,"** namely **".....3. Piperales Dumort. (1829)."** This is the **"order."** Note that the "Magnoliales" and the "Laurales" were bypassed!
- The fourth number is a **"2,"** continue down the list to the next lower rank and seek the first **"2,"** namely **".......2. Saururaceae Rich. Ex E. Meyer, nom. Cons. (1827)."** This is the **"family"** *Saururaceae*.
- At this point, the relationship of *Saururaceae* to other plant families can be readily observed.

Cronquist's System of Angiosperm Classification

1. Magnoliophyta Cronquist, Takht. & Zimmerm. ex Reveal (1996)
.1. Magnoliopsida Brongn. (1843)
...1. Magnoliidae Nova'k ex Takht. (1967)
.....1. Magnoliales Bromhead (1838)
.......1. Winteraceae R. Br. ex Lindl., nom. cons. (1830)
.......2. Degeneriaceae I.W. Bailey & A.C. Smith, nom. cons. (1942)
.......3. Himantandraceae Diels, nom. cons. (1917)
.......4. Eupomatiaceae Endl., nom. cons. (1841)
.......5. Austrobaileyaceae (Croizat) Croizat, nom. cons. (1943)
.......6. Magnoliaceae Juss., nom. cons. (1789)
.......7. Lactoridaceae Engl., nom. cons. (1888)
.......8. Annonaceae Juss., nom. cons. (1789)
.......9. Myristicaceae R. Br., nom. cons. (1810)
.......10. Canellaceae Mart., nom. cons. (1832)
.....2. Laurales Perleb (1826)
.......1. Amborellaceae Pichon, nom. cons. (1948)
.........2. Trimeniaceae (Janet R. Perkins & Gilg) Gibbs, nom. cons. (1917)
.......3. Monimiaceae Juss., nom. cons. (1809)
.......4. Gomortegaceae Reiche, nom. cons. (1896)
.......5. Calycanthaceae Lindl., nom. cons. (1819)
.......6. Idiospermaceae S.T. Blake (1972)
.......7. Lauraceae Juss., nom. cons. (1789)
.......8. Hernandiaceae Blume, nom. cons. (1826)
.....3. Piperales Dumort. (1829)
.......1. Chloranthaceae R. Br. ex Lindl., nom. cons. (1821)
.......2. Saururaceae Rich. ex E. Meyer, nom. cons. (1827)

.....3. Piperaceae C. Agardh, nom. cons. (1824)
.....4. Aristolochiales Dumort. (1829)
.....1. Aristolochiaceae Juss., nom. cons. (1789)
.....5. Illiciales Hu ex Cronquist (1981)
.....1. Illiciaceae (DC.) A.C. Smith, nom. cons. (1947)
.....2. Schisandraceae Blume, nom. cons. (1830)
.....6. Nymphaeales Dumort. (1829)
.....1. Nelumbonaceae (DC.) Dumort., nom. cons. (1829)
.....2. Nymphaeaceae Salisb., nom. cons. (1805)
.....3. Barclayaceae (Endl.) H.L. Li (1955)
.....4. Cabombaceae A. Rich., nom. cons. (1828)
.....5. Ceratophyllaceae Gray, nom. cons. (1821)
.....5. Lardizabalales Loconte (1995)
.....7. Ranunculales Dumort. (1829)
.....1. Ranunculaceae Juss., nom. cons. (1789)
.....2. Circaeasteraceae Hutch., nom. cons. (1926)
.....3. Berberidaceae Juss., nom. cons. (1789)
.....4. Sargentodoxaceae Stapf ex Hutch. (1926)
.....5. Lardizabalaceae Decne., nom. cons. (1839)
.....6. Menispermaceae Juss., nom. cons. (1789)
.....7. Coriariaceae DC., nom. cons. (1824)
.....8. Sabiaceae Blume, nom. cons. (1851)
.....8. Papaverales Dumort. (1829)
.....1. Papaveraceae Juss., nom. cons. (1789)
.....2. Fumariaceae DC., nom. cons. (1821)
...2. Hamamelididae Takht. (1967)
.....1. Trochodendrales Takht. ex Cronquist (1981)
.....1. Tetracentraceae A.C. Sm., nom. cons. (1945)
.....2. Trochodendraceae Prantl, nom. cons. (1888)
.....2. Hamamelidales Griseb. (1854)
.....1. Cercidiphyllaceae Engl., nom. cons. (1909)
.....2. Eupteleaceae K. Wilh., nom. cons. (1910)
.....3. Platanaceae T. Lestib. ex Dumort., nom. cons. (1829)
.....4. Hamamelidaceae R. Br., nom. cons. (1818)
.....5. Myrothamnaceae Nied., nom. cons. (1891)
.....3. Daphniphyllales Pulle ex Cronquist (1981)
.....1. Daphniphyllaceae Mu"Mu""ll.-Arg., nom. cons. (1869)
.....4. Didymelales Takht. (1967)
.....1. Didymelaceae Leandri (1937)
.....5. Eucommiales Nemejc ex Cronquist (1981)
.....1. Eucommiaceae Engl., nom. cons. (1909)
.....6. Urticales Dumort. (1829)
.....1. Barbeyaceae Rendle, nom. cons. (1916)
.....2. Ulmaceae Mirb., nom. cons. (1815)
.....3. Cannabaceae Endl., nom. cons. (1837)
.....4. Moraceae Link, nom. cons. (1831)
.....5. Cecropiaceae C.C. Berg (1978)
.....6. Urticaceae Juss., nom. cons. (1789)
.....7. Physenaceae Takht. (1985)

.....7. Leitneriales Engl. (1897)
.....1. Leitneriaceae Benth. & Hook.f. (1880)
.....8. Juglandales Dumort. (1829)
.....1. Rhoipteleaceae Hand.-Mazz., nom. cons. (1932)
.....2. Juglandaceae A. Rich. ex Kunth, nom. cons. (1824)
.....9. Myricales Engl. (1897)
.....1. Myricaceae Blume, nom. cons. (1829)
.....10. Fagales Engl. (1892)
.....1. Balanopaceae Benth. & Hook.f. (1880)
.....2. Ticodendraceae Go'mez-Laur. & L.D. Go'mez (1991)
.....3. Fagaceae Dumort., nom. cons. (1829)
.....4. Nothofagaceae Kuprian. (1962)
.....5. Betulaceae Gray, nom. cons. (1821)
.....11. Casuarinales Lindl. (1833)
.....1. Casuarinaceae R. Br., nom. cons. (1814)
...3. Caryophyllidae Takht., nom. admiss. (1967)
.....1. Caryophyllales Perleb, nom. admiss. (1826)
.....1. Phytolaccaceae R. Br., nom. cons. (1818)
.....2. Achatocarpaceae Harms, nom. cons. (1934)
.....3. Nyctaginaceae Juss., nom. cons. (1789)
.....4. Aizoaceae Rudolphi, nom. cons. (1830)
.....5. Didiereaceae Drake, nom. cons. (1903)
.....6. Cactaceae Juss., nom. cons. (1789)
.....7. Chenopodiaceae Vent., nom. cons. (1799)
.....8. Amaranthaceae Juss., nom. cons. (1789)
.....9. Portulacaceae Juss., nom. cons. (1789)
.....10. Basellaceae Moq., nom. cons. (1840)
.....11. Molluginaceae Hutch., nom. cons. (1926)
.....12. Caryophyllaceae Juss., nom. cons. (1789)
.....2. Polygonales Dumort. (1829)
.....1. Polygonaceae Juss., nom. cons. (1789)
.....3. Plumbaginales Lindl. (1833)
.....1. Plumbaginaceae Juss., nom. cons. (1789)
...4. Dilleniidae Takht. ex Reveal & Tahkt. (1993)
.....1. Dilleniales Hutch. (1924)
.....1. Dilleniaceae Salisb. (1807)
.....2. Paeoniaceae (Bercht. & J. Presl) Rudolphi, nom. cons. (1830)
.....2. Theales Lindl. (1833)
.....1. Ochnaceae DC., nom. cons. (1811)
.....2. Sphaerosepalaceae (Warb.) Tiegh. ex Bullock (1959)
.....3. Sarcolaenaceae Caruel, nom. cons. (1881)
.....4. Dipterocarpaceae Blume (1825)
.....5. Caryocaraceae Szyszyl., nom. cons. (1893)
.....6. Theaceae D. Don, nom. cons. (1825)
.....7. Actinidiaceae Hutch., nom. cons. (1926)
.....8. Scytopetalaceae Engl., nom. cons. (1897)
.....9. Pentaphylacaceae Engl., nom. cons. (1897)
.....10. Tetrameristaceae Hutch. (1959)
.....11. Pellicieraceae (Triana & Planch.) L. Beauvis. ex Bullock (1959)

.....12. Oncothecaceae Kobuski ex Airy Shaw (1965)
.....13. Marcgraviaceae Choisy (1824)
.....14. Quiinaceae Choisy ex Engl., nom. cons. (1888)
.....15. Elatinaceae Dumort., nom. cons. (1829)
.....16. Paracryphiaceae Airy Shaw (1965)
.....17. Medusagynaceae Engl. & Gilg, nom. cons. (1924)
.....18. Clusiaceae Lindl., nom. cons. (1836)
.....3. Malvales Dumort. (1829)
.....1. Elaeocarpaceae Juss. ex DC., nom. cons. (1824)
.....2. Tiliaceae Juss., nom. cons. (1789)
.....3. Sterculiaceae (DC.) Bartl., nom. cons. (1830)
.....4. Bombacaceae Kunth, nom. cons. (1822)
.....5. Malvaceae Juss., nom. cons. (1789)
.....4. Lecythidales Cronquist (1957)
.....1. Lecythidaceae Poit., nom. cons. (1825)
.....5. Nepenthales Dumort. (1829)
.....1. Sarraceniaceae Dumort., nom. cons. (1829)
.....2. Nepenthaceae Dumort., nom. cons. (1829)
.....3. Droseraceae Salisb. (1808)
.....6. Violales Perleb (1826)
.....1. Flacourtiaceae Rich. ex DC., nom. cons. (1824)
.....2. Peridiscaceae Kuhlm., nom. cons. (1950)
.....3. Bixaceae Link, nom. cons. (1831)
.....4. Cistaceae Juss., nom. cons. (1789)
.....5. Huaceae A. Chev. (1947)
.....6. Lacistemataceae Mart., nom. cons. (1826)
.....7. Scyphostegiaceae Hutch., nom. cons. (1926)
.....8. Stachyuraceae J. Agardh (1858)
.....9. Violaceae Batsch, nom. cons. (1802)
.....10. Tamaricaceae Link, nom. cons. (1821)
.....11. Frankeniaceae A. St.-Hil. ex Gray, nom. cons. (1821)
.....12. Dioncophyllaceae (Gilg) Airy Shaw, nom. cons. (1952)
.....13. Ancistrocladaceae Planch. ex Walp., nom. cons. (1851)
.....14. Turneriaceae Kunth ex DC., nom. cons. (1828)
.....15. Malesherbiaceae D. Don, nom. cons. (1827)
.....16. Passifloraceae Juss. ex Kunth, nom. cons. (1817)
.....17. Achariaceae Harms, nom. cons. (1897)
.....18. Caricaceae Dumort., nom. cons. (1829)
.....19. Fouquieriaceae DC. (1828)
.....20. Hoplestigmataceae Engl. & Gilg, nom. cons. (1924)
.....21. Cucurbitaceae Juss., nom. cons. (1789)
.....22. Datiscaceae R. Br. ex Lindl., nom. cons. (1830)
.....23. Begoniaceae C. Agardh, nom. cons. (1824)
.....24. Loasaceae Dumort. (1822)
.....7. Salicales Lindl. (1833)
.....1. Salicaceae Mirb., nom. cons. (1815)
.....8. Capparales Hutch. (1924)
.....1. Tovariaceae Pax, nom. cons. (1891)
.....2. Capparaceae Juss., nom. cons. (1789)

.....3. Brassicaceae Burnett, nom. cons. (1835)
.....4. Moringaceae R. Br. ex Dumort., nom. cons. (1829)
.....5. Resedaceae DC. ex Gray, nom. cons. (1821)
.....9. Batales Engl. (1907)
.....1. Gyrostemonaceae Endl. (1841)
.....2. Bataceae Mart. ex Meisn., nom. cons. (1842)
.....10. Ericales Dumort. (1829)
.....1. Cyrillaceae Endl. (1841)
.....2. Clethraceae Klotzsch, nom. cons. (1851)
.....3. Grubbiaceae Endl., nom. cons. (1839)
.....4. Empetraceae Gray, nom. cons. (1821)
.....5. Epacridaceae R. Br. (1810)
.....6. Ericaceae Juss., nom. cons. (1789)
.....7. Pyrolaceae Dumort., nom. cons. (1829)
.....8. Monotropaceae Nutt., nom. cons. (1818)
.....11. Diapensiales Engl. & Gilg (1924)
.....1. Diapensiaceae (Link) Lindl., nom. cons. (1836)
.....12. Ebenales Engl., nom. admiss. (1892)
.....1. Sapotaceae Juss., nom. cons. (1789)
.....2. Ebenaceae Gurcke, nom. cons. (1891)
.....3. Styracaceae Dumort., nom. cons. (1829)
.....4. Lissocarpaceae Gilg, nom. cons. (1924)
.....5. Symplocaceae Desf., nom. cons. (1820)
.....13. Primulales Dumort. (1829)
.....1. Theophrastaceae Link (1829)
.....2. Myrsinaceae R. Br., nom. cons. (1810)
.....3. Primulaceae Vent., nom. cons. (1799)
...5. Rosidae Takht. (1967)
.....1. Rosales Perleb (1826)
.....1. Brunelliaceae Engl., nom. cons. (1897)
.....2. Connaraceae R. Br., nom. cons. (1818)
.....3. Eucryphiaceae Endl. (1841)
.....4. Cunoniaceae R. Br. (1814)
.....5. Davidsoniaceae Bange (1952)
.....6. Dialypetalanthaceae Rizzini & Occhioni, nom. cons. (1948)
.....7. Pittosporaceae R. Br., nom. cons. (1814)
.....8. Byblidaceae (Engl. & Gilg) Domin, nom. cons. (1922)
.....9. Hydrangeaceae Dumort., nom. cons. (1829)
.....10. Columelliaceae D. Don, nom. cons. (1828)
.....11. Grossulariaceae DC., nom. cons. (1805)
.....12. Greyiaceae Hutch., nom. cons. (1926)
.....13. Bruniaceae R. Br. ex DC., nom. cons. (1825)
.....14. Anisophylleaceae Ridl. (1922)
.....15. Alseuosmiaceae Airy Shaw (1965)
.....16. Crassulaceae DC., nom. cons. (1805)
.....17. Cephalotaceae Dumort., nom. cons. (1829)
.....18. Saxifragaceae Juss., nom. cons. (1789)
.....19. Rosaceae Juss., nom. cons. (1789)
.....20. Neuradaceae Link, nom. cons. (1831)

.....21. Crossosomataceae Engl., nom. cons. (1897)
.....22. Chrysobalanaceae R. Br., nom. cons. (1818)
.....23. Surianaceae Arn. (1834)
.....24. Rhabdodendraceae (Huber) Prance (1968)
.....2. Fabales Bromhead (1838)
.....1. Mimosaceae R. Br., nom. cons. (1814)
.....2. Caesalpiniaceae R. Br., nom. cons. (1814)
.....3. Fabaceae Lindl., nom. cons. (1836)
.....3. Proteales Dumort. (1829)
.....1. Elaeagnaceae Juss., nom. cons. (1789)
.....2. Proteaceae Juss., nom. cons. (1789)
.....4. Podostemales Lindl. (1833)
.....1. Podostemaceae Rich. ex C. Agardh, nom. cons. (1822)
.....5. Haloragales Bromhead (1838)
.....1. Haloragaceae R. Br. (1814)
.....2. Gunneraceae Meisn., nom. cons. (1842)
.....6. Myrtales Rchb.f. (1828)
.....1. Sonneratiaceae Engl. & Gilg, nom. cons. (1924)
.....2. Lythraceae J. St.-Hil., nom. cons. (1805)
.....3. Rhynchocalycaceae L.A.S. Johnson & B.G. Briggs (1985)
.....4. Alzateaceae S.A. Graham (1985)
.....5. Penaeaceae Sweet ex Guill., nom. cons. (1828)
.....6. Crypteroniaceae A. DC., nom. cons. (1868)
.....7. Thymelaeaceae Juss., nom. cons. (1789)
.....8. Trapaceae Dumort., nom. cons. (1829)
.....9. Myrtaceae Juss., nom. cons. (1789)
.....10. Punicaceae Horan., nom. cons. (1834)
.....11. Onagraceae Juss., nom. cons. (1789)
.....12. Oliniaceae Harv. & Sond., nom. cons. (1862)
.....13. Melastomataceae Juss., nom. cons. (1789)
.....14. Combretaceae R. Br., nom. cons. (1810)
.....7. Rhizophorales Tiegh. ex Reveal (1993)
.....1. Rhizophoraceae R. Br., nom. cons. (1814)
.....8. Cornales Dumort. (1829)
.....1. Alangiaceae DC., nom. cons. (1828)
.....2. Cornaceae (Bercht. & J. Presl) Dumort., nom. cons. (1829)
.....3. Garryaceae Lindl., nom. cons. (1834)
.....9. Santalales Dumort. (1829)
.....1. Medusandraceae Brenan, nom. cons. (1952)
.....2. Dipentodontaceae Merr., nom. cons. (1941)
.....3. Olacaceae Mirb. ex DC., nom. cons. (1824)
.....4. Opiliaceae (Benth.) Valeton, nom. cons. (1886)
.....5. Santalaceae R. Br., nom. cons. (1810)
.....6. Misodendraceae J. Agardh (1858)
.....7. Loranthaceae Juss. (1808)
.....8. Viscaceae Batsch (1802)
.....9. Eremolepidaceae Tiegh. ex Nakai (1952)
.....10. Balanophoraceae Rich. (1822)
.....10. Rafflesiales Oliv. (1895)

.....1. Hydnoraceae C. Agardh, nom. cons. (1821)
.....2. Mitrastemonaceae Makino, nom. cons. (1911)
.....3. Rafflesiaceae Dumort., nom. cons. (1829)
....11. Celastrales Baskerville (1839)
.....1. Geissolomataceae Endl. (1841)
.....2. Celastraceae R. Br. (1814)
.....3. Hippocrateaceae Juss. (1811)
.....4. Stackhousiaceae R. Br. (1814)
.....5. Salvadoraceae Lindl., nom. cons. (1836)
.....6. Tepuianthaceae Maguire & Steyerm. (1981)
.....7. Aquifoliaceae Bartl., nom. cons. (1830)
.....8. Icacinaceae (Benth.) Miers, nom. cons. (1851)
.....9. Aextoxicaceae Engl. & Gilg, nom. cons. (1920)
.....10. Cardiopteridaceae Blume, nom. cons. (1847)
.....11. Corynocarpaceae Engl., nom. cons. (1897)
.....12. Dichapetalaceae Baill., nom. cons. (1886)
....12. Euphorbiales Lindl. (1833)
.....1. Buxaceae Dumort., nom. cons. (1822)
.....2. Simmondsiaceae (Mu"“ll.-Arg.) Tiegh. ex Reveal & Hoogland (1990)
.....3. Pandaceae Engl. & Gilg, nom. cons. (1813)
.....4. Euphorbiaceae Juss., nom. cons. (1789)
....13. Rhamnales Dumort. (1829)
.....1. Rhamnaceae Juss., nom. cons. (1789)
.....2. Leeaceae (DC.) Dumort., nom. cons. (1829)
.....3. Vitaceae Juss., nom. cons. (1789)
....14. Linales Baskerville (1839)
.....1 Erythroxylaceae Kunth, nom. cons. (1822)
.....2. Humiriaceae A. Juss. ex A. St.-Hil., nom. cons. (1829)
.....3. Ixonanthaceae (Benth.) Exell & Mendonc,a, nom. cons. (1951)
.....4. Hugoniaceae Arn. (1834)
.....5. Linaceae DC. ex Gray (1821)
....15. Polygalales Dumort. (1829)
.....1. Malpighiaceae Juss., nom. cons. (1789)
.....2. Vochysiaceae A. St.-Hil., nom. cons. (1820)
.....3. Trigoniaceae Endl., nom. cons. (1841)
.....4. Tremandraceae R. Br. ex DC., nom. cons. (1824)
.....5. Polygalaceae R. Br., nom. cons. (1814)
.....6. Xanthophyllaceae (Chodat) Gagnep. ex Reveal & Hoogland (1990)
.....7. Krameriaceae Dumort., nom. cons. (1829)
....16. Sapindales Dumort. (1829)
.....1. Staphyleaceae (DC.) Lindl., nom. cons. (1829)
.....2. Melianthaceae Link, nom. cons. (1831)
.....3. Bretschneideraceae Engl. & Gilg, nom. cons. (1924)
.....4. Akaniaceae Stapf, nom. cons. (1912)
.....5. Sapindaceae Juss., nom. cons. (1789)
.....6. Hippocastanaceae DC., nom. cons. (1824)
.....7. Aceraceae Juss., nom. cons. (1789)

.....8. Burseraceae Kunth, nom. cons. (1824)
.....9. Anacardiaceae Lindl., nom. cons. (1830)
.....10. Julianiaceae Hemsl., nom. cons. (1906)
.....11. Simaroubaceae DC., nom. cons. (1811)
.....12. Cneoraceae Link, nom. cons. (1831)
.....13. Meliaceae Juss., nom. cons. (1789)
.....14. Rutaceae Juss., nom. cons. (1789)
.....15. Zygophyllaceae R. Br., nom. cons. (1814)
.....17. Geraniales Dumort. (1829)
.....1. Oxalidaceae R. Br., nom. cons. (1818)
.....2. Geraniaceae Juss., nom. cons. (1789)
.....3. Limnanthaceae R. Br., nom. cons. (1833)
.....4. Tropaeolaceae Juss. ex DC., nom. cons. (1824)
.....5. Balsaminaceae A. Rich., nom. cons. (1822)
.....18. Apiales Nakai (1930)
.....1. Araliaceae Juss., nom. cons. (1789)
.....2. Apiaceae Lindl., nom. cons. (1836)
...6. Asteridae Takht. (1967)
.....1. Gentianales Lindl. (1833)
.....1. Loganiaceae R. Br. ex Mart., nom. cons. (1827)
.....2. Gentianaceae Juss., nom. cons. (1789)
.....3. Saccifoliaceae Maguire & Pires (1978)
.....4. Apocynaceae Juss., nom. cons. (1789)
.....5. Asclepiadaceae R. Br., nom. cons. (1810)
.....2. Solanales Dumort. (1829)
.....1. Duckeodendraceae Kuhlm. (1950)
.....2. Nolanaceae Dumort., nom. cons. (1829)
.....3. Solanaceae Juss., nom. cons. (1789)
.....4. Convolvulaceae Juss., nom. cons. (1789)
.....5. Cuscutaceae (Dumort.) Dumort., nom. cons. (1829)
.....6. Retziaceae Bartl. (1830)
.....7. Menyanthaceae (Dumort.) Dumort., nom. cons. (1829)
.....8. Polemoniaceae Juss., nom. cons. (1789)
.....9. Hydrophyllaceae R. Br., nom. cons. (1817)
.....3. Lamiales Bromhead (1838)
.....1. Lennoaceae Solms, nom. cons. (1870)
.....2. Boraginaceae Juss., nom. cons. (1789)
.....3. Verbenaceae J. St.-Hil., nom. cons. (1805)
.....4. Lamiaceae Lindl., nom. cons. (1836)
.....4. Callitrichales Dumort. (1829)
.....1. Hippuridaceae Link, nom. cons. (1821)
.....2. Callitrichaceae Link, nom. cons. (1821)
.....3. Hydrostachyaceae Engl., nom. cons. (1898)
.....5. Plantaginales Lindl. (1833)
.....1. Plantaginaceae Juss., nom. cons. (1789)
.....6. Scrophulariales Lindl. (1833)
.....1. Buddlejaceae K. Wilh. (1910)
.....2. Oleaceae Hoffmanns. & Link, nom. cons. (1813-1820)
.....3. Scrophulariaceae Juss., nom. cons. (1789)

.....4. Globulariaceae DC., nom. cons. (1805)
.....5. Myoporaceae R. Br., nom. cons. (1810)
.....6. Orobanchaceae Vent., nom. cons. (1799)
.....7. Gesneriaceae Dumort., nom. cons. (1822)
.....8. Acanthaceae Juss., nom. cons. (1789)
.....9. Pedaliaceae R. Br., nom. cons. (1810)
.....10. Bignoniaceae Juss., nom. cons. (1789)
.....11. Mendonciaceae Bremek. (1954)
.....12. Lentibulariaceae Rich., nom. cons. (1808)
.....7. Campanulales Rchb.f. (1828)
.....1. Pentaphragmataceae J. Agardh (1858)
.....2. Sphenocleaceae Mart. ex DC., nom. cons. (1839)
.....3. Campanulaceae Juss., nom. cons. (1789)
.....4. Stylidiaceae R. Br., nom. cons. (1810)
.....5. Donatiaceae (Engl.) B. Chandler, nom. cons. (1911)
.....6. Brunoniaceae Dumort., nom. cons. (1829)
.....7. Goodeniaceae R. Br. (1810)
.....8. Rubiales Dumort. (1829)
.....1. Rubiaceae Juss., nom. cons. (1789)
.....2. Theligonaceae Dumort., nom. cons. (1829)
.....9. Dipsacales Dumort. (1829)
.....1. Caprifoliaceae Juss., nom. cons. (1789)
.....2. Adoxaceae Trautv., nom. cons. (1853)
.....3. Valerianaceae Batsch, nom. cons. (1802)
.....4. Dipsacaceae Juss., nom. cons. (1789)
.....10. Calycerales Takht. ex Reveal (1996)
.....1. Calyceraceae R. Br. ex Rich., nom. cons. (1820)
.....11. Asterales Lindl. (1833)
.....1. Asteraceae Dumort., nom. cons. (1822)
.2. Liliopsida Scop. (1760)
...1. Alismatidae Takht. (1967)
.....1. Alismatales Dumort. (1829)
.....1. Butomaceae Rich., nom. cons. (1815)
.....2. Limnocharitaceae Takht. ex Cronquist (1981)
.....3. Alismataceae Vent., nom. cons. (1799)
.....2. Hydrocharitales Dumort. (1829)
.....1. Hydrocharitaceae Juss., nom. cons. (1789)
.....3. Najadales Dumort. (1829)
.....1. Aponogetonaceae J. Agardh (1858)
.....2. Scheuchzeriaceae Rudolphi, nom. cons. (1830)
.....3. Juncaginaceae Rich. (1808)
.....4. Potamogetonaceae Dumort., nom. cons. (1829)
.....5. Ruppiaceae Horan. ex Hutch., nom. cons. (1934)
.....6. Najadaceae Juss., nom. cons. (1789)
.....7. Zannichelliaceae Dumort., nom. cons. (1829)
.....8. Posidoniaceae Hutch., nom. cons. (1934)
.....9. Cymodoceaceae N. Taylor, nom. cons. (1909)
.....10. Zosteraceae Dumort., nom. cons. (1829)
.....4. Triuridales Hook.f. (1876)

.....1. Petrosaviaceae Hutch., nom. cons. (1934)
.....2. Triuridaceae Gardner, nom. cons. (1843)
...2. Arecidae Takht. (1967)
.....1. Arecales Bromhead (1840)
.....1. Arecaceae Schultz Sch., nom. cons. (1832)
.....2. Cyclanthales Nakai (1930)
.....1. Cyclanthaceae Dumort., nom. cons. (1829)
.....3. Pandanales Lindl. (1833)
.....1. Pandanaceae R. Br., nom. cons. (1810)
.....4. Arales Dumort. (1829)
.....1. Acoraceae Martinov (1820)
.....2. Araceae Juss., nom. cons. (1789)
.....3. Lemnaceae Gray, nom. cons. (1821)
...3. Commelinidae Takht. (1967)
.....1. Commelinales Dumort. (1829)
.....1. Rapateaceae Dumort., nom. cons. (1829)
.....2. Xyridaceae C. Agardh, nom. cons. (1823)
.....3. Mayacaceae Kunth (1842)
.....4. Commelinaceae R. Br., nom. cons. (1810)
.....2. Eriocaulales Nakai (1930)
.....1. Eriocaulaceae P. Beauv. ex Desv. (1828)
.....3. Restionales J.H. Schaffn. (1929)
.....1. Flagellariaceae Dumort., nom. cons. (1829)
.....2. Joinvilleaceae Toml. & A.C. Smith (1970)
.....3. Restionaceae R. Br., nom. cons. (1810)
.....4. Centrolepidaceae Endl., nom. cons. (1836)
.....4. Juncales Dumort. (1829)
.....1. Juncaceae Juss., nom. cons. (1789)
.....2. Thurniaceae Engl., nom. cons. (1907)
.....5. Cyperales Hutch. (1934)
.....1. Cyperaceae Juss., nom. cons. (1789)
.....2. Poaceae (R. Br.) Barnh., nom. cons. (1895)
.....6. Hydatellales Cronquist (1980)
.....1. Hydatellaceae U. Hamann, nom. cons. (1976)
.....7. Typhales Dumort. (1829)
.....1. Sparganiaceae Rudolphi, nom. cons. (1830)
.....2. Typhaceae Juss., nom. cons. (1789)
...4. Zingiberidae Cronquist (1978)
.....1. Bromeliales Dumort. (1829)
.....1. Bromeliaceae Juss., nom. cons. (1789)
.....2. Zingiberales Griseb. (1854)
.....1. Strelitziaceae (K. Schum.) Hutch. (1934)
.....2. Heliconiaceae (A. Rich.) Nakai (1941)
.....3. Musaceae Juss., nom. cons. (1789)
.....4. Lowiaceae Ridl., nom. cons. (1924)
.....5. Zingiberaceae Lindl., nom. cons. (1835)
.....6. Costaceae (Meisn.) Nakai (1941)
.....7. Cannaceae Juss., nom. cons. (1789)
.....8. Marantaceae Petersen, nom. cons. (1888)

...5. Liliidae Takht. (1967)
.....1. Liliales Perleb (1826)
.....1. Philydraceae Link, nom. cons. (1821)
.....2. Pontederiaceae Kunth, nom. cons. (1816)
.....3. Haemodoraceae R. Br., nom. cons. (1810)
.....4. Cyanastraceae Engl., nom. cons. (1900)
.....5. Liliaceae Juss., nom. cons. (1789)
.....6. Iridaceae Juss., nom. cons. (1789)
.....7. Velloziaceae Endl., nom. cons. (1841)
.....8. Aloaceae Batsch (1802)
.....9. Agavaceae Endl., nom. cons. (1841)
.....10. Xanthorrhoeaceae Dumort., nom. cons. (1829)
.....11. Hanguanaceae Airy Shaw (1965)
.....12. Taccaceae Dumort., nom. cons. (1829)
.....13. Stemonaceae Engl., nom. cons. (1887)
.....14. Smilacaceae Vent., nom. cons. (1799)
.....15. Dioscoreaceae R. Br., nom. cons. (1810)
.....2. Orchidales Raf. (1815)
.....1. Geosiridaceae Jonker, nom. cons. (1939)
.....2. Burmanniaceae Blume, nom. cons. (1827)
.....3. Corsiaceae Becc., nom. cons. (1878)
.....4. Orchidaceae Juss., nom. cons. (1789)

Index to Names

Names with a zero are synonymys at the next higher name. The ranks for Cronquist are as follows: class, subclass, order, family

To ascertain the position of a name, one reads the index as follows:

Adoxaceae: C-1-6-9-2
Cronquist: class 1, subclass 6, order 9, family 2

For names above the rank of family, read as follows:

Adoxales: C-1-6-9-0
Cronquist: class 1, subclass 6, order 9

If the name is not found in a particular position, the name in question is a synonym of the name adopted by the author.

Unisemataceae: C-2-5-1-2
Urticaceae: C-1-2-6-6
Urticales: C-1-2-6-0
Urticanae:
Urticopsida: C-1-0-0-0
Utriculariaceae: C-1-6-6-12
Uvulariaceae: C-2-5-1-5
Vacciniaceae: C-1-4-10-6
Vacciniales: C-1-4-10-0
Vahliaceae: C-1-5-1-18
Valerianaceae: C-1-6-9-3
Vallisneriaceae: C-2-1-2-1
Vallisneriales: C-2-1-2-0
Vanillaceae: C-2-5-2-4
Velloziaceae: C-2-5-1-7
Velloziales: C-2-5-1-0
Veratraceae: C-2-5-1-5
Veratrales: C-2-5-1-0
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24 Jan 1997

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TAG Reviewer's Manual

Appendix J

List of Submitted Petitions

Use this appendix as a historical record of the petitions submitted to TAG since 1987. It was provided by ARS, Biological Control Documentation Center (BCDC). The list is updated annually. For a list of petitions submitted during the current year, go to the TAG home page on the Internet at the following address:
<http://www.aphis.usda.gov/ppq/ss/tag/tag.html>.

List of TAG IBCW Petitions Received by BCDC

1.(87-1) Proposal for release of *Cyphocleonus achates* against knapweeds (*Centaurea* spp.) in Canada. Received 3/5/87. (See 5.(87-5).)

2.(87-2) Proposal to screen several insects in Europe for potential use against common toadflax (*Linaria vulgaris*) in Canada. Received 3/20/87.

3.(87-3) Proposal for release of (a) *Polygamy transversaloides* and (b) *P. virgatae* against spurges (*Euphorbia* spp.) in Canada. Received 3/26/87. (For b, see 23.(88-6).)

4.(87-4) Proposed test plant list for new testing of *Subanguina picridis* for potential release against Russian knapweed (*Acroptilon [Centaurea] repens*) in the U.S. Received 3/26/87. (See 27.(88-10).)

5.(87-5) Proposal for release of *Cyphocleonus achates* against knapweeds (*Centaurea* spp.) in the U.S. Received 4/16/87. (See 1.(87-1).)

6.(87-6) Proposal for release of *Heilipodus ventralis* against snakeweed (*Gutierrezia* spp.) in the U.S. Received 5/11/87.

7.(87-7) Proposal for importation of *Aceria centaurea* into quarantine in California for testing for use against knapweeds (*Centaurea* spp.). Received 5/14/87.

8.(87-8) Proposal for release of *Aceria convolvuli* against field bindweed (*Convolvulus arvensis*) in the U.S. Received 5/15/87.

9.(87-9) Proposal to bring natural enemies of leafy spurge (*Euphorbia esula*) collected in China into quarantine in California for identification and testing. Received 5/18/87.

10.(87-10) Proposal for importation of *Larinus Curtis* into quarantine in California for testing for use against yellow starthistle (*Centaurea solstitialis*). Received 5/20/87. (See 74.(92-01) for release proposal.)

11.(87-12) Proposal for importation of *Eustenopus hirtus* into quarantine in California for testing for use against yellow starthistle (*Centaurea solstitialis*). Received 5/27/87. (See 38.(89-12) for release proposal.)

12.(87-11) Proposal for release of *Aphthona czwalinae* against leafy spurge (*Euphorbia esula*) in the United States. Received from researcher 5/15/87, from TAG 6/25/87.

13.(87-13) Proposals (a) for release of *Hydrellia pakistanae* against hydrilla (*Hydrilla verticillata*) in the United States, and (b) for introduction of *Hydrellia* n.sp. near *unigena* into quarantine in Florida for testing against hydrilla. Received 7/10/87. (For b, see 24.(88-7).)

14.(87-14) Proposal for importation of *Eurytoma* spp. into quarantine in California for identification and testing against leafy spurge (*Euphorbia esula-virgata*). Received 7/10/87.

15.(87-17) Proposal to move *Orrina phyllobius* from Texas for release against silverleaf nightshade (*Solanum elaeagnifolium*) in California, where the nematode does not occur naturally. Received 8/28/87.

16.(87-15) Proposal for importation of *Bangasternus fausti* into quarantine in California for testing for use against diffuse knapweed (*Centaurea diffusa*). Received 9/8/87. (See 31.(89-4) for release proposal.)

17.(87-16) Proposed test plant list for testing of insects for potential importation for biological control of purple loosestrife (*Lythrum salicaria*) in the U.S. Received 11/18/87. (See 33.(89-6) for petition for domestic quarantine importations.)

18.(88-1) Proposal for release of *Urophora quadrifasciata* in the United States for control of diffuse and spotted knapweeds (*Centaurea diffusa* and *C. maculata*). Received 1/19/88.

19.(88-2) Proposal for release of *Anaitis plagiata* in the United States for control of common St. Johnswort (*Hypericum perforatum*). Received 3/2/88.

20.(88-3) Proposal for release of *Chaetorellia australis* in the United States for control of yellow starthistle (*Centaurea solstitialis*). Received 5/26/88.

21.(88-4) Proposal for approval of seep willow (*Baccharis salicifolia*) as target weed, and for release of *Stolas fuscata* in the United States for control of this weed. Received 6/21/88.

22.(88-5) Proposal for importation of *Aphthona nigriscutis* from Europe, via Canada, into quarantine in the U.S. (Bozeman, MT) for study for control of leafy spurge, *Euphorbia esula*. Received 7/11/88. (See 42.(89-8) for release proposal.)

23.(88-6) Proposal for release of *Pegomya curticornis* from Europe in the U.S. for control of leafy spurge (*Euphorbia esula*). Received 9/1/88. (See 3.(87-3) for proposal for release of *P. curticornis* (=*P. virgatae* n. sp.) in Canada.) (See 81.(92-08) for second petition.)

24.(88-7) Proposal for release of *Hydrellia* n. sp. [= *H. balsiunasi*] from Australia in the U.S. for control of hydrilla (*Hydrilla verticillata*). Received in BCDC 11/17/88. (See 13.(87-13) for proposal for quarantine importation of this species in the U.S.)

25.(88-8) Proposed test plant list for testing insects of hound's-tongue (*Cynoglossum officinale*) in Europe and in quarantine in Canada. Received in BCDC 12/27/88.

26.(88-9) Proposal for release of *Cheilosia corydon* from Europe for control of musk and Italian thistles (*Carduus nutans* and *C. pycnocephalus*) in the U.S. Received in BCDC 12/29/88.

27.(88-10) Proposal for release of *Subanguina picridis* from Central Asia (USSR) for control of Russian knapweed (*Acroptilon repens*) in the U.S. Received in BCDC 1/12/89. (See 4.(87-4) for proposed [and approved] test plant list for this species.)

28.(89-1) Proposal for release of *Cassida azurea* from Europe for control of bladder campion (*Silene vulgaris*) in Canada. Received in BCDC 1/17/89.

29.(89-2) Proposed introduction of *Stolas ingrata* from Argentina into quarantine in Texas for study as potential biocontrol agent for snakeweed (*Gutierrezia* spp.). Received in BCDC 1/18/89.

30.(89-3) Proposal for release of *Puccinia jaceae* from Eurasia against yellow starthistle (*Centaurea solstitialis*) in California, Idaho, Washington, and Maryland. Received in BCDC 2/20/89.

31.(89-4) Proposal for release of *Bangasternus fausti* from Europe against diffuse knapweed (*Centaurea diffusa*) in the U.S. (Montana?). Received in BCDC 2/21/89. (See 16.(87-15) for quarantine importation proposal; see 66.(89-04-S) for submittal of supplemental data.)

32.(89-5) Proposal for release of *Larinus planus* from Northeastern U.S. against Canada thistle (*Cirsium arvense*) in Alberta, Canada, and other areas of western North America. Received in BCDC 3/21/89.

33.(89-6) Proposal for importation into quarantine in Virginia of three insects from Europe for study for control of purple loosestrife (*Lythrum salicaria*). Received in BCDC 3/21/89. (See 17.(87-16) for proposed [and approved] test plant list. See 61.(91-02) for proposal or field release of the 3 insects.)

34.(89-7) Proposal for release of *Namangana pectinicornis* from Thailand against water lettuce (*Pistia stratiotes*) in the U.S. (Florida). Received 3/23/89. (See 57.(90-09) for resubmittal.)

35.(89-11) Proposal for release of *Dasineura* sp. nr. *capsulae* from Italy against leafy spurge (*Euphorbia esula*) in the U.S. (Montana & North Dakota). Received in BCDC 4/18/89.

36.(89-9) Proposal for introduction into quarantine in Montana of *Simyra dentinosa* for study for control of leafy spurge (*Euphorbia esula*) in the U.S. Received in BCDC 5/4/89.

37.(89-10) Proposal for introduction into quarantine (in Montana) of *Chamaesphecia crassicornis* for study for control of leafy spurge (*Euphorbia esula*) in the U.S. Received in BCDC 5/8/89. (See 96.(94-08) for Canada release proposal.)

38.(89-12) Proposal for release of *Eustenopus villosus* from Greece against yellow starthistle (*Centaurea solstitialis*) in the U.S. (California?). Received in BCDC 5/18/89. (See 11.(87-12) for quarantine importation proposal.)

39.(89-13) Proposal for release of *Cochylis atricapitana* from Europe against tansy ragwort (*Senecio jacobaea*) in Canada. Received in BCDC 5/19/89.

40.(89-14) Proposal for introduction into quarantine (in Montana?) of *Oxicesta geographica* for study for control of leafy spurge (*Euphorbia esula*) in the U.S. Received in BCDC 6/8/89.

41.(89-15) Proposal for release of *Urophora solstitialis* from Europe for control of plumeless thistle (*Carduus acanthoides*) in Canada. Received in BCDC 6/14/89.

42.(89-8) Proposal for release of *Aphthona nigriscutis* from Canada against leafy spurge (*Euphorbia esula*) in the U.S. (Montana?). Received in BCDC by FAX 6/23/89. (See 22.(88-5) for quarantine importation proposal.)

43.(89-16) Proposal to initiate a project on the biological control of saltcedar (*Tamarix* spp.) in the United States. Received in BCDC 7/14/89. (See 71.(91-08) for petition for review of test plant list.)

44.(89-17) Proposal for introduction into quarantine at Temple, TX, of *Emphytoecia versicolor* for study for control of cocklebur (*Xanthium strumarium*) in the U.S. Received in BCDC 10/23/89.

45.(89-18) Proposal to initiate a project on the biological control of scentless chamomile (*Matricaria perforata*) in Canada. Received in BCDC 10/23/89.

46.(89-19) Proposal for release of *Bagous* n. sp. Z [=*B. hydrillae*] from Australia for control of hydrilla (*Hydrilla verticillata*) in the U.S. (Florida?). Received in BCDC 10/25/89.

47.(90-1) Proposal for release of *Agonopterix ulicetella* from Hawaii for control of gorse (*Ulex europaeus*) in the U.S. (Oregon). Received in BCDC 1/4/90.

48.(90-2) Proposal for release of *Chaetorellia acrolophi* from Europe for control of diffuse and spotted knapweeds (*Centaurea diffusa* and *C. maculosa*) in Canada. Received in BCDC 2/12/90. (See 58.(90---) for U.S. release proposal.)

49.(90-3) Proposal for release of *Terellia virens* from Europe for control of diffuse and spotted knapweeds (*Centaurea diffusa* and *C. maculosa*) in Canada. Received in BCDC 2/1/90 and 2/12/90. (See 59.(91---) for U.S. release proposal.)

50.(90-4) Proposal for release of *Aphthona lacertosa* from Europe for control of leafy and cypress spurges (*Euphorbia esula-virgata* and *E. cyparissias*) in Canada. Received in BCDC 2/22/90.

51.(90-5) Proposal for release of *Psylliodes chalcomera* from Italy for control of musk thistle (*Carduus* spp.) in the United States. Received in BCDC 2/28/90. (See 90.(94-02) for repetition for release.)

52.(90-6) Proposal for release of *Larinus minutus* from Europe for control of diffuse and spotted knapweeds (*Centaurea diffusa* and *C. maculosa*) in Canada. Received in BCDC 3/5/90. (See 67.(90-06-S) for U.S. release proposal.)

53.(90-7) Proposal for restricted field testing of *Pseudomonas fluorescens* bivor 1 strains D7 & D7 rif from Washington State for control of downy brome (*Bromus tectorum*) in Washington, Oregon, Idaho, Colorado, and Kansas. Received in BCDC 3/14/90. (See 68.(90-07-S) for submittal of supplemental data.)

54.(90--) Proposed protocol for testing biocontrol agents for leafy and cypress spurges (*Euphorbia esula* and *E. cyparissias*) in Canada and the U.S. Received in BCDC 3/21/90.

55.(90--) Proposed importation of *Aphthona seriata* and *A. chinchichi* from China into quarantine in the U.S. (Montana) for study for biological control of leafy spurge *Euphorbia esula*). Received in BCDC 5/3/90 (from researcher) and 5/8/90 from TAG.

56.(90-08) Proposed test plant list for testing *Chrysolina gypsophilae* from Europe in U.S. quarantine (California) as potential biocontrol agent for Dalmatian toadflax (*Linaria dalmatica*). Received in BCDC 5/15/90.

57.(90-09) Resubmission of proposal 89-07 for release of *Namangana pectinicornis*, with responses to TAG comments on original petition. Received in BCDC 6/29/90.

58.(90--) Proposal for cage release of *Chaetorellia acrolophi* from Europe against spotted knapweed (*Centaurea maculosa*) in the U.S. (Montana). Received (from researcher) in BCDC 9/24/90. (See 48.(90-2) for proposal for release in Canada—approved by TAG.)

59.(91--) Proposal for field release of *Terellia virens* from Europe against spotted knapweed (*Centaurea maculosa*) in the U.S. (Montana). Received (from researcher) in BCDC 2/11/91. (See 49.(90-3) for proposal for release in Canada—approved by TAG.)

60.(91-01) Proposal for field test of 3 biochemically-produced mutants of *Pythium rostratum*, a pathogen originally from Europe, for control of diffuse and spotted knapweeds (*Centaurea diffusa* and *C. maculosa*) in the U.S. (Washington). Received in BCDC 3/1/91. (See 70.(91-01-S) for submittal of supplemental data.)

61.(91-02) Proposal for field release of *Hylobius transversovittatus, Galerucella calmariensis*, and *G. pusilla* from Europe against purple loosetrife (*Lythrum salicaria*) in the northern U.S. Received in BCDC 3/4/91. (See 33.(89-6) for proposal for quarantine importation of the 3 insects—approved by TAG; see 72.(91-02-S) for submittal of supplemental data.)

62.(91-03) Proposal for field release of *Eteobalea intermediella* from Yugoslavia against Dalmatian toadflax (*Linaria dalmatica*) in North America (western Canada and northwestern U.S.). Received in BCDC 2/14/91 (from researcher) and officially 4/8/91 (from TAG).

63.(91-04) Proposal for field release of *Eteobalea serratella* from Italy against yellow toadflax (*Linaria vulgaris*) in North America (western Canada and northwestern U.S.). Received in BCDC 2/14/91 (from researcher) and officially 4/8/91 (from TAG). (See 98.(95-01) for second petition for U.S. release.)

64.(91-05) Proposal for field release of *Mecinus janthinus* from Yugoslavia against Dalmatian and yellow toadflax (*Linaria dalmatica* and *L. vulgaris*) in North America (western Canada and northwestern U.S.). Received in BCDC 2/14/91 (from researcher) and officially 4/8/91 (from TAG). (See also 100.(95-03) for proposal for release in the U.S.)

65.(91-06) Proposal for field release of *Chamaesphecia hungarica* from Yugoslavia and Hungary against leafy spurge (*Euphorbia esula*) in western Canada and the U.S. (Montana). Received in BCDC 4/4/91.

66.(89-04-S) Supplemental data in support of proposal (TAG #89-04) for release of *Bangasternus fausti* from Europe against diffuse knapweed (*Centaurea diffusa*) in the U.S. (several northwestern states). Received in BCDC 4/18/91. (See 31.(89-4) for original release proposal.)

67.(90-06-S) Proposal for field release of *Larinus minutus* from Europe against spotted and diffuse knapweed (*Centaurea maculosa* and *C. diffusa*) in the U.S. (Montana and other northwestern states). Received in BCDC 5/14/91. (See 52.(90-6) for proposal for release in Canada—approved by TAG.)

68.(90-07-S) Supplemental data in support of proposal (TAG #90-07) for restricted field testing of strains of *Pseudomonas fluorescens* from Washington for control of downy brome (*Bromus tectorum*) in other states. Received in BCDC 5/7/91 (from researcher) and 5/20/91 from TAG. (See 53.(90-7) for original proposal.)

69.(91-07) Proposal for quarantine importation (Montana) and field release in the U.S. of *Aphthona abdominalis* for control of leafy spurge (*Euphorbia esula*). Received 6/25/91. (See 73.(91-07-S) for supplemental data.)

70.(91-01-S) Supplemental data in support of proposal (TAG #91-01) for restricted field testing of strains of *Pythium rostratum* from Europe for control of knapweeds (*Centaurea* spp.) in Washington. Received in BCDC 12/2/91 from TAG. (See 60.(91-01) for original proposal.)

71.(91-08) Petition for review of test plant list for biological control of saltcedar (*Tamarix*). Received in BCDC 12/5 and 12/10/91 (from researcher) and 12/20/91 from TAG. (See 43.(89-16).)

72.(91-02-S) Supplemental data in support of proposal for field release of *Hylobius transversovittatus, Galerucella calmariensis*, and *G. pusilla* from Europe against purple loosetrife (*Lythrum salicaria*) in the northern U.S. Received in BCDC 3/6/92 (from researcher) and 3/12/92 from TAG Exec. Secr. (See 61.(91-02) for original proposal.)

73.(91-07-S) Supplemental data in support of proposal for quarantine importation (Montana) and field release in United States of *Aphthona abdominalis* from Italy for control of leafy spurge (*Euphorbia esula*). Received in BCDC 1/28/92 (from researcher) and 4/2/92 from TAG Exec. Secr. (See 69.(91-07) for original proposal.)

74.(92-01) Petition for release of *Larinus curtus* from Greece against yellow starthistle in the United States (California, Idaho, Oregon, Washington, and Arizona). Received in BCDC 3/30/92 (from researcher) and 4/6/92 from TAG Exec. Secr. (See 10.(87-10) for petition for quarantine importation.)

75.(92-02) Petition for release of *Apion hookeri* for scentless chamomile in Canada. Received in BCDC from TAG Exec. Secr. 4/8/92. (See 88.(93-07) for petition for U.S. release.)

76.(92-03) Petition for importation into quarantine in Florida (Gainesville) of *Oxyops vitiosa* from Australia for testing for biological control of melaleuca (*Melaleuca quinquenervia*) in the United States. Received 4/14/92. (See 109.(95-06-2) for petition for release.)

77.(92-04) Petition for release of *Larinus obtusus* from Romania and Yugoslavia in the United States (Montana) for biological control of spotted knapweed. Received 5/14/92.

78.(92-05) Petition for release of Dalmatian toadflax strain of *Gymnetron antirrhini* from Europe in North America (Canada and Montana) for control of Dalmatian toadflax. Received 5/26/92. (See also 99.(95-02) below.)

79.(92-06) Petition for release of *Lobesia euphorbiana* from Europe or Canada (cleared by BCWWG for release in Canada) in the United States for biological control of leafy spurge (*Euphorbia esula*). Received in BCDC from TAG Exec. Secr. 12/17/92. (Drafts received from researcher earlier.)

80.(92-07) Petition for release of *Minoa murinata* from Europe or Canada in the United States for biological control of leafy spurge (*Euphorbia esula*). Received in BCDC from TAG Exec. Secr. 12/17/92. (Drafts received from researcher earlier.)

81.(92-08) Petition for release of *Pegomya curticornis* from Europe or Canada (cleared by BCWWG for release in Canada) in the United States for biological control of leafy spurge (*Euphorbia esula*). Received in BCDC from TAG Exec. Secr. 12/17/92. (Drafts received from researcher earlier.) See 23.(88-6) for earlier petition for release in U.S., and see 3.(87-3) for petition for release in Canada.

82.(93-03) Petition for release of *Ceutorhynchus edentulus* from eastern Europe in North America for biological control of scentless chamomile (*Matricaria perforata*). Received in BCDC from Acting TAG Exec. Secr. 3/8/93. (See 121.(96-15) for second release petition, as *Microplontus edentulus*.)

83.(93-01) Petition for release of *Chamaesphecia astatiformis* from eastern Europe in North America for biological control of leafy spurge (*Euphorbia esula*). Received in BCDC from Acting TAG Exec. Secr. 3/10/93.

84.(93-02) Petition for introduction into quarantine in Florida (Gainesville) of *Lophyrotoma zonalis* from Australia for testing for biological control of melaleuca (*Melaleuca quinquenervia*) in the United States. Received in BCDC from Acting TAG Exec. Secr. 3/10/93.

85.(93-04) Petition for introduction into quarantine in California (Albany) and field release in Northwestern U.S. of *Tetranychus lintearius* from New Zealand for biological control of gorse (*Ulex europaeus*) in North America. Received from Acting TAG Exec. Secr. 4/20/93.

86.(93-05) Petition for introduction into quarantine in Maryland (Annapolis) and field release in seven U. S. states of *Nanophyes marmoratus* and *N. brevis* from Europe for biological control of purple loosestrife (*Lythrum salicaria*) in the U.S. Received from Acting TAG Exec. Secr. 6/16/93.

87.(93-06) Petition for release in North America (Canada) of *Ceutorhynchus cruciger* from Central Europe for biological control of hound's-tongue (*Cynoglossum officinale*). Received in BCDC from Acting TAG Exec. Secr. 6/24/93. (See 112.(96-06) for Supplemental Information from researchers.)

88.(93-07) Petition for release in the United States (Montana) of *Apion hookeri* from Canada (Nova Scotia) for biological control of scentless chamomile (*Matricaria perforata*). Received in BCDC from Acting TAG Exec. Secr. 11/8/93. (See 75.(92-02) for petition for release in Canada.)

89.(94-01) Petition for release in the United States (proposed release location not specified; somewhere in the Great Plains?) of *Aphthona chinchihi* from China for biological control of leafy spurge (*Euphorbia esula*). Received in BCDC from Acting TAG Exec. Secr. 2/14/94.

90.(94-02) Petition for release in the United States (Montana, Nebraska, Oregon, Texas, and Maryland) of *Psylliodes chalcomera* from Italy for biological control of musk thistle (*Carduus* "*thoermeri*" (=*nutans*). Received in BCDC from Acting TAG Exec. Secr. 3/22/94. (See 51.(90-5) for earlier petition for release; see 114.([96-08;=93-06[S]) for receipt of supplementary information and petition for release.)

91.(94-03) Petition for review of test plant list for the new target weed sulfur cinqufoil (*Potentilla recta*). Received in BCDC from Acting TAG Exec. Secr. 3/25/94.

92.(94-04) Petition to release the indigenous pathogen *Pseudomonas syringae* var. *tagetis* from Minnesota for biological control of Canada thistle (*Cirsium arvense*) in Minnesota, South Dakota, Colorado, and Maryland. Received in BCDC from Acting TAG Exec. Secr. 3/25/94.

93.(94-05) Petition for importation of *Boreioglycaspis melaleucae* from Australia into quarantine in Florida (Gainesville) for study as biological control agent for melaleuca (*Melaleuca quinquenervia*). Received in BCDC from Acting TAG Exec. Secr. 4/11/94.

94.(94-06) Petition for release of *Diorhabda elongata* from China in Texas and Wyoming for the biological control of saltcedar (*Tamarix ramosissima*). Received in BCDC 4/12/94. (See 103.(94-06[S]) for submittal of supplemental information for this petition.)

95.(94-07) Petition for release of *Trabutina mannipara* from Israel in Texas and Arizona for the biological control of saltcedar (*Tamarix ramosissima*). Received in BCDC 4/12/94.

96.(94-08) Petition for release of *Chamaesphecia crassicornis* from Hungary in Canada for biological control of leafy spurge (*Euphorbia esula*). Received in BCDC 6/30/94. (See 37.(89-10) for petition for quarantine importation in Montana.)

97.(94-09) Petition for review of proposed test plant list for *Altica circicola* from China for study as biological control agent for Canada thistle (*Cirsium arvense*). Received in BCDC 6/30/94. (See 104.(95-06) for petition for release of this species/biotype, as *A. carduorum* China biotype.)

98.(95-01) Petition for release of *Eteobalea intermediella* and *E. serratella* from Yugoslavia and Italy in the United States (Montana) for biological control of Dalmatian and yellow toadflaxes (*Linaria dalmatica* and *L. vulgaris*). Received in BCDC 2/6/95. (See 63.(91-04) for earlier release petition.)

99.(95-02) Petition for release of Dalmatian toadflax-adapted strain of *Gymnetron antirrhini* from Yugoslavia in the United States (initially Montana) for biological control of Dalmatian toadflax (*Linaria dalmatica*). Received in BCDC 2/8/95. (See 78.(92-05) for earlier release petition.)

100.(95-03) Petition for release of *Mecinus janthinus* from Macedonia in the United States (Montana) for biological control of Dalmatian and yellow toadflaxes (*Linaria dalmatica* and *L. vulgaris*). Received in BCDC 2/8/95. (See 64.(91-05) for earlier release petition.)

101.(95-04) Petition for release of *Gymnetron linariae* from Upper Rhine Valley of Europe in Canada and the United States (location[s] not stated) for biological control of Dalmatian and yellow toadflaxes (*Linaria dalmatica* and *L. vulgaris*). Received in BCDC 2/8/95.

102.(95-05) Petition for importation of *Psectrosema* sp. from France into quarantine in Texas (Temple) for study as biological control agent of saltcedar (*Tamarix ramosissima*) in the United States. Received in BCDC 3/22/95.

103.(94-06[S]) Supplementary information for petition for release of *Diorhabda elongata* from China in Texas. Received in BCDC 3/22/95. (See 94.(94-06) for earlier release petition.)

104.(95-06) Petition for release of *Altica carduorum*, NW China biotype, for biological control of Canada thistle (*Cirsium arvense*) in "North America". Received in BCDC 6/1/95. (See #97 above for petition for review of test plant list for this species/biotype, as "*A. circicola*"; see 109.(95-06-2) and 115.(96-09;=95-06-3) for receipt of supplementary information regarding the release petition.)

105.(95-07) Petition for release of *Aphthona Venezuela* from Switzerland for biological control of leafy spurge (*Euphorbia esula*) in "North America". Received in BCDC 6/14/95.

106.(96-01) Petition for importation of *Eucerocoris suspectus* from Australia into quarantine in Florida (Gainesville) and/or California (Albany) for study as a biological control agent for melaleuca (*Melaleuca quinquevervia*) in the United States. Received in BCDC 1/26/96.

107.(96-02) Petition for review of test plant list for the new target weed common crupina (*Crupina vulgaris*). Received in BCDC from researcher 12/7/95, and from TAG Executive Secretary 3/8/96.

108.(96-03) Petition for review of test plant list for Russian thistle (*Salsola "kali"*). Received in BCDC from researcher 12/7/95, and from TAG Executive Secretary 3/8/96.

109.(95-06-2) Request for comments on supplementary information regarding petition for release of Chinese biotype of *Altica carduorum* in Canada (95-06). Received in BCDC 4/3/96. (See 104.(95-06) for original release petition, and 115.(96-09;=95-06-3) for second review of supplementary information.)

110.(96-04) Petition for release of *Oxyops vitiosa* from Australia for biological control of melaleuca in the United States (Florida). Received in BCDC 4/8/96. (See 76.(92-03) for petition for quarantine importation.)

111.(96-05) Request for comments on proposed test plant list for testing in Italy *Thamnurgus euphorbiae* from Italy as a natural enemy of leafy spurge. Received in BCDC 5/15/96.

112.(96-06) Petition for importation of *Pomponatius typicus* from Australia into quarantine in Florida (Gainesville) and/or California (Albany) for study as a biological control agent for melaleuca (*Melaleuca quinquevervia*) in the United States. Received in BCDC 6/4/96.

113.(96-07;=94-02[S]) Supplementary information regarding petition for release of *Psylliodes chalcomera* from Italy for release in the U.S. (MD, TX, MT, NE, OR). Received in BCDC documents from researcher 7/3, 7/10 and 7/22/96, and from TAG Exec. Secr. 8/1 and 8/20/96. (See 90.(94-02) and 51.(90-5) for earlier petitions.)

114.([96-08;=93-06[S]) Supplemental information regarding release of *Mogulones* (=*Ceutorhychus*) *cruciger* in Canada. Received in BCDC 7/17/96. (See 87.(93-06) for initial petition for release.)

115.(96-09;=95-06-3) Request for re-review of supplemental information (93-06-2) for release of *Altica carduorum* from China in Canada (matter was discussed at the TAG meeting, 7/25-26/96, at Billings, MT.). Received in BCDC 8/1/96. (See 104.(95-06) and 109.(95-06-2) for earlier release petition and supplementary information.)

116.(96-10) Request for comments on proposed test plant list for testing *Cecidophyes galii* in Canada as a natural enemy of bedstraws. Received in BCDC 9/13/96.

117.(96-11) Petition for release of *Heteroperryia hubrichi* from Brazil for biological control of Brazilian peppertree (*Schinus terebinthifolius*) in the United States (Florida). Received in BCDC 10/21/96.

118.(96-12) Petition for release of *Spurgia capitigena* from France for biological control of leafy spurge in the United States (Montana?). Received in BCDC 11/6/96.

119.(96-13) Request for comments on proposed test plant lists for testing *Tinthia myrmosaeformis* and *Anthonomus rubripes* ab. *femoratus* from Europe and/or Turkey as natural enemies of sulphur cinquefoil (*Potentilla recta*). Received in BCDC 11/20/96.

120.(96-14) Petition for release of *Pseudophilothrips ichini* from Brazil for biological control of Brazilian peppertree in the United States (Florida). Received in BCDC 10/21/96.

121.(96-15) Petition for the release of *Microplontus edentulus* from Austria and Hungary for biological control of scentless chamomile (*Matricaria perforata*) in North America (Canada). Received in BCDC 11/22/96. (See 82.(93-03) for previous release petition, as *Ceutorhynchus edentulus*.)

122.(97-01) Petition for field testing (release of *Pythium rostratum* (PR1), a biological control agent for diffuse knapweed *(Centaurea diffusa)*, spotted knapweed *(Centaurea maculosa)*, Russian knapweed *(C. repens)*, and yellow starthistle *(C. Solstitialis)* in reservation land of the Colville Confederated Tribes, northeastern Washington.

123.(97-02) Proposal to introduce *Longitarsus quadriguttatus* Pont. (Col.:Chrysomelidae) from Europe for the biological control of hound's tongue *(Cynoglossum officinale* L.) in North America.

124.(97-03) Host plant screening test list for natural enemies of Russian knapweed *(Acroptilon repens)*.

125.(97-04) Petition to introduce *Rhopalomyla* n.sp. (Diptera: Cecidomyiidae) from Switzerland as a biological control agent for scentless chamomile, *Matricaria perforata* Merat (Asteraceae) in Canada.

126.(98-01) Proposed host specificity test for screening potential biological control agents against *Solanum viarum*, tropical soda apple.

127.(98-02) Proposed release of the Brazilian leaf-beetle, *Metriona elatior* Klug from Brazil for the biological control of *Solanam viarum*, tropical soda apple.

128.(98-03) Proposed test plant list for *Puccinia thlaspeos* a potential biological control agent for dyer's-woad, *Isatis tinctoria*.

129.(98-04) Proposed release of the Australian sawfly, *Lophyrotoma zonalis* (Rohwer), from Australia for biological control *of Melaleuca quinquenervia* (melaleuca) in Florida.

130. (99-01) Proposed release of a weakly virulent fungus, *Mycothecium verrucaria*, collected in China, to control morning glories in sugarcane fields in Louisiana and morning glories, common and giant ragweeds, amaranths, and common lambsquarters in field plots in Maryland.

131. (99-02) Proposed field release of *Thamnurgus euphorbiae* Kuster (Coleoptera: Scolytidae) from Italy, a candidate for biological control of *Euphorbia esula* L. (Euphorbiaceae), Leafy Spurge, in the United States.

132. (99-03) Test plant list for host specificity testing of two exotic natural enemies of Mile-a-minute weed (*Polygonum perfoliatum*).

133. (99-04) Petition for release of the leaf-feeder beetle *Metriona elatior* Klug (Coleoptera: Chrysomelidae) for control of tropical soda apple, *Solanum viarum* Dunal (Solanaceae).

134. (00-01) Petition for interstate movement and release of the planthopper *Prokelisia marginata* (Homoptera: Delphacidae) in Washington for control of *Spartina alterniflora*.

135. (00-02) Petition for the introduction and field release of the chondrilla root moth, *Bradyrrhoa gilveolella* (Treitschke) for the biological control of rush skeletonweed in North America.

136. (00-03) Petition for the introduction and field release of the gall mite, *Aceria centaureae* (Nalepa) (Acari: Eriophyidae) for the biological control of diffuse and spotted knapweed in Montana.

137. (00-04) Petition for the field release of the Australian psyllid, *Boreioglycaspis melaleucae* (Moore) (Hemiptera: Psyllidae) for the biological control of the Australian melaleuca or paperbark tree (*Melaleuca quinquenervia* (Cav.) S.T. Blake.

138. (00-05) Petition for release of the tortoise beetle, *Gratiana boliviana* Spaeth (Coleoptera: Chrysomelidae), for the biological control of tropical soda apple (*Solanum viarum Dunal*) in the United States.

139. (00-06) Petition to release the weevil *Coniatus tamarisci* from France to control saltcedar, *Tamarix ramosissima*, a weed of riparian areas of the Western United States and Northern Mexico.

140. (00-07) Petition to release the Eurasian rust fungus *Puccinia jaceae* var. *solstitialis* L. to control yellow starthistle, *Centaurea solstitialis* L., in California. (See also *30.(89-3)*.)

141. (00-08) Petition to release the leaf beetle *Diorhabda elongata* ssp. *deserticola* to control saltcedar, *Tamarix* spp. in the Western United States.

142. (00-09) Petition to release *Cyrtobagous salviniae* Calder and Sands (Curculionidae: Coleoptera) to control *Salvinia molesta* D.S. Mitchell (Salviniaceae) in the United States.

143. (01-01) Petition for field release of the gall mite *Cecidophyes rouhollahi* Craemer Acari:Eriophyidae) from southern France for biological control of false cleavers, *Galium spurium* L. (Rubiaceae), in western Canada.

144. (01-02) Host specificity testing list for invasive hawkweeds (Hieracium spp.) in the United States and Canada.

145. (01-03) Petition to release *Cyrtobagous salviniae* Calder and Sands (Curculionida Coleoptera) to control *Salvinia molesta* D.S. Mitchell (Salviniaceae) in the United States.

146. (01-04) Proposed field release of the Salvinia weevil, *Cyrtobagous salvinia* Calder and Sands (Curculionidae: Coleoptera) to control *Salvinia molesta* D.S. Mitchell (Salviniaceae) in the United States.

147. (01-05) Proposed field release of *Gratiana boliviana* (Coleoptera: Chrysomelidae) to control tropical soda apple (*Solanum viarum*) in the United States.

148. (02-01) Non-target host plant list for host specificity testing of Russian thistle (*Salsola tragus* L.) (Chenopodiaceae).

149. (02-02) Proposed host range test plant list for *Colletotrichum gloeosporioides* from Russian thistle (*Salsola tragus* L.) (Chenopodiaceae).

K

TAG Reviewer's Manual

Appendix K

Weeds for Which Agents Have Been Released

Use this appendix to identify the weeds for which biological control agents have been released in the continental United States and Canada. **Table K-1-1** covers 1945 through 1993. **Table K-1-2** was compiled from various sources and documents releases from the 1920's through the present.

Table K-1-1 Weeds for Which Biological Control Agents Have Been Released in the Continental United States and Canada[1]

	United States		Canada		
Weed Species	**Year Released**	**Number Agents Released**	**Year Released**	**Number Agents Released**	**Degree Control**
St. Johnswort	1945-89	6	1951-79	9	S-C
Gorse	1953-94	2			
Tansy ragwort	1959-69	3	1963-90	5	S
Scotch broom	1960-64	2			
Puncturevine	1961	2	1986	2	S-C
Toadflax, common	1968	1	1962	1	
Toadflax, Dalmatian	1967-86	2	1962	1	
Thistle, Canada	1966-77	3	1968-78	5	
Alligatorweed	1964-71	3			S-C
Spurge, leafy	1964-93	9	1966-88	12	P
Thistle, musk	1969-90	3	1968	1	S-C
Thistle, plumeless	1969-74	2	1968-90	3	P-S
Starthistle, yellow	1969-94	5			
Sage, Mediterranean	1969-71	2			P-S
Thistle, milk	1969	1			
Spurge, cypress	1976	1	1970-90	9	
Knapweed, diffuse	1973-92	9	1970-86	8	
Knapweed, spotted	1973-93	11	1970-87	5	
Waterhyacinth	1972-77	3			S
Thistle, Italian	1973	1			
Thistle, slender-flower	1973-90	3			
Thistle, bull	1983	1	1973	1	
Thistle, Scotch	1973	1			
Halogeton	1975	1			
Skeleton weed	1975-77	3			S
Thistle, Russian	1973-77	2	1975-77	2	
Knapweed, Russian			1976-84	2	P
Thistle, sow			1979-87	3	
Waterlettuce	1987-90	2			S
Bindweed, field	1987-89	2	1989	1	
Hydrilla	1987-90	3			P?
Knapweed, squarrose	1988-90	3			
Snakeweed	1988-93	1			
Campion, bladder			1989	1	
34 Species Weeds	31 Species Weeds		18 Species Weeds		
	68 Species Nat. Enemies		50 Species Nat. Enemies		

1 From Julien (1992); P = partial control; S = substantial control; C = complete control.

Table K-1-2 Weeds for Which Exotic Biological Control Agents Have Been Released in the Continental United States and Canada[1]

Weed	First release in continental U.S.	First release in Canada	Agent Released
Alligatorweed (*Alternanthera philoxeroides* (Mart.) Grisebach)	1964 1967 1971		*Agasicles hygrophila* Selman & Vogt *Amynothrips andersoni* O'Neill *Vogtia malloi* Pastrana
Bindweed, Field (*Convolvulus arvensis* L.)	1989 1987	1989 1989	*Aceria malherbae Nuzacci (=convolvuli)* *Tyta luctuosa (Denis & Schiff.)*
Campion, bladder (*Silene vulgaris* (Moench) Garcke)		1989	*Cassida azurea* Fabricius
Gorse (*Ulex europaeus* L.)	1920s (accid.) 1953 1994		*Agonopterix nervosa* *Apion (Exapion) ulicis* (Forster) *Tetranychus lintearius* Dufour
Halogeton (*H. glomeratus (Steph. ex M. Bieb.)* C.A. Mey.)	1975		*Coleophora parthenica* Meyrick
Hydrilla (*Hydrilla verticillata* (L.f.) Royle)	1987 1991 1989 1987		*Bagous affinis* Hustache Bagous hydrillae *Hydrellia balciunasi* Bock *Hydrellia pakistanae* Deonier
Knapweed, diffuse (*Centaurea diffusa* Lam.)	1984 1990 1992 1988 1991 1993 1980 1984 1986 1980 1992 1973 1981 (migrated from Canada)	1983 1987 1991 1986 1982 1986 1976 1970 1972	*Agapeta zoegana* (L.) *Bangasternus fausti* (Reitter) *Chaetorellia acrolophi* White & Marq. *Cyphocleonus achates* Faber *Larinus minutus* Gyll. *Larinus obtusus* Gyll. *Metzneria paucipunctella* Zeller *Pelochrista medullana* (Staudinger) *Pterolonche inspersa* Staudinger *Sphenoptera jugoslavica* Obenberger *Terellia virens* *Urophora affinis* Frauenfeld *Urophora quadrifasciata* (Meigen)
Knapweed, Russian (*Acroptilon repens* (L.) DC.)	1984	1978	*Subanguina picridis* (Kirjanova)

Table K-1-2 Weeds for Which Exotic Biological Control Agents Have Been Released in the Continental United States and Canada[1] (continued)

Weed	First release in continental U.S.	First release in Canada	Agent Released
Knapweed, spotted (*Centaurea maculosa* Lam.)	1984 1990 1992 1988 1991 1993 1980 1984 1986 1980 1992 1973 1981	1982 1991 1987 1993 1973 1982 1986 1987 1991 1970 1972	*Agapeta zoegana* (L.) *Bangasternus fausti* (Reitter) *Chaetorellia acrolophi* White *Cyphocleonus achates* (Fahraeus) *Larinus minutus* Gyll. *Larinus obtusus* Gyll. *Metzneria metzneriella (=paucipunctella)* (Stainton) *Pelochrista medullana* (Staudinger) *Pterolonche inspersa* Staudinger *Sphenoptera jugoslavica* Obenberger *Terellia virens* (Loew) *Urophora affinis* (Frauenfeld) *Urophora quadrifasciata* (Meigen)
Knapweed, squarrose (*Centaurea virgata* spp. *squarrosa* (Boiss.) Gugler)	1996 1990 1995 1997 1986 1973 1981		*Agapeta zoegana* (L.) *Bangasternus fausti* (Reitter) *Cyphocleonus achates* (Fahraeus) *Larinus minutus* Gyll. *Pterolonche inspersa* Staudinger *Urophora affinis* (Frauenfeld) *Urophora quadrifasciata* (Meigen)
Loosestrife, purple (*Lythrum salicaria* L.)	1992 1992 1992 1994	1993 1993 1993	*Galerucella calmariensis* (L.) *Galerucella pusilla* Duftschmid *Hylobius transversovittatus* (Goeze) *Nanophyes marmoratus* Goeze
Melaleuca (*M. quinquenervia* (Cav.) S.T. Blake)	1997		*Oxyops vitiosa* Pascoe
Poison-hemlock (*Conicum maculatum* L.)	1973 (accid.)		*Agonopterix alstroemeriana* (Clerck)
Puncturevine (*Tribulus terrestris* L.)	1961 1961	1986	*Microlarinus lareynii* (Jacquelin du Val) *Microlarinus lypriformis* (Wollaston)
Purple loosestrife	(See Loosestrife, purple)		
Ragwort, tansy (*Senecio jacobaea* L.)	1966 1969 1969 1959	1968 1990 1971 1961 1971	*Botanophila (Pegohylemyia) seneciella* (Meade) *Cochylis atricapitana* (Stephens) *Longitarsus jacobaeae* (Waterhouse) *Tyria (Hypocrita) jacobaeae* (L.) *Longitarsus flavicornis* (Stephens)
Sage, Mediterranean (*Salvia aethiopis* L.)	1969 1971		*Phrydiuchus spilmani* Klarner *Phrydiuchus tau* Warner

Table K-1-2 Weeds for Which Exotic Biological Control Agents Have Been Released in the Continental United States and Canada[1] (continued)

Weed	First release in continental U.S.	First release in Canada	Agent Released
St. John's wort (*Hypericum perforatum* L.)	1950 1989 1945 1946 1950 1950	1955 1979 1967 1951 1951 1957 1955	*Agrilus hyperici* (Creutzer) *Aphis chloris* Koch *Aplocera (Anaitis) plagiata* (L.) *Chrysolina hyperici* (Forster) *Chrysolina quadrigemina* (Suffrian) *Chrysolina varians* (Schaller) *Zeuxidiplosis giardi* (Keiffer)
Salvinia, giant	2001		*Cyrtobagous salviniae*
Scentless- chamomile (*Matricaria* spp.)		1992	*Apion hookeri* Kirby
Scotch broom (*Cytissus scoparius* (L.) Link)	1920s (accid.) 1964 1960		*Agonopterix nervosa* *Apion fuscirostre* Fab. *Leucoptera spartifoliella* Hubner
Skeletonweed, rush (*Chondrilla juncea* L.)	1977 1975 1976	1993	*Aceria (Eriophyes) chondrillae* (Cane.) *Cystiphora schmidti* (Rubsaamen) *Puccinia chondrillina* Bubak & Syden.
Snakeweed (*Gutierrezia* spp.)	1988		*Heilipodus ventralis* Kuschel
Sowthistle, perennial (*Sonchus arvensis* L.)		1981 1987 1979	*Cystiphora sonchi* (Bremi) *Liriomyza sonchi* Hendel *Tephritis dilacerata* Loew
Spurge, Cypress (*Euphorbia cyparissias* L.)	1976	1982 1987 1982 1986 1970 1965 1987 1982 1990 1989 1990	*Aphthona cyparissiae* (Koch) *Aphthona czwalinai* Weise *Aphthona flava* Guill. *Aphthona nigriscutis* Foudras *Chamaesphecia empiformis* Esper *Hyles (Celerio) euphorbiae* (L.) *Lobesia euphorbiana* (Freyer) *Oberea erythrocephala* (Schrank) *Pegomya curticornis* (Stein) *Pegomya euphorbiae* (Kieffer) *Spurgia capitigena* (Bremi)

Table K-1-2 Weeds for Which Exotic Biological Control Agents Have Been Released in the Continental United States and Canada[1] (continued)

Weed	First release in continental U.S.	First release in Canada	Agent Released
Spurge, leafy (*Euphorbia esula* L.)	1993		*Aphthona abdominalis Duftschmid*
	1986	1982	*Aphthona cyparissiae (Koch)*
	1987	1985	*Aphthona czwalinae Weise*
	1985	1982	*Aphthona flava Guillebeau*
	1993	1990	*Aphthona lacertosa Rosh*
	1989	1986	*Aphthona nigriscutis Foudras*
		1987	*Bayeria (Spurgia) capitigena*
	1975	1970	*Chamaesphecia empiformis Esper*
	1995		*Chamaesphecia crassicornis Bertel*
	1993	1992	*Chamaesphecia hungarica (Tomola)*
	1975	1971	*Chamaesphecia tenthrediniformis (Schiffermuller)*
	1966	1965	*Hyles euphorbiae (L.)*
		1983	*Lobesia euphorbiana (Freyer)*
		1988	*Minoa murinata (Scopoli)*
	1982	1979	*Oberea erythrocephala Schrank*
		1988	*Pegomya curticornis (Stein)*
		1988	*Pegomya euphorbiae (Kieffer)*
	1985	1989	*Spurgia esulae Gagne*
Starthistle, purple (*Centaurea calcitrapa* L.)	1992		*Chaetorellia acrolophi* White & Marquardt
Starthistle, yellow (*Centaurea solstitialis* L.)	1985		*Bangasternus orientalis* (Capiomont)
	1988		*Chaetorellia australis* Hering
	1990		*Eustenopus villosus* (Boheman)
	1992		*Larinus curtus* Hochhut
	1981		*Urophora quadrifasciata* (Meigen)
	1984		*Urophora sirunaseva* (Hering)
Thistle, Bull (*Cirsium vulgare* (Savi)Ten)		1985	*Rhinocyllus conicus* Froelich
	1983	1973	*Urophora stylata* (Fab.)
Thistle, Canada (*Cirsium arvense* (L.) Scop.)	1966	1963	*Altica carduorum* (Guer.)
	1945 (accid.)	1927(accid.)	*Cassida rubiginosa*
	1972	1967	*Hadroplontus (Ceutorhynchus) litura*
	? (accid.)	1989	*Larinus planus* (Fab.)
		1982	*Lema cyanella* (L.)
	1969	1989	*Rhinocyllus conicus* (Froelich)
	1977	1974	*Urophora cardui* L.
Thistle, Italian (*Carduus pycnocephalus* L.)	1975		*Rhinocyllus conicus* (Froelich)
Thistle, milk (*Silybum marianum* (L.) Gaertn.)	1971		*Rhinocyllus conicus* (Froelich)

Table K-1-2 Weeds for Which Exotic Biological Control Agents Have Been Released in the Continental United States and Canada[1] (continued)

Weed	First release in continental U.S.	First release in Canada	Agent Released
Thistle, musk or nodding (*Carduus nutans* L.)	1945(accid. 1990 1997 1969 1975 1996	1927 (accid.) 1968 1975 1991	*Cassida rubiginosa* Muller *Cheilosia corydon* (Harris) *Psylliodes chalcomera* (Illiger) *Rhinocyllus conicus* Froel. *Trichosirocalus (Ceutorhynchidius) horridus* (Panzer) *Urophora solstitialis* (L.)
Thistle, plumeless or welted (*Carduus acanthoides* L.)	1969 1975	1968 1987 1990	*Rhinocyllus conicus* Froelich *Trichosirocalus (Ceutorhynchidius) horridus* (Panzer) *Urophora solstitialis* (L.)
Thistle, Russian (*Salsola australis* R. Br.)	1977 1973	1977 1975	*Coleophora klimeschiella Toll* *Coleophora parthenica* Meyr.
Thistle, Scotch (*Onopordum acanthium* L.)	1973		*Rhinocyllus conicus* (Froelich)
Thistle, slenderflower (*Carduus tenuiflorus* Curtis)	1990 1987 1973		*Cheilosia corydon* (Harris) *Puccinia carduorum* Jacky *Rhinocyllus conicus* (Froelich)
Toadflax, Dalmatian (*Linaria genistifolia* ssp. *dalmatica* (L.) Maire & Peititm.)	1919 (accid.) 1967 1996 1996 1986 1996 1996?	1995 1962 1991 1990 1991	*Brachypterolus pulicarius* (L.) *Calophasia lunula* (Hufnagel) *Eteobalia intermediella* Riedl. *Eteobalia serratella* Treitschke *Gymnetron antirrhini* (Paykull) *Gymnetron linariae* Germar *Mecinus janthinus* Germar
Toadflax, yellow (*Linaria vulgaris* Mill.)	1919 (accid.) 1968 1996 1996 1909 (accid.) 1996?	1991 1962 1992 1991 1991	*Brachypterolus pulicarius* (L.) *Calophasia lunula* (Hufnagel) *Eteobalia intermediella* Riedl. *Eteobalia serratella* Treitschke *Gymnetron antirrhini* (Paykull) *Mecinus janthinus* Germar
Waterhyacinth (*Eichhornia crassipes* (Mart.) Solms)	1974 1972 1977		*Neochetina bruchi* Hustache *Neochetina eichhorniae* Warner *Sameodes albiguttalis* Warren
Water lettuce (*Pistia stratioides* L.)	1990 1987		*Epipsammea pectinicornis* (Hampson) *Neohydronomus affinis* Hustache

1 Compiled from:

Batra, S.W.T. et al. 1981. Insects and Fungi Associated with Carduus Thistles (Compositae). USDA Tech. Bull. 1616.

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L

TAG Reviewer's Manual

Appendix L

Permit Application and Assessment Examples

Contents

Introduction

Use this appendix to locate examples of the following documents related to introducing biological control agents of weeds:

- PPQ Form 525, Application to Move Live Plant Pests or Noxious Weeds
- Environmental assessment
- Biological assessment

Environment Assessment (EA)

The environmental assessment (EA) should be a document approximately 15 pages long. The purpose of an EA is to present, in a concise manner, all of the potential benefits and possible negative impacts of the proposed release. Although scientific literature is consulted and cited in the EA, it is not a scientific document. Therefore, avoid the use of technical and scientific terms not easily understood by the average person, unless they are defined. Present all sides of the issue in a balanced way so that the reader of the EA can come to an informal decision.

Biological Assessment (BA)

The biological assessment (BA) is document required for compliance with Section 7 of the Endangered Species Act of 1973, as amended (ESA). The BA is usually submitted to the U.S. Fish and Wildlife Service (FWS), but under certain circumstances may be submitted to the National Marine Fisheries Service.

The BA should include the following elements:

- Description of the action to be considered
- Description of the specific area that may be affected by the action
- Description of any listed species or critical habitat that may be affected by the action
- Description of the manner in which the action may affect any listed species or critical habitat and an analysis of any cumulative effects
- Relevant reports, including any EIS or EA
- Other relevant available information on the action, the affected listed species, or the critical habitat

The term "Biological Assessment" in ESA terminology is required for formal Section 7 consultation only or when a Federal action is "likely to adversely affect threatened and endangered species or their critical habitats." For informal consultation a Biological Evaluation (BE) is probably a more appropriate term to use to be consistent with FWS terminology.

Although, APHIS **does not** make a distinction between the two terms (Biological Assessment and Biological Evaluation), and uses **only** the term "Biological Assessment" in either case, the documentation prepared for an informal consultation will vary significantly from those that would be prepared for formal consultation.

For most releases of weed biological control agents, the Section 7 consultation with FWS can be completed informally. In such case, the BA (really a BE) is submitted to FWS along with a request for concurrence with APHIS' determination that releases of the weed biocontrol agent are "not likely to adversely affect threatened or endangered species or their critical habitats. If FWS concurs with the APHIS finding, then the informal consultation is complete. If FWS **does not** concur with the APHIS finding, then formal Section 7 consultation is required.

PPQ Form 525, Application to Move Live Plant Pests or Noxious Weeds

No permit can be issued to move live plant pests or noxious weeds until an application is received (7 CFR 330 (live plant pests) or 7 CFR 360 (noxious weeds)).

See reverse side for additional OMB information.

FORM APPROVED
OMB NO. 0579-0054

U.S. DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
PLANT PROTECTION AND QUARANTINE
BIOLOGICAL ASSESSMENT AND TAXONOMIC SUPPORT
RIVERDALE, MARYLAND 20737

APPLICATION AND PERMIT TO MOVE LIVE PLANT PESTS OR NOXIOUS WEEDS

SECTION A - TO BE COMPLETED BY THE APPLICANT

1. NAME, TITLE, AND ADDRESS *(Include Zip Code)*

2. TELEPHONE NO. ( )

3. TYPE OF PEST TO BE MOVED

* ☐ Pathogens ☐ Arthropods ☐ Noxious Weeds

☐ Other (Specify):_____

This permit does not authorize the introduction, importation, interstate movement, or release into the environment of any genetically engineered organisms of products.

A. SCIENTIFIC NAMES OF PESTS TO BE MOVED	B. CLASSIFICATION *(Orders, Families, Races, or Strains)*	C. LIFE STAGES, IF APPLICABLE	D. NO. OF SPECIMENS OR UNITS	E. SHIPPED FROM *(Country or State)*	F. ARE PESTS ESTABLISHED IN U.S.	G. MAJOR HOST(S) OF THE PEST
4.						
5.						
6.						

7. WHAT HOST MATERIAL OR SUBSTITUTES WILL ACCOMPANY WHICH PESTS *(Indicate by line number)*

8. DESTINATION	9. PORT OF ARRIVAL	10. APPROXIMATE DATE OF ARRIVAL OR INTERSTATE MOVEMENT

11. NO. OF SHIPMENTS	12. SUPPLIER	13. METHOD OF SHIPMENT
		☐ Air Mail ☐ Air Freight ☐ Baggage ☐ Auto

14. INTENDED USE *(Be specific, attach outline of intended research)*

15. METHODS TO BE USED TO PREVENT PLANT PEST ESCAPE	16. METHOD OF FINAL DISPOSITION

17. *Applicant must be a resident of the U.S.A. I/We agree to comply with the safeguards printed on the reverse of this form, and understand that a permit may be subject to other conditions specified in Sections B and C.*

SIGNATURE OF APPLICANT *(Must be person named in Item 1)*

18. DATE

SECTION B - TO BE COMPLETED BY STATE OFFICIAL

19. RECOMMENDATION

☐ Concur (Approve) ☐ Comments (Disapprove)

☐ (Accept USDA Decision)

20. CONDITIONS RECOMMENDED

21. SIGNATURE AND TITLE	22. TITLE	23. STATE	24. DATE

SECTION C - TO BE COMPLETED BY FEDERAL OFFICIAL

PERMIT

25. PERMIT NO.

(Permit not valid unless signed by an authorized official of the Animal and Plant Health Inspection Service)

Under authority of the Federal Plant Pest Act of May 23, 1957 or the Federal Noxious Weed Act of 1974, permission is hereby granted to the applicant named above to move the pests described, except as deleted, subject to the conditions stated on, or attached to this application. (See standard conditions on reverse side).

*For exotic plant pathogens, attach a completed PPQ Form 526-1.

24. SIGNATURE OF PLANT PROTECTION AND QUARANTINE OFFICIAL	25. DATE	26. LABELS ISSUED	27. VALID UNTIL	28. PEST CATEGORY

PPQ FORM 526 *Previous edition may be used*
(SEPT 95)

FIGURE L-1-1 EXAMPLE OF PPQ FORM 526, APPLICATION TO MOVE LIVE PLANT PESTS OR NOXIOUS WEEDS

Example of an Environmental Assessment (EA)

Title:

Field Release of a Nonindigenous Sawfly, *Heteroperreyia hubrichi* (Hymenoptera: Pergidae), for Biological Control of Brazilian Peppertree, *Schinus terebinthifolius* (Anacardiaceae)

DRAFT

Environmental Assessment

Month/Year

FIGURE L-1-2 EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT (EA)

Proposed Action: The University of *[XXX]* proposes to release the non-indigenous sawfly, *Heteroperreyia hubrichi* (Hymenoptera: Pergidae) for the biological control of Brazilian peppertree, *Schinus terebinthifolius* (Anacardiaceae), under permit from the USDA, Animal and Plant Health Inspection Service.

Type of statement: Draft Environmental Assessment

For further information: Tracy A. Horner, Ph.D.

FIGURE L-1-2 EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT (EA) (CONTINUED)

Purpose and Need for the Proposed Action

1.1 The University of *[XXX]* proposes to release a nonindigenous sawfly, *Heteroperreyia hubrichi* Malaise (Hymenoptera: Pergidae), in central and southern Florida for the biological control of Brazilian peppertree, *Schinus terebinthifolius* Raddi (Anacardiaceae) under permit from the USDA, Animal and Plant Health Inspection Service. Describe the insect/pathogen and how it will affect the target weed.

Indicate how the insect was identified, who identified it and where voucher specimens are held.

The objectives of the proposed action are... Describe the purpose of release, negative characteristics of plant on humans, habitats, animals, etc.

1.2 APHIS must decide:

1.2.1 To deny the permit application (no action)
1.2.2 To issue the permit as submitted
1.2.3 To issue the permit with management constraints or mitigation measures

1.3 Issues arising from the field release of *[XXX]* are:

1.3.1 Will *[biocontrol agent]* attack non-target plants within and outside of the area infested with *[target weed]*?

1.3.2 Will *[biocontrol agent]* affect a Federally-listed threatened or endangered species or other species of special concern?

1.4 The pending application for release of this biocontrol agent into the environment was submitted by the University of *[XXX]* in accordance with the provisions of the Plant Protection Act of 2000 (7 USC 7701 *et seq.*). This environmental assessment (EA) was prepared by APHIS in compliance with the National Environmental Policy Act (NEPA) (42 USC 4321 *et seq.*) as prescribed in implementing regulations adopted by the Council on Environmental Quality (40 CFR 1500-1509), by USDA (7 CFR 1b), and by APHIS (7 CFR 372).

Alternatives Including the Proposed Action

2.1 This chapter will explain the alternatives available for the control of *[target weed]*, including no action, and summarize the potential environmental consequences of the alternatives.

FIGURE L-1-2 EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT (EA) (CONTINUED)

2.2 Description of the alternatives.

2.2.1 Alternative 1. No Action. Under this alternative, APHIS would not issue a permit to the University of *[XXX]* for the field release of *[biocontrol agent]* for the control of *[target weed]* in *[location of release]*. The release of this biocontrol agent would not take place.

2.2.2 Alternative 2. Issue the Permit *(Preferred Alternative)*. Under this alternative, APHIS would issue a permit to the University of *[XXX]* for the field release of *[biocontrol agent]* for the control of *[target weed]* in *[location of release].* This permit would contain no special provisions or requirements concerning release procedures, post release monitoring, or mitigating measures.

2.2.3 Alternative 3. Issue the Permit with Specific Management Constraints and Mitigating Measures. Under this alternative, APHIS would issue a permit to the University of *[XXX]* for the field release of *[biocontrol agent]* for the control of *[target weed]* in *[location of release]*. However, the permit would contain special provisions or requirements concerning release procedures, post release monitoring, or mitigating measures.

2.3 The following alternatives were considered but are not being evaluated except as consequences of the "No Action" alternative. The following alternatives are not alternatives for decisions to be made by APHIS, but are presently being used to control *[target weed]* by public and private concerns in *[location of release].*

Describe current chemical, mechanical, cultural, biological, etc., practices that are currently conducted to control the target weed in the area of release in the format below.

2.3.1 Chemical Control. Describe all chemical controls used in area of release. The continued use of chemical controls would be a result of APHIS choosing the "No Action" alternative.

2.3.2 Mechanical Control. Describe all mechanical controls used in area of release. The continued use of mechanical controls would be a result of APHIS choosing the "No Action" alternative.

2.3.3 Cultural Control. Describe all cultural controls used to control target weed in area of release. The continued use of cultural controls would be a result of APHIS choosing the "No Action" alternative.

FIGURE L-1-2 EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT (EA) (CONTINUED)

2.4 Summary of Consequences

Table 1: Example of a Summary of Consequences Table

Consequences	No Action	Issue Permit	Issue Permit with Conditions
Effects on non-target organisms	Use of non-selective herbicides would cause harm to native plants and cause water quality to be threatened	None expected	None expected
Effects on threatened and endangered species	Would expose T & E species to the effects of herbicides and disturbance of critical habitat from mechanical controls	None expected	None expected

Affected Environment

3.1 Describe the affected environment. Include a general description of the environment in which the target weed exists. Include water, non-target plants, animals, and human populations within the area. native species after storms open up the canopy.

3.1.1 List the native and introduced plants for which tests were conducted on host preference and which occur inside and outside of the infested area. Summarize host specificity data here in word form but also include a summary table if possible. Do not make a table of your raw data or other non-summarized data. Interpretation of your data is important in this section.

3.1.2 Describe the presence of Federally-listed threatened and endangered plant, animal, etc. species present in the infested area and those which may be affected if the biocontrol agent were to spread beyond the present target weed infested area.

3.1.3 Describe any minority and low-income populations that may be affected by the proposed release of the biological control agent or if there are children present in the infested area. If none, say so. Example: No minority, low income populations, or children should be negatively impacted due to the proposed action. Potential reductions in herbicide usage to control *[target weed]* may even be beneficial to human populations.

Environmental Consequences

4.1 This chapter will analyze the potential environmental consequences of each alternative on the resources described in Chapter 3.

4.2 Effects of Alternative 1. No Action.

FIGURE L-1-2 EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT (EA) (CONTINUED)

4.2.1 Effects on Non-Target Organisms. This section would describe the effects of chemical, mechanical, etc. controls listed previously on non-target organisms. Include both direct and indirect effects and cumulative impacts. Include a discussion of any incomplete or unavailable information.

4.2.2 Effects on Threatened and Endangered Species. This section would describe the effects of chemical, mechanical, etc. controls listed previously on threatened and endangered species. Include both direct and indirect effects and cumulative impacts. Include a discussion of any incomplete or unavailable information.

4.3 Effects of Alternative 2. Issue Permit.

4.3.1 Effects on Non-Target Organisms. This section would describe the effects on non-target organisms if the permit were issued. Include both direct and indirect effects and cumulative impacts. Include a discussion of any incomplete or unavailable information. Host specificity data from the literature and other studies may be included here.

4.3.2 Effects on Threatened and Endangered Species. This section would describe the effects on T&E organisms if the permit were issued. Include both direct and indirect effects and cumulative impacts. Include a discussion of any incomplete or unavailable information. Host specificity data from the literature and other studies may be included here.

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

4.4.1 Effects on Non-Target Organisms. This section would describe the effects on non-target organisms if the permit were issued with specific constraints or mitigating measures. Include both direct and indirect effects and cumulative impacts. Include a discussion of any incomplete or unavailable information. If there are no proposed measures, say so. Example: No specific management constraints or mitigating measures have been recommended for this species. Therefore, under this alternative, impacts on non-target organisms would be identical to those described in 4.3.1.

4.4.2 Effects on Threatened and Endangered Species. This section would describe the effects on T&E species if the permit were issued with specific constraints or mitigating measures. Include both direct and indirect effects and cumulative impacts. Include a discussion of any incomplete or unavailable information. If there are no proposed measures, say so. No specific management constraints or mitigating measures have been recommended for this species. Therefore, under this alternative, impacts on threatened and endangered organisms would be identical to those described in 4.3.2.

FIGURE L-1-2 EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT (EA) (CONTINUED)

4.5 Discuss any disproportionate effects to low income or minority populations or undue risks for children. If there are none, say so. Example: No disproportionate effects are expected to impact low income or minority populations or pose undue risks for children.

4.6 Describe unavoidable effects of the proposed action including unsuccessful control of the target pest. Example: An unavoidable effect of the proposed action would be the unsuccessful control of the target pest. The success rate of biological control of weeds is approximately 30%. Should the proposed action be unsuccessful, the present chemical and mechanical control activities would continue. [*Target weed]* would continue to expand into areas presently uninfected.

4.7 Describe irreversible or irretrievable commitment of resources. Irreversible commitments are those that cannot be reversed and irretrievable commitments are those that are lost for a period of time. Example: once a biological control agent such as *[biocontrol agent]* is released into the environment and it become established, it could move from the target plant to non-target plants and itself becomes a pest. If a host shift does take place, the resulting effects could result in environmental impacts that may not be easily reversed. Biological control agents such as *[biocontrol agent]* generally spread even without the agency of man. In principle, therefore, release of these insects at even one site must be considered equivalent to release over the entire area in which potential host plants occur and in which the climate is suitable for reproduction and survival.

Agencies and Persons Consulted

List preparers and affiliations of the applicant, anyone consulted for information or for review of the environmental assessment.

References Cited

List of references cited in the environmental assessment.

Appendices

Appendix 1. Application for a permit to release *[biocontrol agent]* in the United States.

Appendix 2. Determination by U. S. Fish and Wildlife Service that *[biocontrol agent]* poses no risk to threatened and endangered species. (Letter of concurrence)

Other appendices may be appropriate if necessary.

FIGURE L-1-2 EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT (EA) (CONTINUED)

Example of a Biological Assessment (BA)

Biological Assessment for the Field Release of the Leaf Beetle *Gratiana boliviana* (Coleoptera: Chrysomelidae) for the biocontrol of tropical soda apple *Solanum viarum* (Solanaceae)

Agency Contact:

Dr. Tracy Horner, Entomologist
USDA-APHIS-PPQ
4700 River Road, Unit 133
Riverdale, MD 20737

FIGURE L-1-3 EXAMPLE OF A BIOLOGICAL ASSESSMENT (BA)

SPECIES ACCOUNTS	Page
Solanum drymophilum	3
Solanum incompletum	4
Solanum nelsonii	4
Solanum sandwicense	5
Program Assessment	6

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FIGURE L-1-3 EXAMPLE OF A BIOLOGICAL ASSESSMENT (BA) (CONTINUED)

Solanum drymophilum

FAMILY: Solanaceae

STATUS: Endangered, *Federal Register*, August 26, 1988

DESCRIPTION: Erubia is a spiny, evergreen shrub which can potentially grow to 18 feet in height. Sometimes this shrub grows from a single stem, but often it branches from the base. Sharp, stiff, yellow spines almost one-half-inch long, are located along the mid-vein of the leaves and sometimes along the twigs. Mature shrubs have minute, whitish, star-shaped hairs on their leaves and petioles. These hairs are longer on younger shrubs and they appear on the twigs, and flowers of these younger individuals. The leaves of this shrub are alternate and lanceolate to lanceolate-oblong shaped. Its white, bisexual flowers are five-lobed and fan-shaped. The fruits are round, shiny, black berries. This shrub seems to flower and produce fruit throughout the year. Whether or not it reaches a flowering peak during a certain season is unknown, but its seed production appears to be abundant.

RANGE AND POPULATION LEVEL: Only 100 to 150 plants still exist on a single, 2-acre site in the Sierra de Cayey in central Puerto Rico. This site, known as the Tetas de Cayey, is privately owned. Historically, the species may have been scattered throughout the southeastern section of the central mountains (Sierra de Cayey and Sierra de Naguabo). Although the historic range of the species is unknown, this shrub may have been locally common in sections of eastern Puerto Rico and in the western mountains. In the 1960's, one population was found in the Lares area but this population is now considered extirpated.

HABITAT: The Tetas de Cayey is a mosaic of pastures, native evergreen forest remnants, coffee plantations, and cleared homesites. Situated at an elevation of 2,760 feet, this area is composed of volcanic outcrops. Although Erubia is native to evergreen forests on volcanic soils from 1,000 to 3,000 feet, most of the shrub's remaining population is in a pasture on the area's southern hill. This pasture is surrounded by lots which are undergoing residential and commercial development. Another endangered species, the plant Banara vanderbiltii, also is found in the Tetas de Cayey.

REASONS FOR CURRENT STATUS: Although Erubia is known for its ability to recolonize moderately disturbed sites, the severe deforestation and clearing of its only habitat area have contributed to the shrub's precarious status. Four populations once existed in the Tetas de Cayey; however, because of deforestation, grazing, coffee and charcoal production, and residential and commercial construction, only one population still survives. This population, confined within a 2-acre area, is located in habitat which is likely to continue to undergo development. In addition, because of the sharp spines of immature shrubs, most farmers have regarded the species as a threat to their grazing livestock, and have uprooted it whenever possible.

REFERENCES: Department of the Interior. U.S. Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants: Determination of Endangered Status for Solanum drymophilium. *Federal Register*, Vol. 53, No. 166, August 26, 1988. Pp. 32827-32830.

U.S. Fish and Wildlife Service, Division of Endangered Species. Species Accounts. http://endangered.fws.gov/i/q/saq50.html.

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FIGURE L-1-3 EXAMPLE OF A BIOLOGICAL ASSESSMENT (BA) (CONTINUED)

Solanum incompletum

FAMILY: Solanaceae

STATUS: Endangered, *Federal Register*, November 10, 1994

DESCRIPTION: *S. incompletum* is a woody shrub up to 3 m tall. Its stems and lower leaf surfaces are covered with prominent red prickles or sometimes with yellow fuzzy hairs on young plant parts and lower leaf surfaces. The leaves are oval to elliptical, have prominent veins on the lower surface and are on stalks 7 cm long. Numerous flowers with white petals grow in loose branching clusters. Fruits are round berries about 1.5 cm in diameter that mature from yellow-orange to black.

RANGE AND POPULATION LEVEL: Historically, *S. incompletum* was known from central and northeastern Lanai and scattered locations on Maui, Kauai and Molokai. On the island of Hawaii, *S. incompletum* was known from the Kohala Mountains, Kona, Puu Waawaa, Puu Ikaaka Crater and Omaokoili. The single remaining population consists of two individuals at an approximate elevation of 2,040 m on the island of Hawaii.

HABITAT: *S. incompletum* occurs in dry mesic forest, diverse mesic forest and subalpine forest at elevations from 200 to 2,040 m.

REASONS FOR CURRENT STATUS: The primary threats to the last remaining individuals are stochastic extinction and reduced reproductive vigor due to the extremely small number of existing plants, and competition with the alien plant, German ivy.

REFERENCES: Department of the Interior. U.S. Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants: Endangered Status for 12 Plants From the Hawaiian Islands. *Federal Register*, Vol. 59, No. 217, November 10, 1994. Pp. 56333-565351.

Solanum nelsonii

FAMILY: Solanaceae

STATUS: Candidate for listing

RANGE AND POPULATION LEVEL: This species is known from 8 populations totaling fewer than 300 individuals. It is found on the islands of Hawaii, Molokai, Niihau, Nihoa, and Pearl and Hermes. In the past this species was also found on the islands of Maui, Oahu, Kauai, Midway and Laysan, but is probably extinct from these locations dues primarily to coastal development and the introduction of alien plant species.

HABITAT: Typical habitat is coral rubble or sand in coastal sites.

FIGURE L-1-3 EXAMPLE OF A BIOLOGICAL ASSESSMENT (BA) (CONTINUED)

REASONS FOR CURRENT STATUS: Coastal development, recreational impacts such as trampling by tourists and off-road vehicles and sand mining are threats to the survival of this species.

REFERENCES: Department of the Interior. U.S. Fish and Wildlife Service. Candidate and Listing Priority Assignment Form

Solanum sandwicense

FAMILY: Solanaceae

STATUS: Endangered, Federal Register, February 25, 1994. 59 FR 09304

DESCRIPTION: *S. sandwicense* is a large, sprawling shrub that grows up to 4 m tall. The younger branches are more densely hairy than older branches. The oval leaves are usually 10-15 cm long and 5-14 cm wide and have up to four lobes along the margins. On the flowering stem, a few to as many as 40 flowers are grouped in threes with each flower on a stalk bent at the end so that the flower faces downward. The fruit is a berry, 13-15 cm in diameter, black when ripe

RANGE AND POPULATION LEVEL: Historically, *S. sandwicense* was known from widely scattered populations throughout the Waianae Mountains and southern portions of the Koolau Mountains on Oahu. On Kauai, this species was known from locations in the Kokee region bounded by Kalalau Valley to the north, Milolii Ridge to the west, and Kawaikoi to the east, extending southward to the Hanapepe River. Currently, on Oahu there is a single population and on Kauai there are only four extant populations, totaling about 20 plants.

HABITAT: This species is typically found in open, sunny areas at elevations between 760 and 1,220 m in diverse lowland to montane mesic forests and occasionally in wet forests.

REASONS FOR CURRENT STATUS: The major threats to populations of *S. sandwicense* are habitat degradation by feral pigs and competition with alien plant taxa such as banana poka, prickly Florida blackberry, strawberry guava, kahili ginger and Japanese honeysuckle. This species is also threatened by fire, over-collecting for scientific purposes, stochastic extinction and/or reduced reproductive vigor due to the small number of existing individuals.

REFERENCES: Department of the Interior. U.S. Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants: Determination of Endangered or Threatened Status for 24 Plants From the Island of Kauai, HI. Federal Register, Vol. 59, No. 38, February 25, 1994. Pp. 9304-9329. 5

FIGURE L-1-3 EXAMPLE OF A BIOLOGICAL ASSESSMENT (BA) (CONTINUED)

PROGRAM ASSESSMENT

Host specificity testing: From host specificity testing conducted, the researchers determined that *Gratiana boliviana* has a narrow host range restricted to the genus *Solanum* subgenus *Leptostemonum*, and mainly, section Acanthophora. Although all of the listed endangered or candidate plant species in the genus *Solanum* belong to the subgenus *Leptostemonum*, none belong to section Acanthophora.

Geographical isolation: No listed threatened, endangered or candidate Solanaceous plants occur in the mainland United States. *Solanum incompletum, S. nelsonii* and *S. sandwicense* occur only in Hawaii. *Solanum drymophilum* occurs only in Puerto Rico. This insect will only be permitted for release as a biological control agent in the mainland United States. Accidental introduction of this insect into Puerto Rico or Hawaii is unlikely.

Based on the host specificity of the insect and the geographical isolation of the plant species of concern, we have made a determination that the release of this organism is not likely to affect any listed threatened, endangered or candidate species.

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FIGURE L-1-3 EXAMPLE OF A BIOLOGICAL ASSESSMENT (BA) (CONTINUED)

M

TAG Reviewer's Manual

Appendix M

Manual Maintenance

Contents

Introduction

This appendix is a description of how APHIS-PPQ will support this manual. Directions for you to follow in maintaining the integrity of the *Reviewer's Manual for the Technical Advisory Group for Biological Control Agents of Weeds* (TAG Reviewer's Manual) are included in this appendix.

Issuing Revisions

APHIS-PPQ will revise the TAG Reviewer's Manual by distributing immediate updates received from the TAG Executive Secretary. We will schedule new editions at fixed intervals—at least every 5 years. If more than 50 percent of a section changes, we will issue a new section. We will **not** issue an update solely to correct a minor typographical error. Errors will be corrected only when they would lead to an incorrect action.

Keeping Manuals Current

There are three ways to track revisions to this manual—the Update Record, transmittal memos, and control data.

The *Update Record* is on the back of the title page. Use it to record all the transmittals you receive. If you miss a transmittal, the *Update Record* alerts you.

APHIS-PPQ will mail all revisions with a transmittal memo. The memos are numbered consecutively—allowing you to know if you have missed a transmittal. Filing these memos to assure that you have received all the previous issuances is best. File transmittals immediately upon receipt.

Besides having numbered transmittals, each page in the manual has control data. This is positioned at the bottom of the page. Control data on revised pages alerts you to whether you have the most up-to-date version. The control data looks like this:

PPQ
02/2003-02

FIGURE M-1-1 Example of TAG Manual Control Data

02/2003 is the month and year the page was issued. -02 is the transmittal number. The first transmittal issued for the document is always -01. Subsequent transmittal updates are consecutively numbered (-02).

Knowing What Is Revised

The transmittal will explain the revision's purpose and give you directions for making the revision. Except changes to the index, all revisions are marked with a change bar (as located in the left margin). If no other changes occur, changes in pagination (material moved from one page the next page) will **not** be marked.

Knowing Your Responsibility

To enhance professionalism, keep your TAG Reviewer's Manual current. Therefore, please do the following:

1. Read the revisions when you receive them.
2. Record your transmittal in the *Update Record*.
3. Add or replace the revised pages the day you receive them.
4. If a practice exercise is included, complete it.
5. File transmittal memos in your manual.
6. If you miss a transmittal, order another one.
7. Let the TAG Executive Secretary know when APHIS-PPQ has made an error.
8. Give the TAG Executive Secretary your suggestions for improvements.

Ordering Manuals

The TAG Executive Secretary, in partnership with PPQ's Manuals Unit, is responsible for maintaining and distributing the TAG Reviewer's Manual.

The address of the TAG Executive Secretary is as follows:

USDA, APHIS, PPQ
4700 River Road, Unit 133
Riverdale, MD 20737-1236
FAX: 301-734-4300
E-mail: polly.p.lehtonen@aphis.usda.gov

The address of the PPQ's Manual Unit is as follows:

USDA, APHIS, PPQ
69 Thomas Johnson Drive, Suite 100
Frederick, MD 21702
Attn: Bruce Attavian
FAX: 301-663-3240
E-mail: bruce.n.attavian.@aphis.usda.gov

Use E-mail, FAX, telephone, or mail when requesting services and always provide the following:

Organization
P.O. Box or Street Address, include Room or Suite Number
City, State, and nine-digit Zip Code
Contact Person
Telephone Number
FAX Number

When ordering the TAG Manual and related updates (transmittals), provide the following additional information:

- List the title: *Reviewer's Manual for the Technical Advisory Group for the Biological Control of Weeds* (TAG Reviewer's Manual)
- Indicate either the initial distribution or a transmittal number
- List the number of copies you need

Adding and Changing Addresses and Copy Counts

When adding and changing addresses and copy counts for distribution, provide the following additional information.

- List the title: *Reviewer's Manual for the Technical Advisory Group for the Biological Control of Weeds* (TAG Reviewer's Manual)
- List the number of copies you need to get
- List the new, corrected, or deleted address

Correcting Errors and Suggesting Improvements

If you detect an error, report it by using a *Comment Sheet* on page CS-1-1 that is included with this manual. Or, if it is easier, call, send an E-mail message, or FAX Bruce Attavian or anyone else in PPQ's Manuals Unit.

Do the same if you want to suggest an improvement or question a procedural change. If your improvement is substantive, you might want to submit a formal suggestion to the TAG Executive Secretary.

TAG Reviewer's Manual

Comment Sheet

Use this sheet to suggest an improvement or to identify a problem in the content of the TAG Reviewer's Manual. Send it to The TAG Executive Secretary (See *Appendix M* for addresses and fax numbers.)

Description of Problem

(error, inconsistency, missing, or insufficient information, etc.):

Description of Improvements

(or recommended change; add attachments if necessary):

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