



Animal and Plant Health Inspection Service  
U.S. DEPARTMENT OF AGRICULTURE

# Technical Advisory Group for Biological Control Agents of Weeds Manual

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# Contents

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Figures.....	iv
Tables .....	v
Introduction.....	1-1
Technical Advisory Group Introduction .....	2-1
Technical Advisory Group Charter .....	3-1
Agencies and Organizations’ Perspectives .....	4-1
TAG-BCAW Chair’s Perspective.....	5-1
TAG-BCAW Flow Chart for Petitions for Field Release and Test Plant Lists .....	6-1
APHIS Permitting Process.....	7-1
Biological Control of Weeds.....	8-1
Identification and Characterization of Agent.....	9-1
Host Specificity Testing of Arthropods.....	10-1
Host Specificity Testing of Pathogens .....	11-1
Petitions for Field Release Format.....	12-1
Petitions for Field Release Evaluation.....	13-1
Test Plant List Format.....	14-1
Test Plant List Evaluation .....	15-1
ESA Compliance - Section 7 Consultations.....	16-1
Biological Assessments and Effects Determination .....	17-1
TAG-BCAW Membership Directory .....	A-1
Forms .....	B-1
NAPPO Standard .....	C-1
Fish and Wildlife Service Offices Directory.....	D-1
Plant Classification System.....	E-1
References.....	F-1
Glossary .....	vi

# Figures

---

Figure B-1 Technical Advisory Group (TAG-BCAW) Reviewer’s Comment Sheet - Petition for Field Release of Biological Control Agents of Weeds (front) .....	B-2
Figure B-2 Technical Advisory Group (TAG-BCAW) Reviewer’s Comment Sheet - Petition for Field Release of Biological Control Agents of Weeds (back) .....	B-3
Figure B-3 TAG-BCAW Reviewer’s Comment Sheet for Test Host Plant Lists for Proposed Biological Control Agents of Weeds (front) .....	B-5
Figure B-4 TAG-BCAW Reviewer’s Comment Sheet for Test Host Plant Lists for Proposed Biological Control Agents of Weeds (back) .....	B-6
Figure B-5 Example of PPQ Form 599, Import Label for Living Regulated Organisms (red and white shipping label) (adhesive label issued before September 9, 2014, but valid until expiration date on permit).....	B-8
Figure B-6 PPQ Form 599, Import Label for Living Regulated Organisms (red and white label) Mailing or Shipping (new plain paper (nongummed) or special adhesive (gummed) label issued starting September 9, 2014) .....	B-8

# Tables

---

Table 9-1 National Collections for Specimens .....	9-6
Table 13-1 Where to Find More Information About Target Weeds .....	13-3
Table 13-2 Locating Biological Control Agent Information.....	13-4
Table 17-1 Effects Analysis and Agency Determination .....	17-5
Table 17-2 Conservation Measures for Species Identified in Table 17-1 .....	17-6
Table A-1 TAG-BCAW Membership Directory .....	A-1

# Introduction

---

## Contents

Purpose.....	1-1
Users .....	1-2
Related Documents .....	1-2
Authority .....	1-2
Application.....	1-3
Advisories .....	1-3
<i>TAG-BCAW Manual</i> Contacts.....	1-4
Information Services and Manuals Unit (ISMU) .....	1-4
TAG-BCAW Executive Secretary .....	1-4

---

## Purpose

The Introduction chapter of the *Technical Advisory Group for Biological Control Agents of Weeds Manual (TAG-BCAW Manual)* provides guidance for the technical advisory group and the scientific community, including petitioners and TAG-BCAW reviewers.

The TAG-BCAW Manual serves the following functions:

- Information guide for other users
- Reference guide for preparing petitions
- Reference guide for preparing test plant lists
- Reference guide for reviewing and evaluating petitions for field release of biological control agents of weeds in the United States
- Reference guide for reviewing and evaluating test plant lists
- Training tool for orienting TAG-BCAW members

The TAG-BCAW Manual is written specifically for researchers preparing and submitting petitions or test plant lists associated with the proposed release of biological control agents of weeds, and for TAG-BCAW members responsible for reviewing and evaluating submitted petitions and test plant lists.

The manual **does not** cover the following:

- Approval for permits
- Approval for petitions
- Final decisions on the release of biological control agents of weeds

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## Users

The *Technical Advisory Group for Biological Control Agents of Weeds Manual* is written for use by TAG-BCAW members and by petitioners. Parts of this manual may be referenced by others, such as experts within the Federal agencies represented on TAG-BCAW, researchers, external reviewers, university experts, foreign nationals who are involved in evaluating biological control agents, and members of international organizations, such as the North American Plant Protection Organization (NAPPO). The experience level of *TAG-BCAW Manual* users will vary, but TAG-BCAW members should fully understand and communicate their Agency's or organization's current perspective on biological control activities.

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## Related Documents

### Authority

Enabling legislation provides the authority to carry out the mission of protecting American agriculture from plant pests. Legislative Acts are the fundamental authority granted by Congress to the Secretary of Agriculture to promulgate regulations to protect American agriculture. The regulatory authority for taking the actions listed in this manual is contained in the Plant Protection Act (PPA). The PPA provides the authority to prohibit or restrict imports, exports, or interstate movement of biological control agents, plant pests, plant products, plants, noxious weeds, and means of conveyance.

The regulatory authority for taking the actions listed in the manual are contained in the following:

- Endangered Species Act (ESA) (16 U.S.C. 1531 et. seq.)
- National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.)
- Plant Protection Act of 2000 (PPA) (7 U.S.C 7701 et. seq.)
- Coastal Zone Management Act (16 U.S.C. 1451 et. seq.)
- Executive Order 13112 (64 CFR 6184) for Invasive Species

### Plant Protection Act of 2000

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.”

### Cooperating Organizations

The following are cooperating agencies, countries, and organizations for the TAG-BCAW Manual:

- Canada, Agriculture and Agri-Food Canada
- Mexico, SAGARPA-SENASIA-DGSV
- National Plant Board

- United States Department of Defense (USDOD), U.S. Army Corps of Engineers (COE)
- United States Environmental Protection Agency (EPA)
- United States Department of Agriculture (USDA), Agricultural Research Service (ARS)
- USDA, Animal and Plant Health Inspection Service (APHIS)
- USDA, Forest Service (FS)
- USDA, National Institute of Food and Agriculture (NIFA)
- USDA, Natural Resource Conservation Service
- United States Department of Interior (USDI), Bureau of Indian Affairs (BIA)
- USDI, Bureau of Land Management (BLM)
- USDI, Bureau of Reclamation (BR)
- USDI, Fish and Wildlife Service (FWS)
- USDI, National Park Service (NPS)
- USDI, U.S. Geological Survey (USGS)
- Weed Science Society of America (WSSA)

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## Application

This manual contains information for TAG-BCAW members to use as they review test plant lists and petitions for release. This manual contains instructions for petitioners to follow to prepare and submit a petition; and provides instructions for petitioners to follow to submit an application for a permit.

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## Advisories

Advisories are used throughout the *Technical Advisory Group for Biological Control Agents of Weed Manual* to bring important information to your attention. Please carefully review each advisory. The definitions coincide with American National Standards Institute (ANSI)<sup>1</sup>, and are in the format shown below:

### CAUTION

CAUTION is used to indicate tasks involving possible minor-to-moderate risk of injury.

### DANGER

DANGER is used to indicate tasks involving possible risk of death or serious injury.

### NOTICE

NOTICE is used to alert a reader to important information or agency policy.

### SAFETY

SAFETY is used for general instructions or reminders related to safety.

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<sup>1</sup> TCIF Guidelines, Advisories (Safety-Related Warning Message), TCIF-99-021 Issue 1, p.4.



**⚠ WARNING**

WARNING is used to indicate tasks involving possible serious risk of injury.

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## **TAG-BCAW Manual Contacts**

### **Information Services and Manuals Unit (ISMU)**

The PPQ Information Services and Manuals Unit (ISMU) issues and maintains manuals electronically on the [APHIS Plant Protection and Quarantine Manuals](#) webpage.

If you are unable to access the *TAG-BCAW Manual* online or have a suggested edit (layout, spelling, etc.) please contact ISMU by email at [PPQ.IRM.ISMU.Manuals.Feedback@usda.gov](mailto:PPQ.IRM.ISMU.Manuals.Feedback@usda.gov).

Revisions to the manual are announced via the [APHIS Stakeholder Registry](#) to government employees and external stakeholders who have subscribed to receive *TAG-BCAW Manual* updates. To subscribe, navigate to the [APHIS Stakeholder Registry](#), enter your email address, and select the relevant manuals under Plant Health Information – Manual Updates.

### **TAG-BCAW Executive Secretary**

If you have a question about the content of the manual that requires an answer or have a suggestion for improving the content of the manual, please contact the TAG-BCAW Executive Secretary.

Ben Slager, TAG-BCAW Executive Secretary  
USDA-APHIS-PPQ

Email: [benjamin.h.slager@usda.gov](mailto:benjamin.h.slager@usda.gov)  
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# Technical Advisory Group Introduction

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## Contents

Introduction.....	2-1
Biological Control of Weeds.....	2-1
History.....	2-2
Subcommittee on Biological Control of Weeds.....	2-2
Working Group .....	2-2
Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW) .....	2-3
References.....	2-4

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## Introduction

The *Technical Advisory Group Introduction* chapter provides information about the Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW).

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## Biological Control of Weeds

Biological control can be defined as the deliberate use of natural enemies (competitors, parasites, pathogens, predators, and other organisms) to suppress and maintain populations of a target pest species (insects, mites, plant pathogens, and other pest organisms) below densities that cause economic and/ or environmental damage.

Classical biological control of weeds consists of returning to the native range of the target weed, identifying its complex of natural enemies, carefully testing the specificity of identified natural enemies, and releasing one or more host specific, natural enemies to control the target weed. Refer to [Biological Control](#) for basic information. Many organizations are involved in searching, testing, and introducing potential biological control agents of weeds. Some of these organizations include the USDA Agricultural Research Service (ARS); the USDA Forest Service (FS); USGS Biological Resources Division; State departments of agriculture and universities; Agriculture and Agri-Food Canada, and CAB International. Within the United States, the importation and the release of biological control agents of weeds are regulated by USDA-APHIS because the agents may potentially present a plant pest risk.

## History

Over the last 50 years, technical advisory groups have assisted researchers and regulatory agencies in evaluating proposed biological control agent introductions for biological control of weeds in the United States.

### Subcommittee on Biological Control of Weeds

The Subcommittee on Biological Control of Weeds, the first advisory group, was 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 plant species targeted for biological control are universally regarded as weeds and recommend a course of action for situations involving conflicts of interest; and
- Recommend non-target plant species to be tested against the phytophagous organisms proposed for introduction.

Through the 1960s the Subcommittee communicated primarily through correspondence, **only** meeting periodically to discuss 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 subject matter experts in plant taxonomy, ornamentals, and plant containment. At that time, the Bureau of Reclamation dropped its membership.

### Working Group

In 1971 the Subcommittee on Biological Control of Weeds became known as the Working Group on Biological Control of Weeds. 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, Cooperative State Research, Education, and Extension Service (now the National Institute of Food and Agriculture), and the U.S. Army Corps of Engineers.

Although the Subcommittee and Working Group were formed to provide advice primarily to the researchers, the Subcommittee's and Working Group's comments could be used by APHIS-PPQ in making decisions about issuing permits for importation or release. Responsibilities and procedures followed by 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; and
- Review adequacy of documentation supporting a proposed field release.

## Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW)

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

Over the years, the TAG-BCAW has adapted to the needs of both researchers and regulatory agencies to better serve when they propose introducing an exotic organism into the United States for the biological control of weeds.

Today the TAG-BCAW, with their scientific expertise, functions as a liaison to the biological control community and APHIS. The TAG-BCAW can advise potential petitioners about issues related to test plant lists and host specificity testing and research.

APHIS-PPQ seeks the advice of and recommendations from the TAG-BCAW and relies on the TAG-BCAW to provide scientifically justified, unbiased recommendations. APHIS considers TAG-BCAW's recommendations before performing a National Environmental Policy Act (NEPA) analysis; and then considers TAG-BCAW's recommendations on proposed biological control agent of weeds before making a permit decision.

The Plant Protection Act gives APHIS the authority to regulate the importation and release of biological control agents that may potentially present a plant pest risk. These regulations can be found in [7 CFR 330.200](#).

The expectation is that researchers will involve the TAG-BCAW relatively early in a program to suggest the inclusion of certain test plants, perform, a NEPA analysis, identify conflicts of interest, and assess risk associated with a release.

TAG-BCAW **does not** inform researchers of areas where a plant species may be considered a weed or a desirable plant. TAG-BCAW members **do not** make final decisions on the approval and permitted action for the release of biological control agents of weeds in North America.

TAG-BCAW members **only** recommend to APHIS-PPQ that a proposed biological control agent be approved or denied permission for release and recommend specific action to petitioners before they apply for a formal permit.

### NOTICE

TAG-BCAW **does not** approve petitions or permits. Refer to [APHIS Permitting Process](#).

In summary, the TAG-BCAW 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. TAG-BCAW continues to serve as a science-based link between the research community and regulatory agencies, and to provide 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. *Bulletin of the Entomological Society of America* 29(3); 55–61.

# Technical Advisory Group Charter

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## Contents

Introduction.....	3-1
Charter, Technical Advisory Group for Biological Control Agents of Weeds, October 1997, Revised 2010.....	3-1
Mission.....	3-1
Objectives .....	3-2
Expectations.....	3-2
Standard Operating Procedures.....	3-2
Duties of TAG-BCAW Members.....	3-2
Duties of the TAG-BCAW Chair .....	3-3
Duties of the TAG-BCAW Executive Secretary .....	3-3
Duties of USDA-APHIS-PPQ .....	3-3
Annual Meeting .....	3-4
Administration .....	3-4
Federal Advisory Committee Act (FACA) .....	3-4
Membership .....	3-5

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## Introduction

The *Technical Advisory Group Charter* chapter describes the TAG-BCAW's charter, mission, objectives, and standard operating procedures.

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## Charter, Technical Advisory Group for Biological Control Agents of Weeds, October 1997, Revised 2010

### 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 nonindigenous biological control agents of weeds. This is based on considerations of potential nontarget

impacts, conflicts of interest, natural resources, agricultural production, and the Endangered Species Act (ESA) Threatened and Endangered Species List.

## **Objectives**

Incorporate member agencies' concerns and perspectives into planning biological control programs.

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.

Provide recommendations to APHIS-PPQ for use in making permitting decisions.

## **Expectations**

Individuals planning to release a nonindigenous biological control agent should contact the TAG-BCAW early in the research program, particularly for species targeted for the first-time release of a biological control agent in the North America.

TAG-BCAW members review two types of documents: the proposed plant list for host specificity testing (test plant list) and the petition for first-time field release of a nonindigenous organism. TAG-BCAW members may suggest inclusion of certain test plants, identify conflicts of interest, and assess potential risks associated with an environmental release. The person seeking permission to release a biological control agent into the environment addresses these different perspectives. The exchange of scientific information helps Federal regulatory officials evaluate potential effects of the biological control agent of weeds on target and nontarget plants in North America.

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## **Standard Operating Procedures**

### **Duties of TAG-BCAW Members**

Duties of TAG-BCAW members are as follows:

- Represent their Agency's or organization's interests by reviewing petitions from the organization's current perspective on biological control.
- Review each petition to evaluate risk to agriculture, human health, and the environment.
- Identify and consult subject matter experts who are familiar with the taxonomy, biology, ecology, and other aspects of the organisms being considered for release and the target weed.
- Provide a written response consolidating their Agency's or organization's comments to the TAG-BCAW Executive Secretary within the deadline.
- Participate in the annual TAG-BCAW meeting.
- Appoint an alternate within their organization to serve in the absence of the official member.

## **Duties of the TAG-BCAW Chair**

The TAG-BCAW Chair is a TAG-BCAW member, elected by the TAG-BCAW membership to serve a three-year term. The Chair may serve an unlimited number of terms. Duties of the TAG-BCAW Chair are as follows:

- Arrange and preside over meetings of TAG-BCAW.
- Assess all TAG-BCAW members' continued involvement on the TAG-BCAW to assist in keeping the respective organizations actively included on the TAG-BCAW.
- Contact TAG-BCAW Agencies and organizations to request a new qualified candidate who can represent that organization and replace nonactive TAG-BCAW members.
- Help build consensus among reviewers with divergent viewpoints. The Chair may call meetings or telephone conferences including outside specialists and the involved researcher.
- Maintain records of TAG-BCAW recommendations.
- Review all recommendations of TAG-BCAW members and provide consolidated recommendations to the petitioner, TAG-BCAW members, appropriate officials in Canada and Mexico, APHIS TAG-BCAW Executive Secretary, and other interested parties.

## **Duties of the TAG-BCAW Executive Secretary**

The TAG-BCAW Executive Secretary is an APHIS employee.

Duties of the TAG-BCAW Executive Secretary are as follows:

- Assign due dates for reviews of all petitions and test plant lists.
- Compile petition and test plant list reviews and forward to the TAG-BCAW Chair.
- Develop with the TAG-BCAW Chair, the TAG-BCAW annual meeting agenda, date, time, and location.
- Facilitate the distribution of petitions and test plant lists to TAG-BCAW members.
- Make all arrangements for the TAG-BCAW annual meeting (daily meeting space, hotel, shuttle, etc.).
- Maintain a filing system and perform other archival functions for TAG-BCAW.
- Maintain the [TAG-BCAW website](#) and include APHIS permit decisions on the internet.
- Receive and acknowledge receipt of all submitted petitions and test plant lists.
- Receive and respond to requests to extend review deadlines.
- Serve as the contact for *Technical Advisory Group for Biological Control Agents of Weeds Manual* maintenance.
- Transmit recommendations from the TAG-BCAW Chair to APHIS-PPQ.

## **Duties of USDA-APHIS-PPQ**

Duties of USDA-APHIS-PPQ for petitions are as follows:

- Assure compliance with applicable statutes and regulations.
- Conduct training workshops as needed.
- Consider TAG-BCAW's recommendations.
- Evaluate petitions for release of biological control agents of weeds by conducting a plant pest risk assessment.



- If a petition is submitted, then APHIS may initiate the development of environmental and biological assessments when needed.
- APHIS-PPQ will communicate permitting policy pertaining to movement of these organisms.
- When the TAG-BCAW recommends to APHIS to release an agent, then APHIS will review the recommendations and if reservations are noted ensure that these are addressed.

## **Annual Meeting**

The TAG-BCAW Chair calls an annual meeting to evaluate the effectiveness of the TAG-BCAW, and to discuss controversial issues relating to biological control of weeds in North America. The TAG-BCAW membership elects a Chair every three years, during the annual meeting.

## **Administration**

USDA-APHIS-PPQ will be responsible for the administrative maintenance of Federal Agencies' representation.

## **Federal Advisory Committee Act (FACA)**

TAG-BCAW meetings shall be conducted in compliance with the Federal Advisory Committee Act (FACA).

The law as amended (P.L. 104-4, Sec. 204), states the following:

- 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:
  - 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; and
  - 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-BCAW because TAG-BCAW members include some Federal officials, some designated State officials, and some organizations. The TAG-BCAW 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.

The TAG-BCAW focuses primarily on assisting the individuals who will seek permits. Secondly, TAG-BCAW provides a communication conduit within a scientific framework for APHIS.

## Membership

APHIS will solicit one representative from each of the following Agencies:

- Department of Defense, U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- USDA, Animal and Plant Health Inspection Service
- USDA, Agricultural Research Service v USDA, Forest Service
- USDA, National Institute of Food and Agriculture
- USDA, Natural Resource Conservation Service
- USDI, Bureau of Indian Affairs
- USDI, Bureau of Land Management
- USDI, Bureau of Reclamation
- USDI, National Park Service
- USDI, U.S. Fish and Wildlife Service
- USDI, U.S. Geological Survey

APHIS may solicit members who are State or Federal government employees (one each) from the following organizations:

- National Plant Board
- Weed Science Society of America
- Other Federal Agencies expressing interest in participation

Each TAG-BCAW member is a representative of his/her respective Agency or organization. A TAG-BCAW member's lack of participation or response to the TAG-BCAW petitions is of concern for all involved. Everyone's best interests are served when all members are active.

The TAG-BCAW Chair will assess each TAG-BCAW member's continued involvement on the TAG-BCAW in trying to keep the respective Agencies or organizations as part of TAG-BCAW. If a current TAG-BCAW member is nonactive, then the TAG-BCAW Chair has the prerogative to contact the represented Agency or organization and request a new qualified candidate to represent the Agency or organization and replace the non-active current TAG-BCAW member.

Furthermore, if an organization's representative does not provide comments or the representative does not request an extension of a petition's documented deadline, then the TAG-BCAW Chair interprets this to mean the organization does not oppose the petition.

# Agencies and Organizations' Perspectives

## Contents

Introduction.....	4-2
U.S. Department of Agriculture (USDA) .....	4-2
Animal and Plant Health Inspection Service (APHIS).....	4-2
Agricultural Research Service (ARS).....	4-3
Forest Service (FS) .....	4-3
National Institute of Food and Agriculture (NIFA) .....	4-3
U.S. Department of the Interior (USDI) .....	4-4
Bureau of Indian Affairs (BIA).....	4-4
Bureau of Land Management (BLM) .....	4-4
Bureau of Reclamation (BR) .....	4-5
Fish and Wildlife Service (FWS).....	4-5
National Park Service (NPS) .....	4-6
U.S. Geological Survey (USGS).....	4-6
Department of Defense (DOD).....	4-7
U.S. Army Corps of Engineers (COE).....	4-7
Environmental Protection Agency (EPA) .....	4-7
National Plant Board.....	4-7
Weed Science Society of America .....	4-7
Canada: Agriculture and Agri-Food Canada (AAFC) .....	4-7
Mexico: SAGARPA-SENASIA-DGSV .....	4-8

## **Introduction**

The *Agencies and Organizations' Perspectives* chapter provides a summary of the perspective of each Agency and organization which has a representative on the TAG-BCAW. Members are responsible for reviewing and evaluating submitted petitions for release and test plant lists, and for recommending action based on their Agency's or organization's current perspective on biological control of weeds in North America.

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## **U.S. Department of Agriculture (USDA)**

### **Animal and Plant Health Inspection Service (APHIS)**

The biological control activities within APHIS are performed under the regulatory authority of the Plant Protection Act of 2000, which states that, "biological control is often a desirable, low-risk means of ridding crops and other plants of plant pests and noxious weeds, and its use should be facilitated by the Department of Agriculture, other Federal Agencies, and States whenever feasible." The Act also defines a biological control organism as any enemy, antagonist, or competitor used to control a plant pest or noxious weed. The authority to regulate biological control agents is dependent on the agents' plant pest risks.

The Animal Plant Health Inspection Service (APHIS) is involved in biological control activities that aim to safeguard American agriculture and ecosystems and minimize the economic and environmental impacts of nonindigenous pests, weeds, and plant diseases deemed of regulatory significance to APHIS, State departments of agriculture, tribal governments, and cooperators within the United States and American territories.

APHIS biological control activities include the direct involvement of Plant Protection and Quarantine (PPQ) Field Operations (FO) personnel in distributing, releasing, and monitoring approved biological control agents for selected target pests. PPQ, through its FO and Policy Management (PM) units, also provides funds to Federal, State, university, local, and tribal project partners through cooperative trade agreements. Cooperators conduct target pest and biocontrol agent surveys, agent collections and releases, and pre- and post-release monitoring. The PPQ Science and Technology (S&T) unit is also involved in biological control. S&T scientists develop release and monitoring protocols, rear selected biological control agents, and incorporate biological control into integrated pest management strategies. S&T provides funding for pre-release research and development efforts with potential biological control agents considered for U.S. release. Finally, the PPQ Pest Permitting Branch is responsible for approving or rejecting initial U.S. introduction and field release of biological control agents and for permitting subsequent interstate distribution and releases. All Agency units engage with other USDA Agencies, organizations, and a wide range of cooperators and customers to develop appropriate Agency legislation and regulations that meet U.S. needs for economical, efficient, and effective biological control programs of weeds.

## **Agricultural Research Service (ARS)**

The Agricultural Research Service (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. ARS policy is to work with regulatory Agencies such as APHIS, Fish and Wildlife Service, and the Environmental Protection Agency to ensure that all the Agency's releases/applications are in accordance with existing laws and regulations.

## **Forest Service (FS)**

The Forest Service (FS) is charged with the management of approximately 190 million acres of national forests and grasslands. The FS recognizes that the invasion of exotic plants is a key threat to continued existence of vulnerable native species, and to the integrity and healthy functioning of unique habitats. Exotic weeds also are a major problem and interfere with the FS' effective management, compromise productivity, and impede the public's enjoyment 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 local management goals. However, FS recognizes that once a weed has become widely distributed, most conventional management tools provide only localized relief or containment. Biological control is usually the only realistic approach for many weed infestations. FS is supportive of vegetation management personnel to evaluate the feasibility of using weed biological control. When suitable approved biological control agents are available, managers are encouraged to add them as a control strategy in integrated weed management programs.

When external researchers are testing new biological control agents for weeds that also affect FS lands, the FS actively encourages and supports their research through funding, providing experimental release plots, and participating in joint development programs. When weeds of concern to FS are not being targeted by other research agencies, FS researchers may initiate the search for, testing of, and importation of biological control agents.

## **National Institute of Food and Agriculture (NIFA)**

The Land Grant University System and the National Institute of Food and Agriculture (NIFA) have fundamental responsibility for discovering, developing, implementing, and extending technology in support of American agriculture and in concert with America's natural resources. With a 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 the development of pest management strategies and programs for implementation in agricultural, forest, pasture, rangeland, and 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 NIFA supported Agricultural Experiment Station System, are disciplines that directly support biological control of weeds.

Botany, plant ecology, land conservation and taxonomic studies in plants, animals, and microbes are among the many components of that expertise.

An additional component of NIFA is the development and delivery of information in support of biological control and other integrated pest management (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.

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## **U.S. Department of the Interior (USDI)**

### **Bureau of Indian Affairs (BIA)**

The Bureau of Indian Affairs (BIA) has responsibility for approximately 56 million acres of Indian trust land (land held in trust by the United States for various Indian tribes and individuals). These trust lands are located within 326 reservations (i.e., pueblos, rancheros, missions, villages, communities, etc.). At present, there are 565 Federally recognized American Indian and Alaska Native tribes and villages.

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 welcomed 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.

### **Bureau of Land Management (BLM)**

The Bureau of Land Management (BLM) is responsible for carrying out a variety of programs for the management and conservation of resources on 253 million surface acres, as well as 700 million acres of subsurface mineral estate. Most of the public lands are located in the Western United States, including Alaska. Public lands make up about 13 percent of the total land surface of the United States and more than 40 percent of all land managed by the Federal Government. The public lands are characterized predominantly by extensive grassland, forest, high mountain, arctic tundra, and desert landscapes. The BLM manages multiple resources and uses, including energy and minerals; timber; forage; recreation; wild horse and burro herds; fish and wildlife habitat; wilderness areas; and archaeological, paleontological, and historical sites. These multiple uses create surface disturbances exposing the public lands to invasive and noxious weeds. As such, the BLM uses biological control of weeds as a component of its integrated weed management program. The policy and use of biological controls are in *BLM Manual 9014* where BLM's policy is stated as follows:

Agencies and Organizations' Perspectives  
**U.S. Department of the Interior (USDI)**

- 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 the use of 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.

A Memorandum of Understanding exists between the BLM and APHIS which describes the interaction between these two agencies and National Environmental Policy Act compliance conditions. Prior to the release of an approved biological control agent, each State's State Office must examine the practitioner's *Biological Control Agent Release Proposal* (BCARP), which is notification of a planned release. Once an agent has been released, a *Biological Control Release Record* must be filled out within 24 hours after release and kept on record for a minimum of seven years. All BLM Field Offices submit a comprehensive Integrated Pest Management report to their State Office each year. Final reports are then compiled and reviewed at the National Office. These precautions ensure that only approved biological control agents are released and those releases are continually monitored to evaluate efficacy over time.

### **Bureau of Reclamation (BR)**

The policy of the Bureau of Reclamation (BR) is to implement integrated pest management (IPM) for the control and management of pests and invasive species. As defined by the Federal Insecticide, Fungicide, and Rodenticide Act, and amended by the Food Quality Protection Act of 1996, "Integrated Pest Management is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks," and "Federal agencies shall use Integrated Pest Management techniques in carrying out pest management activities and shall promote Integrated Pest Management through procurement and regulatory policies, and other activities."

Reclamation views biological control as an important tool in the IPM toolbox. Only by using the combined suite of IPM tools, including biological control, can pests and invasive plant species be successfully controlled. In addition, the TAG-BCAW is a vital component in a reviewable and transparent process during the evaluation of proposed biological control agents of weeds.

### **Fish and Wildlife Service (FWS)**

The Fish and Wildlife Service (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 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 (ESA). 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 biocontrol organisms must not include other nonindigenous organisms. Approval must 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, then they should be used on National Wildlife Refuges and other lands and waters under the jurisdiction of the Service.

### **National Park Service (NPS)**

The National Park Service (NPS) relies on an integrated pest management (IPM) approach to manage 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.

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.

### **U.S. Geological Survey (USGS)**

The United States Geological Survey (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 nonnative 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.



## Department of Defense (DOD)

### U.S. 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 also 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, the Department of Defense (DOD) and Army Corps of Engineers (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.

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## 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.

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## 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, Application to Move Live Plant Pests, Noxious Weeds, Soil, and Prohibited Plants](#)) requires approval from both the receiving State and USDA. The National Plant Board's representation on TAG-BCAW facilitates this approval process and keeps all stakeholders involved from the beginning.

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## 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.

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## Canada: Agriculture and Agri-Food Canada (AAFC)

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 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 us in the direction of a cleaner environment. Part and parcel with Canada's success and safety record is its continuing association with TAG-BCAW.

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## **Mexico: SAGARPA-SENASIA-DGSV**

Mexican participation in TAG-BCAW has been very useful because biological control of weeds is in development in Mexico. Some weeds are common to Mexico, Canada, and the United States; and cooperative projects could be carried out. A greater number of agents to be imported into Mexico is expected.

Plants that are considered weeds in one country may not be considered weeds in another country. Given this, possible conflict of interests and impact on nontarget plants are the main concerns of Mexico. Target weed information must be reviewed to focus especially on the beneficial uses in Mexico and the impact on Mexican endangered and threatened species.

# TAG-BCAW Chair's Perspective

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## Contents

Introduction.....	5-1
TAG-BCAW Chair's Concept.....	5-1
TAG-BCAW Chair's Evaluation Procedures .....	5-2

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## Introduction

The *TAG-BCAW Chair's Perspective* chapter provides the steps the current TAG-BCAW Chair follows when reviewing a petition for release of a proposed biological control agent of weeds and for examining each reviewer's comments and recommendations; and the Chair's overall concept for the TAG-BCAW and for making the final TAG-BCAW recommendation for a petition.

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## TAG-BCAW Chair's Concept

The TAG-BCAW Chair uses their general understanding of and ideas about how TAG-BCAW helps facilitate the use of proposed biological control agents of weeds in the environment, and specifically about their role as Chair of TAG-BCAW.

The petitions that receive mixed recommendations (some recommended release; some recommended release with reservations; some **do not** recommend release) are the hardest to evaluate. Often this situation is compounded when **only** a few members have reviewed the petition and submitted a recommendation.

In general, TAG-BCAW should take a conservative stance in its recommendations. Determining if the proposed biological control agent of weeds may present a plant pest risk is the key issue. Once a biological control agent of weeds is released, it is difficult to control or manage the organism if the need should arise.

The overall concept to make the final TAG-BCAW recommendation is, "How confident are we in the testing conducted and the information presented to recommend a proposed biological control agent of weeds for release into the environment?"

## **TAG-BCAW Chair's Evaluation Procedures**

Before reviewing each petition as the TAG-BCAW Chair, first review each petition from the perspective of a member representing his or her Agency (for the current TAG-BCAW Chair, the Forest Service).

Then as the TAG-BCAW Chair, evaluate each petition as follows:

1. Look over all the responses other members of TAG-BCAW have submitted.
2. Determine how many responses were submitted.
3. Determine each member's recommendation
  - Recommend without reservations.
  - Recommended with reservations.
  - Not recommended.
4. Examine each Reviewer's Comment Sheet; and make notes on the key points each reviewer has made—both negative and positive. Look for similarities in the comments among reviewers.
5. 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”).
6. Eliminate comments that are invalid or inconsistent with the data presented. May discuss these points with the reviewer to ensure a full understanding of his/her comments.
  - The majority of points and concerns raised by reviewers are related to host specificity tests and the impact on nontarget plants. Address these comments first, along with the environmental impacts.
  - When correct and valid points are made about a particular test, 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”).
  - Taxonomic issues are always of concern. The TAG-BCAW members need to know what biological control agent is being tested and what weed is being targeted. When there is a concern about the taxonomic information, you may 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 getting additional information to validate or refute concerns.
  - Comments on petitions for release that address points outside of TAG-BCAW'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”). TAG-BCAW is concerned with the use of the proposed biological control agent of weeds and is not concerned with setting research priorities.
7. If a reviewer's comments are partially correct, but may not be completely valid, then attempt to have the reviewer and the researcher discuss the concern.

**TAG-BCAW Chair's Evaluation Procedures**

8. If some of the points cannot be resolved after deliberations and discussions between the researcher and the reviewer, then begin weighing the factors that are in contention. Often, reviewing the entire petition is useful when there are mixed views from the researchers.
  - Is there a concern with plant pest risk to nontarget plants?
  - Does the host specificity test cover a reasonable representation of the species identified on the test plant list?
  - Is there a problem with taxonomy?
  - Has this proposed biological control agent of weeds been reviewed previously? If so, what were the points that caused the proposed biological control agent of weeds not to be recommended?
  - Has the researcher addressed previous TAG-BCAW questions?
  - Does the researcher appear to be concerned and conscientious in the studies?
9. After reexamining all the significant questions that are unresolved, recommend an action from TAG-BCAW that you believe you can justify.
10. Write a letter to APHIS-PPQ and include the following:
  - If the recommendation is to release, then include key points about the reason for the recommendation. 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, then include key reasons for the recommendation, such as the following:
    - Recommend tests that may answer and resolve the questions raised.
    - Attempt to develop a list of major concerns or questions that caused this recommendation.
    - Indicate that the researcher and the reviewers should directly discuss the points further.
11. Provide copies of the letter (sent to APHIS-PPQ) to the researcher, TAG-BCAW members, and other interested parties.
12. TAG-BCAW's response to APHIS is just a recommendation and is not a final decision. The recommendation of TAG-BCAW is not a majority rule verdict; that is, if eight reviewers recommend release and four reviewers recommend not to release, then TAG-BCAW's recommendation is not necessarily to release. In addition, unresolved comments from a single reviewer recommending that a proposed biological control agent of weeds not be released does not mean that TAG-BCAW will recommend against release.

# TAG-BCAW Flow Chart for Petitions for Field Release and Test Plant Lists

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## Contents

Introduction.....	6-1
TAG-BCAW Petitions for Field Release and Test Plant Lists Flow Chart.....	6-2

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## Introduction

The *TAG-BCAW Flow Chart for Petitions for Field Release and Test Plant Lists* chapter provides a flow chart for the documentation flow of petitions and test plant lists.

### NOTICE

The Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW) Chair consolidates recommendations that are received from TAG-BCAW members. The *TAG-BCAW Manual* provides an understanding of how the TAG-BCAW Chair reaches a final TAG-BCAW recommendation.

## TAG-BCAW Petitions for Field Release and Test Plant Lists Flow Chart

Refer to the [TAG-BCW Petition Flow Chart](#).

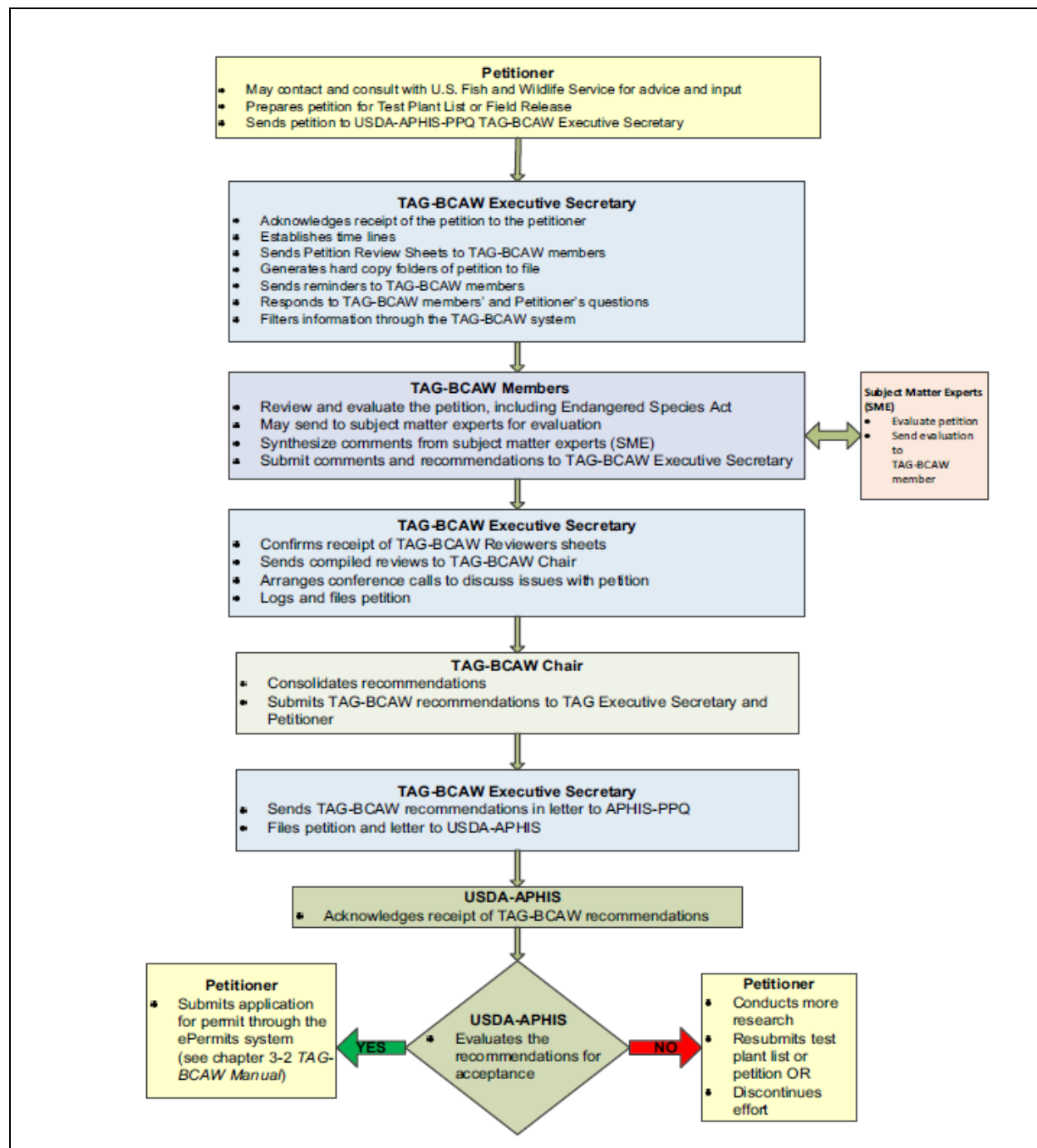


Figure 6-1 TAG-BCAW Petition for Field Release or Test Plant List Flow Chart

# APHIS Permitting Process

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## Content

Introduction.....	7-1
Permitting Process for Weed Biological Agents .....	7-1
Step 1: Early Input .....	7-2
Step 2: Applying for APHIS Permits for Importation.....	7-2
Step 3: APHIS Responses to the Recommendation Letter from the TAG-BCAW Chair .....	7-4
Step 4: Environmental Compliance in Support of Petition for Release .....	7-4
Step 5: Compliance With Executive Order 13175 .....	7-6

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## Introduction

The *APHIS Permitting Process* chapter provides information about APHIS’ role in each step of the review process for petitions submitted to the TAG-BCAW for the release of proposed biological control agents of weeds, and the flow of documents used by APHIS when considering whether to issue a permit for the release of such nonindigenous organisms.

APHIS has authority to regulate the importation and interstate movement and release of biological control organisms (because they may potentially present a plant pest risk), noxious weeds, and plant pests under the Plant Protection Act of 2000. APHIS regulates the movement of these organisms in order to prevent the dissemination of plant pests or noxious weeds. These regulations may be found in [7 CFR 330](#).

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## Permitting Process for Weed Biological 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” that poses a potential plant pest risk. APHIS regulates biocontrol organisms because they are plant pests. Before issuing a permit to release a biocontrol organism into the environment, APHIS must comply with 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.*), and Executive Orders (EO) 13112 (64 FR 6183) for Invasive Species and EO 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations.”



TAG-BCAW petitioners may refer to the following pages that describe the content and flow of documents used by APHIS to meet the requirements of the Acts and Executive Orders which includes APHIS' responsibility for the issuance of such permits. An understanding of the various documents APHIS prepares and or reviews conducted should help to clarify this process.

## **Step 1: Early Input**

Researchers should submit a proposed test plant list to the Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW) whether or not a proposed biological control agent has yet been identified. The TAG-BCAW, an interagency group, was established to advise weed biological control researchers and to provide the APHIS-PPQ Pest Permitting Branch with a recommendation on the proposed Federal action, issuance of a permit authorizing release to the environment. At this early stage of the review process, TAG-BCAW makes recommendations on the target weed choices and comments on the proposed test plant list for host specificity testing.

Both TAG-BCAW reviewers and researchers should review Federal and State lists of threatened and endangered species prior to host specificity testing. All threatened and endangered species should be considered when designing the test plant list. Candidate species and species proposed for listing should also be considered because they may be listed at any time. Obtain information on listed species at [ECOS: Species Reports](#). Even though a U.S. Fish and Wildlife Service (USFWS) representative participates on the TAG-BCAW review panel, this does not substitute for the ESA consultation process.

Petitioners are encouraged to contact the regional offices and local field offices of the USFWS in the areas where the target weed is located, prior to and during the host testing phase in order to obtain advice and guidance regarding any threatened, endangered, or proposed species. The USFWS can also provide guidance regarding obtaining seeds or samples of these plants or related species that can serve as surrogates for these species. As data is collected on host-specificity, it is good to consult with the USDA-APHIS Biological Control Specialist to ensure that testing is progressing appropriately and identify issues early in the process.

## **Step 2: Applying for APHIS Permits for Importation**

Permits are required from APHIS for any of the following situations:

- Importation of live biological control organisms into the United States and its Territories (refer to [PPQ 526 Permit for Importation](#))
- Interstate movement of live biological control organisms (includes movement between any State, territory and the District of Columbia) (refer to [PPQ 526 Permit for Interstate Movement](#)). There are exceptions for those biological control organisms allowed to move interstate without a permit as per 7 CFR 330 as [revised in 2019](#).
- Retaining live biological control organisms in containment facilities after expiration of a permit (refer to [PPQ 526 Permit for Continued Curation](#))
- Movement of any live biological control organism from the confines of a containment facility to any other containment facility or for environmental release (refer to [PPQ 526 Permit for Removal from Containment](#))

All conditions of any permit, including all authorizations and restrictions, remain binding as long as the permit is valid and prior to expiry. Revocation or expiration of any permit requiring containment for the regulated organisms requires devitalization or destruction of all organisms regulated by that permit, or a new permit for the organisms.

Guidance and step-by-step instructions for obtaining each of these types of PPQ 526 permits can be found on the following APHIS webpages: [Regulated Organism and Soil Permits](#) and [Biological Control Organism Permits](#).

### **PPQ 526 Permit for Importation**

A PPQ 526 Permit for Importation is needed every time live biological control organisms are imported into the United States and its Territories. A PPQ 526 Permit frequently requires an USDA-APHIS inspection containment facility as the destination, unless the organisms being imported meet certain conditions.

Additional information concerning containment facilities can be found at [Containment Facility Inspections](#).

### **PPQ 526 Permit for Interstate Movement**

A PPQ 526 Permit for Interstate Movement is needed every time live weed biological control organisms are moved across State lines between any State of the United States and its Territories, unless those species are specifically exempted under 7 CFR 330. (Refer to the [APHIS Revises the Regulations for the Movement of Plant Pests and Biocontrol Agents](#) webpage for more information). A PPQ 526 permit is required regardless of the use (research, release, etc.). There may be exceptions to the requirement for an interstate movement permit for certain biological control organisms.

### **PPQ 526 Permit for Continued Curation**

A PPQ 526 Permit for Continued Curation is required in order to retain live regulated organisms in containment beyond the expiration of any PPQ 526 permit that requires containment. When continued movement is involved, colonies/cultures of organisms may be kept under a new PPQ 526 Permit for importation or interstate movement when renewed.

### **PPQ 526 Permit for Removal from Containment**

A PPQ 526 Permit for Removal from Containment is required in order to move any live regulated organisms from the confines of an APHIS inspected containment for any reason, including movement between containment facilities regardless of their relative location (in addition to such movements which may be described and permitted in the existing permit).

If movement between specific containment facilities is already described and permitted in an existing PPQ 526 Permit for importation, interstate movement, or continued curation, then an additional 526 Permit is not required for such movement.

A PPQ 526 Permit is required to remove a regulated weed biological control organism from containment and enables release into the environment after APHIS approval, following the processes described in [Step 3: APHIS Responses to the Recommendation Letter from the TAG-BCAW Chair](#) and [Step 4: Environmental Compliance in Support of Petition for Release](#).

#### **NOTICE**

Keep in mind that any removal from containment **without** safeguards (i.e., escape-proof packaging while moving to another containment facility or a physically separate part of a containment facility) constitutes release into the environment.

## NOTICE

An application may be submitted by any individual in accordance with APHIS regulations [7 CFR 330.201](#), [330.202](#), and [330.203](#)) and may be from a party who is not the petitioner or researcher, but who is proposing to colonize, increase, or distribute the agent. Upon receipt of the application, APHIS will proceed with the environmental compliance process described in [Step 4: Environmental Compliance in Support of Petition for Release](#).

### Step 3: APHIS Responses to the Recommendation Letter from the TAG-BCAW Chair

After receiving the TAG-BCAW's recommendation, APHIS reviews the recommendation, including reviewers' comments, information cited by reviewers, and any additional information available to APHIS in order to determine if APHIS will support initiating the environmental compliance review process to allow release of the biological control agent. The decision by APHIS to support or not continue the process may or may not agree with the TAG-BCAW's recommendation to release (or not release), based on all the information APHIS considers. However, historically the TAG-BCAW's recommendation and the subsequent APHIS decision regarding release frequently coincide.

In the cases where APHIS supports the request to release, APHIS may still request that the petitioner provide additional information or clarification, which will be used to support and enhance the environmental compliance documents in the following steps. This additional information or clarification is usually in response to questions or concerns raised by the reviewers or other parties which are often received even with a TAG-BCAW recommendation for release.

When release of the weed biological control agent is not supported by APHIS, then APHIS will convey the reasons for not supporting release to the Petitioner and may outline steps to take if the Petitioner wishes to improve the petition. At this point, the decision of the Petitioner or other researchers will be whether to invest additional time and resources to improving the petition and submitting an amended petition to the TAG-BCAW Executive Secretary. The subsequent submission of a new or an amended petition may or may not lead to a recommendation for release or support for release by APHIS. APHIS will deny the application submitted for removal from containment and therefore will not proceed with the environmental compliance process described in [Step 4: Environmental Compliance in Support of Petition for Release](#).

### Step 4: Environmental Compliance in Support of Petition for Release

Issuance of permits by APHIS for the environmental release of nonindigenous weed biological control organisms is considered a Federal action and requires compliance with the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA). Steps and procedures APHIS follows to comply with these Acts regarding the proposed release of biological control agent against weeds are described in [Compliance with the Endangered Species Act \(ESA\)](#) and [Compliance with the National Environmental Policy Act \(NEPA\)](#).

The petitioner should not apply for a PPQ 526 Permit to remove a weed biological control organism from containment (refer to [PPQ 526 Permit for Removal from Containment](#)) until they are contacted by USDA-APHIS near approval of the organism for release.

### **Compliance with the Endangered Species Act (ESA)**

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. (Refer to [ESA Compliance - Section 7 Consultations](#).) Although the researcher should have received input from the USFWS or possibly the National Marine Fisheries Service from the beginning, APHIS-PPQ determines if consultation with the USFWS or possibly the National Marine Fisheries Service must be conducted at this point in the process. If the proposed release will have no effect on listed species or designated critical habitat, then no consultation with the USFWS or the National Marine Fisheries Service is required.

Informal consultation with the USFWS or possibly the National Marine Fisheries Service occurs when the release of the biological control organism “may affect but is not likely to adversely affect” listed species or designated critical habitat.

The document required for Section 7 consultation with the Services is a biological assessment (BA). This document is prepared by APHIS and is submitted to the USFWS or possibly the National Marine Fisheries Service.

The BA includes several elements:

- A description of the action to be considered.
- A description of the specific area that may be affected by the action.
- A description of any listed species or critical habitat affected by the action.
- A 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 EA or EIS.
- Other relevant information on the action, affected listed species, or critical habitat.

The USFWS reviews the BA, and if they concur with the “may affect, **not** likely to adversely affect” determination, then USFWS will send APHIS a concurrence letter and the consultation process is complete. Once complete, APHIS incorporates the concurrence from USFWS into the environmental assessment (EA) and makes any final changes necessary.

In very rare cases, APHIS may pursue formal consultation with the USFWS. Formal consultation is required when APHIS determines that the proposed release “may affect and is likely to adversely affect” listed species or designated critical habitat. Typically, APHIS does not proceed with formal consultation except under the unusual circumstances, where the adverse effect may be in doubt, or is likely to be very limited.

### **Compliance with the National Environmental Policy Act (NEPA)**

The document required for National Environmental Policy Act (NEPA) compliance is the environmental assessment (EA), a concise public document that provides evidence and analysis to determine whether a Finding of No Significant Impact (FONSI) can be reached. The EA is prepared by APHIS staff scientists. The EA provides the public with the potential positive and negative environmental impacts, both direct and indirect, that may occur following release into the environment. Petitioners from other Federal agencies must also consider their own NEPA implementing procedures specific to any proposed actions.

Once the EA has been completed, APHIS-PPQ publishes a 30-day notice of availability of the EA in the Federal Register to allow public comment on the proposed action. After considering the comments, APHIS does one of the following:

- Reaches a finding of no significant impact (FONSI); or
- Is unable to reach a FONSI and concludes that preparation of an environmental impact statement (EIS) is required. An EIS is a document prepared in compliance with NEPA when significant impacts are expected from the proposed action.

If a FONSI has been reached, APHIS will publish the availability of the FONSI in the [Federal Register](#) and post the final EA and FONSI on the [APHIS Plant Health Environmental Assessments website](#).

### **Step 5: Compliance With Executive Order 13175**

APHIS, like other Federal Agencies, is bound to comply with various Executive Orders (EO), some of which apply to these proposed actions. EO 13175, Consultation and Coordination with Indian Tribal Governments, was issued to ensure that there would be meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications. Therefore, APHIS implements contact and communication with Federally recognized tribal governments regarding the proposed environmental release of weed biological control organisms.

Typically, prior to the publication of the EA in the [Federal Register](#), APHIS staff prepares a letter describing the proposed Federal action and requests review and input from Native American Tribes in any area likely to be inhabited or affected by the release of the proposed biological control agent against weeds. If the tribal government requests consultation with APHIS, environmental compliance and other actions in preparation of the proposed release are paused until consultation is concluded.

# Biological Control of Weeds

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## Contents

Introduction.....	8-1
Biological Control.....	8-1
Risk Analysis of Biological Control Agents of Weeds .....	8-2
References.....	8-3

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## Introduction

The *Biological Control of Weeds* chapter provides a brief introduction to biological control.

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## Biological Control

Classical biological control of weeds is a weed control method where exotic natural enemies are used to reduce exotic weed infestations. The practice of weed biological control in the United States began in the 1940s and has resulted in some spectacular successes in the suppression of the targeted weed. One of the earliest and best-known examples is the introduction of *Chrysolina* leaf beetles for control of Klamath weed, a poisonous weed that invaded dairy pastures and rangelands in the western United States and Canada.

Several different kinds of organisms have been used as biological control agents of weeds: insects, mites, nematodes, and plant pathogens; of these, herbivorous insects are the most common weed biological control agent.

Efforts to develop a weed biological control agent consist of the following steps:

1. Foreign exploration in the weed's area of origin.
2. Host specificity studies of potential biocontrol agents.
3. Approval of the agent by government regulatory authorities.
4. Release and establishment in areas invaded by the target weed.
5. Post-release monitoring.

Biological control is one of the many weed management options used alone or combined with other management approaches. The use of biological control agents of weeds may be the preferred or only tool available in some habitats or situations, although chemical, cultural, and mechanical options have their place, too. Many land managers, ranchers, and farmers use an integrated weed management approach, combining more than one method to control weeds.



TAG-BCAW's mission statement is, "To facilitate proposed biological control agents of weeds in North America by providing guidance to researchers and recommendations to regulating Agencies for or against release of nonindigenous biological control agents of weeds. This is based on considerations of potential nontarget impacts, conflicts of interest, natural resources, agricultural production, and the Endangered Species Act (ESA) Threatened and Endangered Species List." The TAG-BCAW's role in the development of a classical weed biological control agent is to review the information obtained during the host specificity studies and provide a recommendation to the USDA-APHIS-PPQ as to the proposed biological control agent of weeds and its potential for non-target impacts.

The ecological implications of managing exotic species with exotic biocontrol agents intentionally introduced from the native range of the target weeds must be thoroughly evaluated before release. Potential risks are systematically evaluated using established, standardized protocols that yield repeatable and scientifically valid data.

Historically, biological control has been most effective against large infestations of a single weed species and has been most successful on weeds that have been introduced into areas where co-evolved natural enemies do not occur.

Biological control has several advantages over other types of weed control (Wapshire, et al., 1989). These advantages include long-term or sustained management of the target plant, limited treatment side-effects or nontarget effects, attack restricted to one or a few very-closely related weed species, self-perpetuating agents, and nonrecurring costs.

TAG-BCAW plays a role in evaluating the introduction of an exotic organism to control weed infestations by objectively weighing such advantages against potential nontarget impacts and conflicts of interest.

Wapshire et. al.'s (1989) article "Recent Developments in Biological Control of Weeds" (refer to [References](#)), provides a review, examples, and a discussion of the advantages and disadvantages of different approaches to biological control of weeds, such as classical, augmentative, inundative, or conservation approaches.

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## **Risk Analysis of Biological Control Agents of Weeds**

The aim of host specificity and other pre-release studies of a proposed biological control agent is to produce a body of information for regulatory authorities to perform an ecological risk analysis of the potential for direct damage to native non-target plant species and negative economic impacts following release of the control agent. Risk analysis consists of three elements: hazard identification, analysis of exposure, and analysis of probability. Hazard identification is achieved through the host specificity testing where the different life stages of the proposed biological control agent that pose the threat are identified and the agent's physiological host range is described. Analyses of exposure and probability are based on the predicted field host range following release and the predicted actual damage to non-target species.

The physiological host range of a species is the absolute limit of its host range and is genetically determined. The field host range is the subset of hosts used by a species following its release into the environment and will vary with availability of hosts (e.g., geographic allopatry, host synchrony), genetic variation in host vulnerability (e.g., defense chemicals), and the behavior and physiology of the control agent. The physiological host range can be defined using no-choice

or starvation tests in which a proposed biological control agent is exposed to a non-target plant which must be utilized, or the agent dies. Information on the field host range is predicted from results obtained during choice tests in the laboratory and in the field. Based on the results of all tests and other behavioral and life history observations, predictions are made on the likelihood that a potential agent will damage a particular plant or group of plants in the environment it is to be released.

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## References

For more information about biological control of weeds, refer to the following listed references as well as those listed in Biological Control of Weeds in [Appendix F](#).

Charudattan, R.; Walker, H.L., eds. 1982. Biological Control of Weeds with Plant Pathogens. New York, NY: John Wiley & Sons, Inc.

Hoddle, M.S. 2004. Restoring balance: Using exotic species to control invasive exotic species. Conservation Biology 18: 38-49.

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Van Dreische, R.; Hottle, M; Center, T. 2008. Control of Pests and Weeds by Natural Enemies: An Introduction to Biological Control. Blackwell Publishing Ltd.

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



# Identification and Characterization of Agent

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## Contents

Introduction.....	9-1
Identification and Characterization of Proposed Biological Control Agents of Weeds.....	9-1
Approaches, Methods, and Tools for Identification and Characterization of the Agent.....	9-3
Taxonomic Approaches.....	9-3
Morphological Methods.....	9-3
Functional Analysis.....	9-3
Molecular or Genetic Tools .....	9-4
Challenges.....	9-4
Cryptic or Sibling Species .....	9-5
Experts .....	9-5
Reference Collections .....	9-5
References.....	9-7

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## Introduction

The *Identification and Characterization of Agents* chapter provides information that is intended for and is pertinent to all classes of agents, including arthropods, plant pathogens, and nematodes.

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## Identification and Characterization of Proposed Biological Control Agents of Weeds

Successful classical biological control of weeds requires accurate identification and characterization (biological, chemical, ecological, and phylogenetic) of the proposed biological control agent of weeds.

Target and agent identification and characterization are critical because they have the potential to do the following:

- Affect future evaluation processes.

## **Identification and Characterization of Proposed Biological Control Agents of Weeds**

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

Both petitioners and the TAG-BCAW reviewers should consider the following questions when describing an agent:

- What is the agent? (e.g., insect, mite, fungus, bacterium, virus, nematode)
- What is the life cycle of the agent?
- What other information (e.g., biological, chemical, ecological) should be known about the agent?
- Why is this information needed?
- What type of information about the identification and characterization of the agent needs to be documented in the petition?
- How can pertinent information be best conveyed to others?

There are many complex questions associated with the identification and characterization of proposed biological control agents of weeds, target weeds, and close relatives of both.

Addressing these requires highly specialized technical expertise. TAG-BCAW members who are unfamiliar with certain subject areas are encouraged to consult with experts for additional help in verifying information presented in petitions.

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

- What is the scientific name of the agent (at minimum, genus and species)? Who determined the name (i.e., taxonomic authority)? What is the level of confidence of this determination?
- How is the agent related to other taxonomic groups?
- Are the voucher specimens deposited in a national museum where they are accessible to scholars and international experts?
- Does the agent (or a closely related species) already occur in areas likely to be the targeted for agent release?
- Can the agent be differentiated below the species level and if so, is it currently resolved and uncontested?
- Can the agent's presence post-release be unambiguously confirmed (e.g., based on sampling evidence that the natural enemy is present, and feeding damage to host plants)?
- How does the agent affect the target weed (e.g., defoliation, stem or root galling, seed destruction, etc.), and is damage caused by a specific life stage of the agent?
- Are the agent's intensity and scale (individual, patch, or population level) of damage on the target weed well characterized?

## **Approaches, Methods, and Tools for Identification and Characterization of the Agent**

Researchers use a variety of approaches, methods, and tools to identify and characterize biological control agents of weeds. A critical challenge for the TAG-BCAW is determining if the approaches, methods, and tools employed confer an appropriate level of confidence in identifications and characterizations. What is the evidence? How is the evidence presented?

### **Taxonomic Approaches**

For proposed biological control agents of weeds, taxonomic identification must be provided at minimum to the species level. In some cases, identification below the species level may be necessary. For many microbial groups, sexual and asexual forms exist for a given species. Taxonomy may be based on spore forms or other reproductive characteristics. For other groups, biotypes, genotypes, strains, pathotypes, and subspecies exist. These sub-taxa are characterized in different ways; for example, some may refer to isolates. Isolates are often limited collections made from a specific location and may not represent the entire genetic diversity of the species. Accuracy in naming potential biological control agents of weeds is as important as accurate characterization (biological, chemical, ecological).

### **Morphological Methods**

Conventional morphological methods are often initially used to determine species identity. Physical attributes unique to the species are used to generate a diagnosis that can be used to distinguish the agent from close relatives once it has been released.

Attributes may include:

- Armature (spine, hairs)
- Body shape and size
- Color patterns
- Cuticle surface
- Internal Structures (stylet, reproductive organs, etc.)
- Morphometric parameters
- Physiological (spiracles, pores) structures
- Reproductive structures
- Shape and number of appendage (antennae, legs, palpi, etc.) segments

### **Functional Analysis**

Functional analysis of characteristics, such as part of the host plant utilized, feeding behavior, or infection parameters can also be incorporated into the identification of an agent. In some cases, these methods can provide a more accurate way to identify an agent.

#### **EXAMPLE**

Plant galling arthropods are typically identified from the location (on host plant) and unique morphology of the galls; this approach provides a more certain yet simple identification of the arthropod species than the morphological traits of the arthropod species itself.

Other methods for characterizing an agent involve biological or chemical characterization using a range of available tools.

## Identification and Characterization of Agent Challenges

In some cases, assessments of agent identity must extend beyond taxonomy to include the following biological and chemical characterizations:

- Biological traits such as growth on selective media (microbes), phenology, diapause;
- Enzymatic reactions and other chemical analyses;
- Host indexing for characterizing pathogens;
- Disease symptoms/damage patterns;
- Hybridization studies and evaluation of reproductive strategies employed by an agent; and
- Range location and relationship to other ecotypes.

## Molecular or Genetic Tools

Identification and characterization of an agent using molecular or genetic tools yields more definitive agent identification and can significantly enhance or reveal complex agent characterizations.

A number of techniques have been used to identify biological control agents:

- Allozymes and proteins: compare data between geographical isolates
- Amplified fragment length polymorphism (AFLP) and Selective Amplification of Microsatellite Polymorphic Loci (SAMPL): assess variation among individuals of the same species
- DNA barcoding
- DNA sequencing: differentiate species and populations
- Multiple Arbitrary Amplicon Profiling (MAAP): assess variation among individuals of the same species; includes RAPD, ISSRs, UP\_PCR, DAF techniques
- Microsatellites or Simple Sequence Repeats (SSRs): differentiate species and populations
- Polymerase chain reaction (PCR): qualitative and quantitative (qPCR) detection of species
- Restriction fragment length polymorphism (RFLP): differentiate between closely related taxa

Sequencing of diagnostic rDNA regions is now preferred as fast and accurate and decreasing costs. DNA bar-coding uses molecular markers such as COI, CO IIITS, 12S rRNA, 16S rRNA, 18S rRNA, 28S rRNA, and heat shock protein 90 (hsp90), and will distinguish most species, including cryptic species, immature stages, and unknown species. Sequencing technology is rapidly developing. Second generation techniques such as pyrosequencing, sequencing by synthesis and sequencing by ligation are vast improvements on first generation or Sanger sequencing. Third generation techniques are already under development. Molecular data provides the capacity to label agents for later verification.

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## Challenges

The TAG-BCAW is continually challenged to accurately assess the petitioners' identification and characterization of proposed biological control agents of weeds.

Species identifications or characterizations presented in petitions or test lists may be incorrect. When this occurs, implications are as follows:

- Hampering of access to published information may be due to incomplete names
- Loss of effort thus far invested toward biologically controlling weeds

## Identification and Characterization of Agent Challenges

- Misguided sense of confidence using a knowledge base that is inappropriate to the proposed biological control agent of weeds being studied
- Potential to improperly assess the risk factors

### Cryptic or Sibling Species

The presence of cryptic or sibling species in shipments of proposed agents received in containment facilities may go unnoticed, depending upon taxonomic status of the group involved. Cryptic or sibling species can cause serious problems in host plant testing, resulting in inaccurate or erroneous assessments of host range and in quarantine operations after the research has been completed and the agent has been approved for release.

In this situation, the wrong or untested species may be included in environmental releases.

#### EXAMPLE

Populations collected from a geographically distant part of a tested agent's range may prove to be a different species, even though the populations appear to be similar.

The unintentional release of cryptic or sibling species has been documented in existing North American weed biological control programs. Researchers and TAG-BCAW reviewers alike may prevent this problem by questioning whether such possibilities might exist in the reported identification process.

### Experts

What is an expert? Does the expert have the appropriate breadth of knowledge? Who are the world authorities? What is the expertise of the person who is describing the characterization? Not all experts agree, so there may be some confusion relying on them. Since world authorities are not always accessible and may lack critical knowledge of certain groups, definitive identification is not always possible. It is therefore extremely important that individuals of the species approved for release always come from the same population tested with a reference collection made of individuals from the population released (refer to section below).

### Reference Collections

Reference collections support biological control and hold specimens of proposed biological control agents that have been studied by taxonomists. In some cases, access to reference collections is limited, since collections may be located in foreign museums. Reference collections and hands-on experience may be limited to geographic regions. If these geographic regions fall outside of the main region being studied by taxonomic experts, then the experts may have limited capacity to identify exotic agents.

#### 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.

As required by [NAPPO RSPM No. 7](#), a reference collection of 10 or more individuals from the released population must be deposited in national collections. It is required that the specimens be deposited in national collections of Canada, Mexico, and the United States to ensure that the experts in North America conducting future taxonomic studies have access to and include representatives of the biological control agent. Specimens should be of good condition for DNA extraction and with clear labels indicating collection locality, latitude and longitude, date of

## Identification and Characterization of Agent Challenges

collection, name of collector, and any other pertinent information. A letter explaining that the specimens are biological control agents and are being donated to the National Collection as part of the conditions under which release will be granted should accompany the specimens when they are submitted. A copy of the letter should be included in the petition submission to TAG-BCAW.

Refer to [Table 9-1](#) for National Collections for Specimens.

**Table 9-1 National Collections for Specimens**

Country	Designated Collection Manager	Contact Information
United States of America	<b>Dr. Floyd Shockley, Acting Collections Manager</b> National Museum of Natural History Smithsonian Institution PO Box 37012, MRC 165, Room CE-419 Washington, DC 20013-7012 United States of America	Phone: 202-633-0990  Fax: 202-786-2894  Email: <a href="mailto:shockleyf@si.edu">shockleyf@si.edu</a>
Canada	<b>Dr. Owen Lonsdale, Collections Manager</b> Canadian National Collection of Insects, Arachnids and Nematodes Agriculture and Agri-Food Canada/Agriculture et Agroalimentaire Canada KW Neatby Building 960 Carling Avenue Ottawa, ON K1A 0C6 Canada	Phone: 613-759-1992  Fax: 613-759-1927  Email: <a href="mailto:owen.ionsdale@agr.gc.ca">owen.ionsdale@agr.gc.ca</a>
Mexico	<b>Christina Mayorga Martinez</b> Instituto de Biología - UNAM Departamento de Zoología 3er Circuito Exterior s/n Ciudad Universitaria Alcaldía Coyoacán 04510 Ciudad de México México	Phone: 55 22 57 17 99  Email: <a href="mailto:mayorgac@ib.unam.mx">mayorgac@ib.unam.mx</a>

## Taxonomic Authority

The petitioner must include the name of the recognized taxonomic authority in that particular taxon. If the name of the agent species is not listed, then the petitioner must include a letter from the expert taxonomist in the particular taxon so stating. Taxonomists may be reluctant to go on record with determinations unless they have a high level of confidence in their assessment. The use of incomplete names is not necessarily a limitation, since much of the assessment is based on biological information obtained after collection.

Has the taxonomic authority done historical research on the taxonomy of the relevant taxon? Minor frustrations may occur in assessing the knowledge base because of synonymies (process), revisions to new genera, and other changes in the names by which information on agents is retrieved.

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## References

For more information about identification and characterization of agents, refer to the [References](#) in Appendix F.

Abebe, E.; Mekete, T.; Thomas, W.K. 2011. A critique of current methods in nematode taxonomy. *African Journal of Biotechnology* 10: 312-323.

Gaskin, J.F.; Bon, M-C.; Cock, M.J.W.; Cristofaro, M.; De Biase, A.; De Clerck-Floate, R.; Ellison, C.A.; Hinz, H.L.; Hufbauer, R.A.; Julien, M.H.; Sforza, R. 2011. Applying molecular-based approaches to classical biological control of weeds. *Biological Control* 58:1-21.

NAPPO (North American Plant Protection Organization). 2015. Guidelines for Petition for First Release of Non-indigenous Phytophagous or Phytopathogenic Biological Control Agents. Regional Standard for Phytosanitary Measures (RSPM) No. 7. Available at: [https://www.nappo.org/application/files/5315/8352/2957/RSPM\\_07-30-07-15-e.pdf](https://www.nappo.org/application/files/5315/8352/2957/RSPM_07-30-07-15-e.pdf)

# Host Specificity Testing of Arthropods

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## Contents

Introduction.....	10-1
Host Plant Selection.....	10-2
Host Specificity Testing.....	10-2
Rigidity of Arthropod Behavior: Importance to Host Specificity Testing.....	10-3
Screening Tests .....	10-4
No-choice Plant Tests.....	10-4
Multiple-choice Plant Tests.....	10-5
Oviposition Testing.....	10-5
Field Testing.....	10-6
Experimental Design.....	10-6
Conclusion .....	10-7
References.....	10-8

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## Introduction

The *Host Specificity Testing of Arthropods* chapter provides the guidelines for host specificity testing of all arthropod species that are potential classical biological control agents of weeds. These guidelines must be read and comprehensively understood by all TAG-BCAW members that review and evaluate petitions submitted for environmental releases of new proposed biological control agents of weeds (i.e., species not previously screened and then approved for environmental release).

The sequence of tests described here is an example and is not intended to serve as a definitive checklist. Details of host specificity tests vary according to the biology and life history of each proposed species. When reviewing the methods section of a petition, evaluate if the petitioner has used an appropriate method for studying the host range of the species.



## Host Plant Selection

A strategy based on the Wapshere centrifugal method for selecting plants for host specificity testing is covered under [Test Plant Lists](#). Briese proposed a more advanced approach that uses plant molecular systematics in test plant species choice. Alternative host plant selection strategies may also be used.

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. The centrifugal testing approach may **not** be appropriate for all organisms, particularly facultative saprophytes (i.e., culturable organisms), thus criteria for selecting test plant species should be clearly stated.

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## Host Specificity Testing

Host specificity testing is the process of rigorously evaluating a proposed species to determine its ecological host range. The ecological host range consists of those plants on which all individuals of the species would consistently develop normally and complete their life cycle in nature. Host specificity testing of proposed arthropod agents begins with field studies of the species when initially discovered in the native range on the target weed.

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. This type of survey can give the researcher a preliminary indication of whether the arthropod is a generalist or specialist herbivore. Similarly, once the species is identified, a literature search will often indicate if the arthropod is likely to have too broad a host range to be considered as a proposed biological control agent of weeds. Species confirmed to be generalist feeders or those with a broad host range are dropped from further consideration. Researchers then focus their efforts on evaluating more promising potential agents under controlled environmental conditions. This evaluation determines if the proposed species' host range is limited enough to make it a feasible biological control agent.

No set protocol or standard procedure is routinely used for host specificity testing. A variety of tests are adapted or developed and implemented for each proposed species, depending upon feeding behavior or the part of the plant on which it feeds.

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

For some species, field-collected material is frequently more readily attainable and cheaper to use than trying to establish and maintain a laboratory colony. A disadvantage of using field-collected individuals is that they may be contaminated with diseases or parasitoids which could ultimately affect their behavior. Furthermore, a researcher is less able to control for age and vigor of field-collected material (e.g., females may already have laid most of their eggs at the time of collection).

Laboratory-reared individuals are easier to control and provide a better opportunity for researchers to observe the arthropod's biology and life history attributes more closely. In addition, laboratory colonies, compared to wild populations, provide a more genetically homogeneous population to work with that is free of diseases and parasites. Unfortunately,

laboratory colonies can undergo genetic bottlenecks resulting in behavioral changes or loss of vigor, particularly if the individuals are continuously reared on artificial diets or the colonies are continuously reared through numerous generations. This can be mitigated by periodically introducing field-collected individuals sourced from the original collecting location to laboratory colonies, or by maintaining separate genetic lines of the agent which are periodically crossed to sustain genetic diversity and colony vigor.

Natural populations of a proposed species may be 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 experimental subjects.

In general, proposed species selected for screening or starting a rearing colony should originate from a single and clearly defined collection site. This ensures that the population of an agent that is to be released retains the same genetic diversity and characteristics as the population that was tested.

### **Rigidity of Arthropod Behavior: Importance to Host Specificity Testing**

As arthropods select host plants and feed on them, they appear to transition smoothly from one behavior to another—walking, stopping, and feeding just as mammals do. Nonetheless, arthropod behavior is generally much less fluid than that of mammals. Insects and mites find, preliminarily assess, then select and feed on hosts in a series of discrete steps, each step mediated by a particular physical or chemical stimulus. In some cases, serio-chemical cues must be present for the arthropod to sustain its feeding behavior. If critical stimulus is lacking, then host selection or feeding may be aborted triggering a different behavior, such as flying away to search for another plant.

Not all arthropods have the same sequence of behaviors. Certain steps displayed by one species may not be displayed by another. Nevertheless, arthropod behavior is generally considered to be rigid, at least at the gender and life stage within the species level, and this rigidity constitutes an important basis for scientists' confidence in the results of host specificity tests. Under both natural (unmanipulated) field and controlled experimental test conditions, genetically determined behaviors prevent arthropods from skipping steps in order to satisfy their need for food.

Immature arthropods usually have host plants selected for them by ovipositing adults. Immature arthropods may therefore have relatively under-developed host discrimination abilities. When arthropods deposit eggs on unsuitable host plants, larvae may or may not still attempt to feed. If the host plant is of poor nutritional quality or possesses defensive chemicals, then larvae may either grow and develop for a time but fail to complete development, or they may complete development but emerge as undersized adults. The production of undersized adults can be indicative of additional deleterious physiological effects; affected adults may also be sterile or less fecund. For some species, such as many root feeders, larvae are able to seek out suitable hosts, so host selection for oviposition is likely more random.

## Screening Tests

Current practices involve a tiered approach to non-target testing. The general sequence is no-choice tests on as many test plant list species as possible, followed by multiple choice tests (agent simultaneously exposed to one or more non-target species and the target weed). Tests use standardized observations of feeding or oviposition and measures of development to compare acceptance and suitability of target and non-target plant species. Researchers should strive to conduct tests on the biologically and ecologically relevant phenological stages of test plants. Final testing of the most promising proposed biological agents of weeds is frequently conducted in field cages or as open field tests in the agents' and target weeds' country of origin.

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## No-choice Plant Tests

During the initial stage of evaluation, all species identified on the test plant list (refer to [Test Plant Lists](#)) are considered to be potentially at risk of attack by the proposed biological control agent of weeds, according to their degree of relatedness to the target weed. The first level of host specificity testing usually concentrates on quick, simple tests to evaluate the response of the proposed organism to the selected plant species. Such 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. Published strategies for preliminary testing are further discussed in [Testing Methodology for Biological Control](#).

In general, preliminary testing involves placing immatures of the potential agent on the appropriate plant part/phenological stage of the non-target species, either in a container (such as a petri dish) or enclosed on potted plants where they either feed or eventually die because the host is physiologically unacceptable. Observations of a similar number of immatures of the potential agents placed on the same part of the target weed serves as a positive control.

At the coarsest resolution of host acceptance behavior, arthropods probe test plants with mouth parts or ovipositors in an effort to discriminate between hosts and non-hosts. In general, such minor probing or tasting are not considered to be true feeding, and for all practical purposes can be regarded as nonfeeding.

Arthropods may ingest enough material on certain plants to produce droppings. However, if the life span of the organism will be extended but there is little evidence of continued development, then these accepted but unsuitable species can also be discarded as potential host plants. A final category of host-plant interaction is characterized by those plant species on which the proposed biological control agent of weeds readily feeds, grows, and appears to undergo successful development. As potentially accepted and suitable non-target hosts, risks to these plant species **must** be further evaluated using more refined assessments.

## Multiple-choice Plant Tests

The next level of host specificity testing aims to approximate more natural conditions where arthropods can freely select both the plant species and part of the plant on which to feed, complete development, or oviposit. These tests typically require a reliable supply of live, healthy, potted plants. Plant parts (at minimum, large healthy bouquets of foliage, flowers, seeds, fruit, roots, or stems) can be acceptably used under certain circumstances. Arthropod behavior is often influenced differently by constituent cues produced by intact test plants, in comparison to elicited cues produced as part of test plant damage or wounding responses. Researchers and TAG-BCAW reviewers alike must carefully consider the implications of using plant parts rather than whole plants on test results reported in petitions.

Like the no-choice tests, multiple-choice tests may indicate that although development can be successfully completed on non-target species, it may take significantly longer than for the individuals feeding on the target weed (used as a positive control). Arthropods completing development on non-target species may emerge as smaller and less reproductively fit adults than those produced on the target host.

The main purpose of these secondary feeding tests is to identify and eliminate from further testing non-target plant species that are not at risk and focus additional testing on those species that appear to support normal arthropod development.

## Oviposition Testing

Arthropods may complete normal development when confined on nontarget species. This does not necessarily mean that nontarget plants would be selected as hosts under (unmanipulated) field conditions. Furthermore, plants must first be recognized as hosts before they can be selected by ovipositing females. Oviposition preference is therefore given strong consideration in host specificity testing. Oviposition testing requires larger cages in which mated females can freely move around and choose between non-target and test weed plants. If oviposition is observed, then the plants are retained under typical field growing conditions to see if eggs will hatch, and the larvae will complete their development and produce normal adults.

Like most tests conducted under laboratory conditions, oviposition tests are subject to many limitations. The confined space in the cage or mixing of odors from the enclosed plants can confuse the female into laying eggs on what otherwise would be an unsuitable host. If the foliage of the test plant and the positive control are intertwined, then the female can accidentally deposit eggs on the wrong plant. Some arthropod species use semiochemical or tactile cues to determine if conspecific eggs have already been laid on a plant; if the number of eggs present exceeds an acceptable threshold, then the female will automatically move on to search for an oviposition site with fewer or no eggs.

Because the life span of many arthropod species is relatively short, most females deposit all of their eggs in a fairly restricted oviposition period. If the females do not find a suitable host in time, then they may resort to depositing their eggs on any available surface, on what would be considered an unsuitable host under normal conditions. Thus, the placement of an egg on a non-target plant may not be the result of intentional selection by the female. The importance of using plant material at the appropriate stage of development (phenology) and in a healthy condition for exposure to the proposed biological control agents of weeds is a critical consideration. Results of

ovipositing tests must be analyzed carefully with a sound understanding and consideration of the biology and ecology of the potential agent.

Oviposition tests are another way to eliminate additional plant species from further testing. These tests can provide useful information on the host specificity of an arthropod species, but they may **not** provide definitive answers to the question of ecological host range.

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## Field Testing

The most generally accepted, accurate information on the ecological host range of a proposed arthropod biological control agent is obtained from tests conducted under natural field conditions. Ideally, nontarget plant species are cultivated alone or in intermixed plots with the target weed in areas where a natural population of the proposed arthropod is known to be present. Arthropods from the surrounding population freely select among the test plants and the target weed for oviposition and subsequent larval development. While this is a much more definitive test, this also has its disadvantages.

Often the foreign country where the field tests are to be conducted will not allow North American plants to be introduced and planted due to the risk that they may escape and become weeds. After planting the test plants, the arthropod population in the area may be too low to allow for a realistic assessment. Sometimes this situation can be overcome by enclosing the plants in large cages, collecting the arthropods from the surrounding area (or rearing them artificially in a laboratory), and releasing relatively large numbers in the cage. This remedy may, however, reproduce the cage test biases described above.

Field testing may also include no-choice methods (e.g., releasing on critical non-target species patches without the weed present).

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## Experimental Design

Due to the wide range of variability in behavior and life cycle demonstrated by each arthropod species, using a standard design for all host testing is unrealistic. Therefore, host testing for each proposed agent requires a slightly different and customized experimental design. The design used should be critically reviewed to determine if rigorous enough experimental standards were used and if adequate quality control was followed.

Each design should be reviewed to determine adequacy and standardization of the following:

- Quality of host plant
- Quality of test arthropods
- Number of plants for each plant species tested
- Number of plant species used to represent a genus
- Number of arthropods tested
- Stage of arthropod used in the test
- Replication of tests
- Use of appropriate surrogate plant species in place of rare, threatened, or endangered native plant species
- Use of actual threatened and endangered species

## Behavioral Testing

Behavioral evaluations of the biocontrol organism can address many characteristics that may be difficult to ascertain in containment or in the country of origin. In particular, when propagules of threatened or endangered species can be difficult to acquire, evaluation of organisms using volatiles collected from threatened or endangered species *in situ* can provide useful information as part of the evaluation of host specificity. The organisms in question can be tested in olfactometers using the volatiles collected from the test plant to determine whether the organism is attracted, indifferent, or even repelled from that plant. All of the key characteristics identified in the experimental design section above apply to these studies. Because these studies are complicated and difficult to do, they should not be required for all petitions, however, they can be valuable in addressing key concerns for some threatened and endangered species.

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## Conclusion

The general process used in host specificity testing begins with field studies of the arthropod when the arthropod 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 additional plant species and identify those that are possibly at risk of attack by the proposed biological control agent of weeds. At this point in the screening process only a few plant species require additional testing. These usually require much more complex and comprehensive tests to determine which could possibly be selected by females as a suitable host and can support natural development of the arthropod.

The results of host testing are easy to evaluate if under several different test arrangements arthropods are found to feed and develop only on the target weed. In this case, there is usually no question about host specificity. It is rare that an arthropod will not feed on more than one species in no-choice tests. However, a wide variety of results are possible from choice, field, and behavioral testing and each set of results should be evaluated in their own right.

In the past, if the other plants in the host specificity tests on which the arthropod fed and developed were weeds or were accidentally introduced plants of no known value, then the release of the insect was usually approved.

However, if the nontarget plant attacked is a native species or a desirable agricultural or ornamental plant, then the researcher must demonstrate, based on phenology, climatic limits, or geographic range, why the proposed biological control agent of weeds will not utilize or not significantly damage, desirable plant species at a population level.

Therefore, the most important parts of host specificity testing to relate to TAG-BCAW and other reviewers are the petitioner's explanation and interpretation of their results, and how they can be used to extrapolate the potential damage the proposed biological control agent of weeds may cause (should the proposed biological control agent be released) to nontarget plants, especially to threatened and endangered species.



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## References

For more information about host specificity testing of arthropods, see the following listed references as well as those listed in Testing Methodology for Biological Control in [Appendix F](#).

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# Host Specificity Testing of Pathogens

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## Contents

Introduction.....	11-1
Host Specificity Testing .....	11-2
Protocols and Conditions for Host Specificity Testing .....	11-2
Physiological Conditions .....	11-2
Positive Control .....	11-3
Host Plant Selection.....	11-3
Condition of Test Plants.....	11-3
Growing Conditions.....	11-4
Inoculation Route and Method.....	11-4
Techniques Used for Rating Disease .....	11-4
Disease Symptoms on Nontarget Hosts .....	11-5
Field Trials .....	11-5
Environmental Conditions .....	11-6
Physiological Stage of Test Plants .....	11-6
Controls.....	11-6
References.....	11-6

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## Introduction

The *Host Specificity Testing of Pathogens* chapter provides the guidelines for host specificity tests of pathogens that are proposed as biological control agents of weeds. These guidelines are to be read and looked over again by TAG-BCAW members before reviewing and evaluating submitted petitions.

## Host Specificity Testing

Host specificity testing of pathogens proposed as biological control agents of weeds (hereafter referred to as pathogens) must initially take place under controlled environmental conditions. Frequently these studies are conducted in greenhouses or growth chambers and in an approved containment facility. The use of dew chambers to facilitate fungal infection under controlled conditions is commonplace.

The wide range of problems encountered in raising plants under such conditions might complicate the analysis of test results. A test under conditions that heavily favors disease is the first step to conclude that a negative is a negative. Then more detailed, quantitative experiments (statistics, etc.) are conducted to clarify what a “non-target effect” actually means. It has been shown that cuticle properties etc., can be different under artificial conditions, leaving plants more susceptible to pathogen attack, and sometimes leading to false positives. Since the cuticle is the primary barrier to infection from foliar pathogens, this may confound results. Therefore, studies conducted in a containment facility, with artificial light simulating natural light conditions (daylight, dusk/dawn), would be more approximate of natural conditions.

Many greenhouse coverings exclude ultra-violet light (UV), which when present (as under field conditions) has been shown to be detrimental to many types of pathogens. UV light is known to trigger the production of enzymes in plants that are involved in the immune response to pathogen attack. Hence, field grown plants are often pre-adapted to ward off pathogenic attack.

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## Protocols and Conditions for Host Specificity Testing

Ascertaining optimum conditions for disease of a target weed is important prior to initiating host range experiments. Although determining optimum conditions for disease may be a lengthy process, it provides the foundation for host range determinations.

Factors that need to be considered include the following:

- Inoculum application method
- 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 dew period and length of dew period
- Temperature of growth chamber after dew period

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## Physiological Conditions

The physiological condition of the test plants at the time of pathogen inoculation is 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. Part of the plant inoculated (e.g., top or bottom surface of the leaf) is also important to document.

## Positive Control

The petition may **not** necessarily contain the details of how all the preceding experiments were carried out, as long as the petition clearly shows these factors have been considered.

A positive control is one that is reasonably expected to give a positive response. When the researcher uses a positive control in the host specificity tests, the reviewer can be certain that the researcher is striving for evidence that conditions were favorable for disease and that the pathogen was functional.

In the case of a host specificity test, the target weed with a suitable number of replicates must be included in all tests. If the pathogen is a compatible agent, then the target weed will exhibit a strong reaction to the pathogen. Susceptibility of biotypes of the target weed needs to be established before host specificity testing is conducted. A representative biotype can then be used as the positive control in subsequent tests.

---

## Host Plant Selection

A strategy based on the Wapshere centrifugal method for selecting plants for host specificity testing is covered under [Test Plant Lists](#). Another approach is Berner et. al.'s mixed model analysis combining disease ratings and DNA sequences to determine the host range of a pathogen and the use of best linear unbiased prediction (BLUPs) of pathogen host range. Another method takes into account the pathogen's biology (e.g., a rust fungus with primary and alternate hosts in phylogenetically distinct families, host range models based on the known hosts of facultative saprophytes, etc.). Other systems, such as Briese's proposed plant molecular systematics method may also be used.

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.

---

## 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 (i.e., healthy), and that are in a good physiological condition should be used. Where possible, testing leaves of different ages would be advantageous within the same replicate.

The petitioner should describe the phenological stage of test plants (seedlings, vegetative buds, flowers, fruit, seeds). Watering and fertility regimes should be described, as well as the type and size of containers used. The type of soil used in the pots should be adequately described, since sterile soil can eliminate possible beneficial species that can directly affect susceptibility of plants to diseases such as *Trichoderma* spp. 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 activated enzyme systems 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, and light spectrum under which the plants were grown. If the petition clearly indicates that these factors were considered, then reporting all of these values in the petition may not be essential.

---

## **Inoculation Route and Method**

The inoculation route (through soil for root pathogens, foliar spray for aerial pathogens, etc.) and inoculation method (use of surfactants, abrasives, wounding, placing inoculated plants under plastic cover, etc.) should be described. The reviewer should be able to assess whether proper route and method of inoculation was used.

---

## **Techniques Used for Rating Disease**

Another important aspect of host specificity 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. Macroscopic and microscopic evaluation of the infection provides the researcher with a key to use to evaluate any nontarget symptoms.

Since there are qualitative factors that must be considered, the petition should clearly state what those factors are and how the researcher made the evaluations. Qualitative determinations should be confirmed by some quantitative measure. Macroscopic measurement may be as simple as determining density by counting the number of fungal 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 5 mm, 6 to 10 mm, and >10 mm, respectively). Microscopic measurement which may consist of B&H staining of leaves from initial inoculation to expression enables observation of a compatible reaction compared to a hypersensitive reaction. 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, plant species 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.

A phased approach may be used. The first phase is simply plus-and-minus to identify those plant species that are not susceptible to get an idea about amounts of disease on potentially susceptible non-targets. The second phase consists of detailed, quantitative, if possible, experiments to describe what the disease response means in terms of damage to the nontarget.

Another approach is to run side-by-side comparative studies that include a relative of the proposed biological control agent of weeds already in the U.S. or a pathogen on the nontarget that is already in the U.S. Infection may occur, but pathogen reproduction may not. This is probably an acceptable level of risk, depending on the plant species. If the plant so affected is an endangered or threatened species, then determining if the infection causes demonstrable damage to the plant, and stating this finding is desirable. Such damage might be a reduction in growth rate, a reduction in flowering, or a reduction in viability of dispersal organs, such as seeds. However, it should be noted that artificial conditions might favor leaf drop or plants that might never flower under greenhouse conditions, and hence assessments obtained under such situations would be dubious.

In another scenario, a small amount of pathogen reproduction may occur, but no or little secondary infection might take place, indicating that the pathogen would not be able to sustain a population on the nontarget species. This may be acceptable risk, but further experimentation is probably prudent in this situation. Inocula can be collected from this type of infection and used in studies to determine whether the inoculum is viable and infective. If the inoculum is not infective, then the risk is probably acceptable.

A measurable secondary infection may occur on nontarget hosts. In this situation, further experimentation is needed. If practical, then field trials (overseas is permissible) can provide insight as to whether these limited types of infection have serious environmental and ecological implications for nontarget plant hosts.

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## **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:

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

In the case of exotic pathogens, these trials will be conducted overseas within the native range of the pathogen (ideally in a location climatically similar to that of the intended release area), before approval for release from containment.

## Environmental Conditions

Environmental conditions during the growth of the test plants, at the time of inoculation, and during the evaluation period should be monitored and reported. The following factors are important to include:

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

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## Physiological Stage of Test Plants

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

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## Controls

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

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## References

For more information about host specificity testing of pathogens, refer to the following listed references as well as those listed in [Testing Methodology for Biological Control](#) in Appendix F.

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# Petitions for Field Release Format

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## Content

Introduction.....	12-2
Format for Petitions for Field Release .....	12-2
Cover Page .....	12-3
Summary .....	12-3
Introduction.....	12-3
Nature of the Problem.....	12-4
Proposed Action .....	12-4
Target Weed Information .....	12-4
Taxonomy .....	12-5
Description.....	12-5
Distribution of the Target Weed.....	12-5
Taxonomically Related Plants .....	12-5
Distribution of Taxonomically Related Plants .....	12-5
Life History of the Target Weed.....	12-5
Impacts of the Target Weed.....	12-6
Management Options.....	12-6
Biological Control Agent of Weeds Information .....	12-6
Taxonomy .....	12-6
Geographical Range.....	12-7
Known Host Specificity.....	12-7
Life History .....	12-7
Population of the Biological Control Agent Studies.....	12-8
Experimental Methodology and Analysis.....	12-8
Test Plant List .....	12-8
Design .....	12-9

Positive Controls.....	12-9
Rationale for Study Design and Execution.....	12-9
Results and Discussion .....	12-9
Summary of Results.....	12-9
Protocol for Releasing the Proposed Biological Control Agent .....	12-10
Post-release Monitoring.....	12-10
Benefits and Risks .....	12-10
Potential Environmental Impacts .....	12-11
Human Impacts .....	12-11
Economic Impacts.....	12-11
Plant Impacts.....	12-11
Abiotic and Edaphic Impacts .....	12-11
Non-plant Impacts.....	12-12
Methods for Mitigation.....	12-12
Outcome of No Action .....	12-12
Petitioner’s Conclusion.....	12-12

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## Introduction

The *Petitions for Field Release Format* chapter contains a guide for petitioners and researchers to follow when preparing a petition; and provides guidelines for TAG-BCAW members to follow when reviewing and evaluating petitions for the release of biological control agents of weeds.

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## Format for Petitions for Field Release

The petitioners and researchers will follow the format below when preparing a petition for biological control agent of weeds for field release. The information requested in this format is believed to best demonstrate the potential risks that might be involved in the proposed biological control agent of weeds release and the long-term ecological consequences of a successful release.

The format for the petition for field release contains the following main sections:

- [Cover Page](#)
- [Summary](#)
- [Introduction](#)
- [Target Weed Information](#)
- [Biological Control Agent of Weeds Information](#)
- Host Specificity Testing
- Environmental and Economic Impacts of the Proposed Release
- Pre-Release Compliance
- Post-Release Monitoring

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## Cover Page

Prepare a cover page for the petition and include the following information on the cover page:

1. Date of the petition and date of mailing.
2. Name of the petitioner, affiliation, and contact information (petitioner's address, email address, telephone number, fax number).
3. Type of petition: Proposed field release of a [*biological control agent*] of a [*target weed(s)*]. Include order, family, genus, species, author, and geographical origin.
  - A. If this petition represents additional information requested by the TAG-BCAW for a previously submitted petition, then include the TAG-BCAW assigned number of the previous petition.
  - B. If providing additional information requested by TAG-BCAW, then address only those sections indicated to be of concern to TAG-BCAW; and highlight the specific sections changed. Include a summary of the changes that were made.
4. List of locations where the studies have been conducted.
5. If part of the study has been conducted in a U.S. containment facility or facilities, then list the location of each containment facility.
6. List the containment facility or facilities the petitioner intends the proposed biological control agent of weeds to pass through prior to initial North American releases.

### NOTICE

Please be aware that pathogens will require a different type of containment facility than that used for arthropods.

7. States or Provinces for initial release in the United States.
8. Name(s) of those person(s), affiliation, and contact information (address, email address, telephone number, fax number) who will be conducting the release(s) and who will be monitoring the release(s) in the United States.
9. Confirmation of submission of specimens to each national collection as described in [Reference Collections](#). Please include a copy of the letter sent to each designation collections manager listed in [Table 9-1 National Collections for Specimens](#).

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## Summary

Include an abstract of the petition, with the following information in the summary:

- Problem
- Approach
- Main findings

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## Introduction

Include the following information in the petition's introduction:

- [Nature of the Problem](#)
- [Proposed Action](#)

## Nature of the Problem

Give a brief summary (one to two paragraphs) of the problem caused by the weed.

Consider including the following topics in the summary:

- History of introduction and/or spread of the target weed
- Pending issues about the following:
  - Agent(s)
  - Location of release
  - Taxonomy of proposed biological control agent(s) of weeds
  - Taxonomy of target weed
- Sectors affected and magnitude of program (e.g., agricultural, natural, rangeland)
- Target weed's present distribution in North America

## Proposed Action

Provide a statement of the proposed action.

**EXAMPLE** Proposed action: 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 along with additional information in subsequent petitions for field release.

Include the following under the petition's Target Weed Information:

- [Taxonomy](#)
- [Description](#)
- [Distribution of the Target Weed](#)
- [Taxonomically Related Plants](#)
- [Distribution of Taxonomically Related Plants](#)
- [Life History of the Target Weed](#)
- [Impacts of the Target Weed](#)
- [Management Options](#)

## **Taxonomy**

Include the following under Taxonomy:

- Full classification, synonymy, and common name; include order, family, genus, species.
- Cite experts who identified the target weed in North America (name, organizations, locations).
- List names of experts and publications confirming the presence of the target weed in North America. Include organizations, locations.
- Problems (and if possible, proposed resolutions) associated with the group's identification or present taxonomy.
- Origin and location of herbaria containing voucher specimens, and the date of specimen deposit. The voucher specimens referred to here are those used as representatives of the population that occur in the area where the researcher has conducted the studies.

## **Description**

Provide a general description of the target weed, complete enough that the correct identification could be made by a person encountering the weed in the field.

## **Distribution of the Target Weed**

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

- Map of native range (map).
- Areas of introduction throughout the world (map), pattern of movement, and apparent limits.
- Present distribution areas in North America (map).
- Description of the target weed's areas of potential spread in North America.
- Genetic and phenotypic variability with respect to geographic distribution.
- Habitats or ecosystems where this weed is found in North America.

## **Taxonomically Related Plants**

Include the following:

- Identify both native and non-native plants that are closely related to the target weed;
- Emphasize economically and environmentally important species; and
- Identify crops, ornamentals, and native plants including threatened and endangered species and those with cultural or aesthetic value.
  - If possible, identify how closely these plants are related to the target weed; and
  - If applicable, include identified surrogates.

## **Distribution of Taxonomically Related Plants**

Describe the distribution and habitats in North America of the taxonomically related plants identified under [Taxonomically Related Plants](#).

## **Life History of the Target Weed**

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 of the Target Weed

Indicate any and all impacts made by the target weed. Include any potential conflicts. Use the following list as a guide (not all areas listed below are applicable to all petitions):

- Beneficial uses—honeybees, forage, ground cover, fruit, etc.
- Social and recreational impacts—value as ornamentals or other.
- Impact on threatened and endangered species.
- Economic losses, including direct control costs.
- Health—poisonous, allergenic.
- Regulatory—noxious weed, restricts trade.
- Effects on native plant and animal populations.
- Impact of weed control on nontarget plants.
- Effects on ecosystem functions and ecological relationships.
- Other, e.g., aesthetic.

## Management Options

Describe options for managing the target weed.

1. Historical options—what has been done before and its 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 of Weeds Information

Include the following under Biological Control Agent Information:

### NOTICE

If a petition concerning this agent has been previously submitted, then state when and where. Be sure the previously identified TAG-BCAW concerns are adequately addressed in this submission. Highlight the changes.

- [Taxonomy](#)
- [Geographical Range](#)
- [Known Host Specificity](#)
- [Life History](#)
- [Population of the Biological Control Agent Studies](#)

## Taxonomy

Include the following under Taxonomy:

- Full classification (order, family, genus, species), synonymy, and common names. For pathogens, also include strain, race, or other specific designation (e.g. isolate number, pathovar, etc.).
- A general description of the proposed biological control agent, including helpful morphology and diagnostic characteristics that could be used to identify the agent in the field.

## Biological Control Agent of Weeds Information

- Method for distinguishing the proposed biological control agent in the field and in containment (e.g., how the proposed biological control agent will be discriminated from existing related organisms and antagonistic, cryptic, or competing species).
- Reason for choosing the proposed biological control agent.
- Taxonomic expert who identified the proposed biological control agent, including the expert's name(s), address, email address, and affiliations (with locations).
- Problems with identification or with taxonomy. Include citations referencing the issues.
- For arthropods and pathogens: the origin and locations of voucher specimens, date of specimen deposit, and how the voucher specimens are preserved.
- For arthropods and pathogens: a description of the methods used to identify life stages.
- For arthropods and pathogens: If available, DNA analysis or other molecular evaluation.
- For arthropods and pathogens: Identification/characterization information used to confirm the determination during the evaluation processes and during field colonization efforts overseas.

## Geographical Range

Include the following under Geographic Range:

- Origin of the proposed biological control agent—maps and literature citations describing the native range of the agent.
- If the proposed biological control agent is being used in other countries, then give the names of countries (ISO country names) of introduction and present range and known site efficacy.
- Expected, attainable range of the biological control agent outside the area proposed for initial release in North America—based on climatic, environmental, and vegetative preferences of the proposed biological control agent.

## Known Host Specificity

Include the following under Known Host Specificity:

- Literature records indicating other host plants that have been attacked by the proposed biological control agent.
- Field host-plant collections and observations of the biological control agent in the area of origin, including maps and data.
- Literature records known host plant specificity of organisms closely related to the biological control agent, **no** matter where the organisms occur.

## Life History

Include the following under Life History:

- Basic biology and life history of the proposed biological control agent (i.e., diapause, resting stages, life cycle, dispersal capability, overwintering, etc. from literature, field observations, and laboratory studies) in enough detail to explain the agent's role in the new environment.
- Known mortality factors.
- Extent of damage to or control of the target weed.
- Extent of damage to or impact on nontarget plants and other organisms.

## Population of the Biological Control Agent Studies

Include the following under Population of Biological Control Agent Studied:

- Geographical source(s) (origin) of the biological control agent. If available, include a map and site description. Be as accurate as possible so that the same population can be located if needed.
- How a pest-free population of the proposed biological control agent was obtained and maintained in containment if applicable.
- Biological control agent studied for the initial release is from the same population used for the studies or the biological control agent for release is identical to those tested (genetic or morphological confirmation).
- Locations of field studies, lab studies, and containment facilities.

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## Experimental Methodology and Analysis

Include the following under Experimental Methodology and Analysis section:

- [Test Plant List](#)
- [Design](#)
- [Positive Controls](#)
- [Rationale for Study Design and Execution](#)

### Test Plant List

Often a new biological control agent will require alteration of a previously approved test plant list. If this is the case, then so state and identify and explain the rationale and changes. Include the host test plant list, even if no changes were made.

#### NOTICE

If an acceptable test plant list was already prepared and reviewed by TAG-BCAW prior to preparing the petition, then so state under the Test Plant List heading. Highlight any changes made to the test plant list.

If a test plant list has not already been prepared and reviewed by TAG-BCAW prior to preparing the petition, then list the test plant(s) and provide the rationale for selecting the plants.

1. List the species of host plants on which the proposed biological control agent was tested.
2. Explain why the listed plant species were chosen to determine the potential feeding range of the proposed biological control agent.
3. Include considerations given to threatened and endangered plant species and economically important plants.
4. Refer to the required Format for Test Plant Lists. Follow this format to help ensure that host specificity of the agent is properly circumscribed.
5. Refer to [ESA Compliance - Section 7 Consultations](#) for guidelines to comply with Section 7 and to expedite any review necessary because of protected species.



## Design

Include the following under Design:

- Plant parts and growth stages of all plants tested.
- Source population of the test plants and target weed used in the test.
- Number of replicates.
- Number, stage, and age (arthropods) or phase (pathogens) of individual agents including number of males and females (arthropods), 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).
- Details of experimental setup pertaining to overall environmental conditions and study areas.
- How data were measured, recorded, and evaluated. Include statistical methods used.

## Positive Controls

Indicate, under Positive Controls, how appropriate positive controls were used in all tests. Target is present at every step in the test process.

### NOTICE

The target weed should be challenged with the proposed biological control agent before each testing procedure.

## Rationale for Study Design and Execution

Include under Rationale for Study Design and Execution, an explanation of why the test procedures were selected and how they are appropriate for the biology of the agent being tested.

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## Results and Discussion

Include the following under the Results and Discussion section:

- [Summary of Results](#)
- [Protocol for Releasing the Proposed Biological Control Agent](#)
- [Post-release Monitoring](#)
- [Benefits and Risks](#)

## Summary of Results

Provide a summary of the environmental impacts of this organism as a biological control agent and any risk associated with its release, including the following:

- Results in relation to host specificity and environmental impact.
- Relevant citations of related literature, results of host specificity testing, and field observations.
- Presenting results in a manner that supports the conclusion (tables, graphs, narratives).

## **Protocol for Releasing the Proposed Biological Control Agent**

Include the following under Protocol for Releasing the Proposed Biological Control Agent:

- Methods used to ensure pure cultures and correct identification of the proposed biological control agent to be released, including the following:
  - For arthropods: species, genus, family, and order.
  - For pathogens: strain, race, or other specific designation, e.g. isolate number, pathovar, etc. (Make consistent with above.)
  - Names, affiliations, and locations of identifiers. (Make consistent with above.)
  - Description of identification methods.
  - Problems in identification.
  - Date and place of depository containing voucher specimens.
- General release protocol to ensure the absence of natural enemies and cryptic or sibling species.
- Specific location of rearing or culturing facility.
- Intended sites (States or Provinces) for initial release. Timing of release. Release methods to be used.
  - For arthropods: if known, the number to be released.
  - For pathogens: method of preparing inoculum and inoculum concentration.

## **Post-release Monitoring**

Include the following explanation of the post-release monitoring plan under Post-release Monitoring:

- When the anticipated initial release of the proposed biological control agent(s) will occur.
- Groups to best perform monitoring.
- Monitoring techniques to determine if the proposed biological control agent(s) become established.
- Monitoring techniques to characterize the spread of the proposed biological control agent and the observed impact (if any) on target and nontarget plants or organisms.

## **Benefits and Risks**

Include the following under Benefits and Risks:

- Provide a comprehensive statement that discloses all relevant known data gaps concerning the proposed biological control agent's and the target weed's biology and ecology.
- Include the factors that would reasonably influence the probable benefits or possible negative impacts of releasing the biological control agent.
- Give your perspective, weighing the probable benefits of releasing the agent against the risks associated with the agent.

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## Potential Environmental Impacts

Include the following under the Potential Environmental Impacts section:

- [Human Impacts](#)
- [Economic Impacts](#)
- [Plant Impacts](#)
- [Abiotic and Edaphic Impacts](#)
- [Nonplant Impacts](#)
- [Methods for Mitigation](#)
- [Outcome of No Action](#)

Discuss and present a clear picture of the long-term ecological consequences that might result from the successful establishment of the proposed biological control agent in the North American environment. This discussion should go beyond the risk associated with attacks on a few closely related species of plants, as indicated in the host testing results. The discussion should look at the overall potential impact of populations of this proposed biological control agent building up on the weed in a range of habitats.

This information will be considered by APHIS in an environmental assessment (EA), before the Agency considers issuing a permit.

### Human Impacts

Include positive and negative impacts of the proposed biological control agent to humans. Discuss ways to mitigate negative effects.

**EXAMPLE** Health, recreation, aesthetics, nuisance, poison, allergens.

### Economic Impacts

Include a discussion of the potential gains and losses regarding the economic impacts of the proposed biological agent of weeds as follows:

- Aesthetic impacts
- Biological impacts
- Ecological impacts (such as on natural resources, components, structures, and functioning of affected ecosystems)
- Social impacts (such as cultural)

### Plant Impacts

Describe the value of proposed biological direct and indirect impacts (positive and negative) of the proposed biological control agent on the target plant population against impacts on nontarget plants. Cover the intended effects on the target weed and on nontargets, including potential impacts on agricultural, horticultural, and threatened and endangered plants.

### Abiotic and Edaphic Impacts

Identify the potential abiotic and edaphic impacts of the proposed biological control agent on water, soil, and air resources.

### **Non-plant Impacts**

Describe the indirect impacts (positive and negative) of the proposed biological control agent's release on organisms (**other than** plants) associated with the target weed (directly or indirectly).

### **Methods for Mitigation**

Identify the methods (management and other alternatives) to mitigate potentially undesired effects. Include how to control the proposed biological control agent if there is a problem.

### **Outcome of No Action**

Provide a statement of potential outcomes if the proposed biological control agent is **not** released.

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## **Petitioner's Conclusion**

Under the Petitioner's Conclusion section, summarize all the results from your study of this proposed biological control agent, its host testing, and your evaluation of the potential environmental impact. Offer your conclusions on the potential risks and benefits regarding the consequences of releasing this proposed biological control agent and its successful establishment in the North American environment throughout the range of its target weed and susceptible nontarget hosts. If available, then include a quantitative risk assessment.

# Petitions for Field Release Evaluation

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## Contents

Introduction.....	13-1
Evaluation Guidelines—Petitions for Field Release.....	13-2
Agency’s or Organization’s Perspective .....	13-2
Questions or Concerns During Review and Evaluation .....	13-2
Sending Petitions Out for Additional Comments .....	13-2
Petitions for Field Release Checklist .....	13-2
Recording Comments .....	13-3
Reviewer’s Overall Recommendation .....	13-3
Locating Target Weed Information .....	13-3
Locating Biological Control Agent Information.....	13-4
Locating Methods and Approaches Information .....	13-4
Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds...	13-5
Reviewer’s Overall Recommendation Checklist .....	13-12

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## Introduction

The Petitions for Field Release Evaluation chapter contains the guidelines for TAG-BCAW members reviewing and evaluating petitions for the release of biological control agents of weeds. Petitioners may use the Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds to double-check their petitions before submitting for review.

## Evaluation Guidelines—Petitions for Field Release

TAG-BCAW members will follow these evaluation guides when reviewing and evaluating petitions for field release of biological control agents of weeds. Review the information in this section before using the [Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds](#).

Petitioners may use the [Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds](#) to double-check their petitions for field release of a biological control agent prior to submitting the petitions to USDA-APHIS-PPQ.

### Agency's or Organization's Perspective

TAG-BCAW members should fully understand their Agency's or organization's current perspective on biological control activities before reviewing the petition. Refer to [Agencies and Organizations' Perspectives](#) for brief summaries.

### Questions or Concerns During Review and Evaluation

If a TAG-BCAW member reviewing a petition has questions or concerns that only the petitioner could answer or resolve, then the TAG-BCAW member should contact the petitioner directly. The TAG-BCAW member should notify the TAG-BCAW Chair of the question(s) asked and the petitioner's answer(s) so other TAG -BCAW members can be kept informed in case they have similar questions.

### Sending Petitions Out for Additional Comments

TAG-BCAW members reviewing petitions should proceed with sending petitions for additional comments as follows:

1. Establish timelines for additional reviews, keeping in mind that the time frame for reviewing and evaluating petitions is 90 days. Allow time for any subject matter expert(s) 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 out for comments.
3. Prepare a request for additional comments cover letter with the following information:
  - A. Specific guidance on which part of the petition you need the subject matter expert(s) (SME) to review.
  - B. Contact information in case the SMEs have questions or concerns. As a TAG-BCAW member, you should remain the individual who directly contacts the petitioner.
  - C. Timeline of when you expect a reply from the SME(s).

### Petitions for Field Release Checklist

Use the [Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds](#) to understand how much of this information was addressed by the petitioner and how thoroughly each topic was covered in the petition for release of the proposed biological control agent.

## Recording Comments

Each TAG-BCAW member reviewing a petition will record synthesized comments on a [TAG-BCAW Reviewer’s Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds](#). If the petition was sent for additional review(s), then list the names and subject matter expert areas in *Block E, Summary Comments* (refer to the example in [Figure B-2](#)).

## Reviewer’s Overall Recommendation

After reviewing all sections of the [Evaluation Guidelines—Petitions for Field Release](#) and completing the [Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds](#), each TAG-BCAW reviewer will then use the information to develop an overall evaluation and recommendation from their Agency’s or organization’s viewpoint on the [TAG-BCAW Reviewer’s Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds](#).

## Locating Target Weed Information

For additional references about economic botany, host specificity, plant specification systems, plant taxonomy and distribution, protected species, or submitted petitions, refer to [Table 13-1](#).

**Table 13-1 Where to Find More Information About Target Weeds**

If you need additional information or research references about:	And:	Then:
Economic Botany	→	GO to <a href="#">Economic Botany</a>
Protected Species	→	GO to <a href="#">Protected Species</a>
Host Specificity	Arthropods	GO to <a href="#">Testing Methodology for Biological Control</a>
	Pathogens	
Plant Classification Systems	→	GO to <a href="#">Plant Classification System</a>
Plant Taxonomy and Distribution	→	GO to <a href="#">Testing Methodology for Biological Control</a>
Submitted Petitions	Current list	GO to <a href="#">TAG-BCAW website</a>
	Historical list	

## Locating Biological Control Agent Information

For additional research references about biological control agents, identification and characterization of agents, or host specificity, refer to [Table 13-2](#).

**Table 13-2 Locating Biological Control Agent Information**

If you need information about:	And:	Then:
Biological control agents	→	GO to <a href="#">Biological Control Agents</a>
Identification and characterization of agents	→	GO to <a href="#">Identification and Characterization of Proposed Biological Control Agents of Weeds and References</a>
Host Specificity	Arthropods	GO to <a href="#">Host Specificity Testing of Arthropods</a> and References
	Pathogens	GO to <a href="#">Host Specificity Testing of Pathogens</a> and <a href="#">Testing Methodology for Biological Control</a>

## Locating Methods and Approaches Information

For additional information about methods and approaches most commonly used by researchers, then refer to [Table 13-3](#).

**Table 13-3 Locating Biological Control Agent Information**

If you need:	For:	And:	Then:
To review basic information or research additional references	Host specificity	Arthropods	GO to <a href="#">Host Specificity Testing of Arthropods</a> and <a href="#">Testing Methodology for Biological Control</a>
		Pathogens	
Testing methodology for biological control operations	→	→	GO to <a href="#">Testing Methodology for Biological Control</a>



## Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds

Use the criteria below to evaluate how much information was addressed by the petitioner and how thoroughly each topic was covered in the petition for field release of the proposed biological control agent of weeds.

### Cover Page

Determine if the following information is included on the cover page:

- Date of petition and date of mailing.
- Petitioner's complete name, affiliation, and contact information (address, email address, telephone number, fax number).
- Type of Petition: Proposed biological control agent is clearly identified (order, family, genus, species, author, geographical origin); and target weed is clearly identified (order, family, genus, species, author, geographical origin).
- If petition is in response to additional information requested by TAG-BCAW, then original petition's TAG-BCAW assigned number.
- If providing additional specific information requested by TAG-BCAW, then only the requested sections have been addressed and changed and highlighted; includes a summary of the changes made.
- Locations where the studies have been conducted.
- If part of the study has been conducted in a U.S. containment facility or facilities, then the location of each containment facility.

### NOTICE

Pathogens will require a different type of containment facility than used for arthropod agents.

- Containment facility or facilities petitioner intends the proposed biological control agent(s) to pass through prior to initial releases in the United States.
- States or Provinces for initial release in Canada, Mexico, and/or United States.
- Person's name, affiliation, and contact information (address, email address, telephone number) who will be conducting the release and monitoring in the United States.

### Summary

Determine whether there is an abstract of the petition with a summary of the problem, approach, and main findings.

### Introduction: Nature of the Problem and Proposed Action

TAG-BCAW Reviewers: The introduction of the petition should provide a quick overview of the nature of the problem and the petitioner's proposed action.

1. Read the petition introduction.
2. Determine if you will need additional reviews by subject matter experts within your Agency or organization in order to formulate an informative recommendation from your Agency's or organization's perspective.

**Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds**

3. If you determine that you need additional reviews, then refer to [Sending Petitions Out for Additional Comments](#).
4. If you do not need additional reviews, then review the petition following the guidelines in this checklist.
5. Use the [TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds](#).

Determine the following:

- If there are issues about the taxonomy for either the target weed or the biological control agent.
- If you need a subject matter expert to validate the taxonomic information—entomologist, biologist, botanist, pathologist.
- If there are issues about the proposed biological control agent.
- If there are issues about the location of the release.

## Target Weed Information

TAG-BCAW Reviewers: If you need to review basic information or research additional references, then refer to [Table 13-1](#).

### Taxonomy

Determine if the following information on taxonomy is provided:

- Full classification (order, family, genus, species); synonym, and common name.
- Expert who identified the target weed in North America is cited (name, organization(s), and locations).
- Experts who confirmed the target weed's presence in North America are listed (organizations and locations).
- Problems associated with the group's identification or present taxonomy and proposed resolution (if any).
- Origin and location of the herbaria containing voucher specimens and date of deposit.

### Description

Determine whether the general physical description of the target weed is complete enough that correct identification could be made by a person encountering the target weed in the field.

### Distribution of the Target Weed

TAG-BCAW Reviewers: Distribution of Target Weed section should provide you with a sense of where the target weed will spread in North America.

Determine if the following information is provided:

- Adequate description and map of native range.
- Adequate description and map of the areas of introduction throughout the world, pattern of movement, and apparent limits.
- Adequate description and map of the target weed's present distribution in North America.
- Adequate description and map of the target weed's areas of potential spread in North America.

## Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds

- Adequate description of genetic and phenotypic variability with respect to geographical distribution.
- Adequate description of the habitats or ecosystems where the weed is found in North America.

### Taxonomically Related Plants

Determine if the following information is included:

- Both native and non-native plants that are closely related to the target weed.
- Emphasizes economically and environmentally important species.
- Crops, ornamentals, and native plants including endangered or threatened species that are closely related to the target weeds. If applicable, includes identified surrogates.
- Adequate description of how closely these plants are related to the target weed.

### Distribution of Taxonomically Related Plants

Determine if there is an adequate description of the distribution and habitats in North America of those taxonomically related plants identified under [Taxonomically Related Plants](#).

If information is lacking, then add comments on the [TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds](#). Otherwise, refer to Reviewer's Overall Recommendation Checklist.

### Life History of the Target Weed

Determine if the following information is included:

- Adequate explanation of life history of the target weed.
- Adequate explanation of general biology of the target weed.
- Discussion of factors that are believed to contribute to the plant's weediness.

### Impacts of the Target Weed

Determine if information about the impacts and potential conflicts made by the target weed are provided, which is helpful in evaluating the release of the proposed biological control agent of weeds. Use the following areas of impact as a guide when reviewing a petition (not all areas listed below are applicable to all petitions).

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

### Management Options

Determine if the following information is included:

## Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds

- Historical options for managing the target weed; 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.

### NOTICE

Petitioner may **not** have information on new chemicals developed.

## Biological Control Agent Information

If you need to review basic information or research additional references about biological control agents, then refer to [Biological Control Agent Information](#).

Determine if a petition concerning this agent has been previously submitted (when and where). If a petition concerning this agent has been previously submitted, then determine whether the previously identified TAG-BCAW concerns have been adequately addressed in this latest submission and are highlighted.

### Taxonomy

Determine if the following information has been provided:

- Full classification
  - For Arthropods (order, family, genus, species) synonym and common name.
  - For Pathogens, also strain, race or other specific designation (isolate number, pathovar, etc.)
- General description of the proposed biological control agent of weeds, including morphology, and diagnostic characteristics that could be used to identify the proposed biological control agent in the field.
- Reason for choosing this proposed biological control agent.
- Taxonomic expert who identified the proposed biological control agent, expert's information (name, address, email address, and affiliations with locations).
- Problems with identification or with taxonomy, including citations and referencing issues.
- **Look for reference of an authoritative identification.**
  - Arthropods and pathogens: look for the origin and locations of voucher specimens, date of specimen deposit, how the voucher specimens are preserved.
- More detail is needed because a complex or problem taxonomic group is involved.
- Arthropods and pathogens: description of methods used to identify life stages.
- Arthropods and pathogens: If available, then DNA analysis or other molecular evaluation is included (useful when differentiation among close taxonomic groups is difficult using standard morphometric techniques).
- Arthropods and pathogens: Voucher methods are appropriate to the taxa or level of science involved.
- Arthropods and pathogens: location of the voucher specimens (recognized taxonomic institutions are the best sources for information about voucher specimens).

## Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds

- Arthropods and pathogens: Identification/characterization information was used to confirm the determination during the evaluation processes (additional collections, long-term rearing, etc.) and during field colonization efforts overseas.
- Method for distinguishing the proposed biological control agent in the field and in containment (e.g., how the agent will be discriminated from existing, related organisms from antagonistic, cryptic, or competing species).

### Geographical Range

This section should provide you with a good understanding of the potential range of the biological control agent.

Determine if the following are included:

- Adequate description of the native range of the biological control agent (maps and literature citations).
- Adequate description of the names of the countries (refer to list of [ISO country codes](#); select “Country codes” followed by “Search”) where the proposed biological control agent has been introduced, its present range, and its known efficacy are shown.
- Potential spread of the biological control agent outside the area proposed for the initial release in North America based on climatic, environmental, and vegetative parameters is shown.

### Known Host Specificity (Range)

This section should give you a good sense of other plants the agent utilizes in its native range.

Determine if the following are included:

- Literature records indicating other host plants the proposed biological control agent is known to attack.
- Field host-plant collections and observations of the biological control agent in the area of origin including maps and data.
- Literature records for known host plants of organisms closely related to the biological control agent (regardless of where the organism occurs).

### Life History

Determine if the following are included:

- Information provided is specific to the proposed biological control agent (the importance of a biological control agent’s life history will vary).
- Basic biology and life history of the proposed biological control agent are provided in enough detail to explain the proposed biological control agent’s role in the new environment.
- Known mortality factors.
- Extent of damage to or control of the target weed.
- Extent of damage to or impact on the nontarget plants and other organisms.

### 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.

## Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds

Determine if the following is included:

- Geographic source(s) (origin) of the biological control agent population is adequately described so the same population can be located if needed. A map and a description are included if available.
- How a pest-free population of the proposed biological control agent was obtained and maintained in quarantine if applicable.
- Biological control agent studied for the initial release is from the same population used for the studies or the biological control agent for release is identical to those tested (genetic or morphological confirmation).
- Locations of field studies, lab studies, and containment facilities.

### Experimental and Methodology and Analysis

The description (method and data) should be sufficient for someone who is qualified to repeat the experiment. If you need more information about methods and approaches commonly used by research or to review basic information or research additional references, then refer to [Table 13-3](#).

### Test Plant List

Determine if the following are included:

- If an acceptable test plant list was already prepared and reviewed by TAG-BCAW prior to preparing the petition, then so states.
- Identifies and explains the rationale and changes to the test plant list; changes are highlighted.
- Includes the host test plant list, even if no changes were made.
- Lists the species of host plants on which the proposed biological control agent was tested.
- Explains why the listed host plant species were chosen to determine the proposed biological control agent's potential feeding range.
- Considerations are given to threatened and endangered species and economically important plants.

### Design

Determine if the following are included:

- Petitioner provides the following information about the design of the tests.
- Part and growth stage of the plants tested.
- Source population of test plants and target weeds used in the tests.
- Number of replicates.
- Number and stage (arthropods) or phase (pathogens) of individual proposed biological control agents (number of males and number of females (arthropods), target weeds, and test plants in each replicate; 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).
- Details of the experimental setup pertaining to overall environmental conditions and study areas.
- Explanation of how the data were measured, recorded, and evaluated and statistical methods used.

### **Positive Controls**

Determine how appropriate positive controls were used in all tests (positive control is where the target is present at every step in the test process).

### **Rationale for Study Design and Execution**

Determine if there is sufficient explanation of why the test procedures were selected and how they are appropriate for the biology of the proposed biological control agent being tested.

## **Results and Discussion**

### **Summary of Results**

Determine if the following are included:

- Results discussed in relation to host specificity and environmental impact.
- Method of presentation is appropriate to show the results.
- Interpretation and significance of the results may be different between arthropods and pathogens; as a TAG-BCAW reviewer, ensure you reached the same conclusion as the petitioner through interpretation of the data.

TAG-BCAW Reviewer: If the method of presentation is not appropriate to show the results, then contact the petitioner directly to ask for the results in another way that would help you better understand the results.

### **Protocol for Releasing the Proposed Biological Control Agent**

Consider your Agency's or organization's concerns when evaluating this section of the petition for:

- Methods used for ensuring pure cultures and correct identification of the proposed biological control agent to be released.
  - Arthropods: species, genus, family, and order.
  - Pathogens: strain, race, or other specific designation, e.g., isolate number, pathovar, etc. (consistent with above)
  - Names, affiliations, and locations of identifiers (consistent with above)
  - Description of identification methods
  - Problems in identification
  - Date and place of depository containing voucher specimens
- General release protocol to ensure the absence of natural enemies and cryptic or sibling species.
- Specific location of rearing or culturing facility.
- Intended sites (State or Provinces) for initial release
  - Timing of release
  - Release methods to be used
  - Arthropods: if known, the number to be released
  - Pathogens: method of preparing inoculum and inoculum concentration

### **Post Release Monitoring**

Determine if the following information is provided:



## Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds

- Plan for post-release monitoring.
- Monitoring plan adequately describes how the spread and impact of the proposed biological control agent on the target weed and nontarget plants will be determined.
- Monitoring plan adequately describes monitoring techniques to be used to determine if the biological control agent becomes established.
- Monitoring plan adequately describes groups to best perform monitoring.

### Benefits and Risks

Determine if the following information is provided:

- Comprehensive statement of potential benefits and risks associated with the agent.
- Comprehensive statement discloses all relevant data gaps concerning the proposed biological control agent's and the target weed's biology and ecology that might reasonably influence the probable benefits or possible negative impacts of releasing the agent. Refer to [Risk Assessment](#) for additional information.

### Potential Environmental Impacts

The petitioner should present a clear picture of the long-term ecological consequences that might result from the successful establishment of the proposed biological control agent in the North American environment. The discussion should go beyond the risk associated with attacks on a few closely related species of plants, as indicated in the host specificity testing results. The discussion should look at the overall potential impact of populations of the proposed biological control agent building up on the weed in a large variety of different habitats.

### Human Impacts

Determine if the following information is provided:

- Positive and negative impacts of the proposed biological control agent of weeds on humans considered.
- Ways to mitigate any negative effects of the proposed biological control agent of weeds on humans.

### Economic Impacts

Determine if information on gains and losses regarding economic impacts of the proposed biological control agent of weeds is provided, including:

- aesthetic impacts;
- biological impacts;
- ecological impacts (such as on natural resources, components, structures, and functioning of affected ecosystems); and
- social impacts (such as cultural).

### Plant Impacts

Determine if there is sufficient information on the value of the proposed biological control agent of weeds introduction on target populations against impacts on nontarget plants, including potential impacts (positive and negative) on agricultural, horticultural, and threatened and endangered plants.



### **Non-plant Impacts**

Determine if there is information regarding positive and negative impacts (if any) of the proposed biological agent's release to non-plant organisms associated with the target weed (directly or indirectly).

### **Abiotic and Edaphic Effects**

Determine if there is information on the potential effects of the proposed biological control agent of weeds on water, soil, and air resources.

### **Method for Mitigation**

Determine if mitigative methods are identified for controlling the proposed biological control agent of weeds, should a potential problem occur.

### **Outcome of No Action**

Determine whether there is a statement of potential outcomes if the proposed biological control agent of weeds is **not** released.

### **Petitioner's Conclusion**

Determine if the following are included:

- Petitioner offers conclusions about the potential risks and benefits of releasing the proposed biological control agent of weeds.
- Discussion includes the probability of successful establishment of the proposed biological control agent in the environment throughout the range of its target weed and susceptible nontarget hosts.
- Quantitative risk assessment (a quantitative risk assessment is **not** necessary).

---

## **Reviewer's Overall Recommendation Checklist**

After you have finished reviewing the petition and completing the [Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds](#), provide an overall assessment of the following items:

- Completeness and comprehensiveness in completing the sections of the petition.
- Thoroughness in addressing your Agency's organization's concerns.
  - Were your concerns met?
  - If your concerns were **not** met, then provide a summary of your Agency's or organization's concerns and the reasoning behind them.
- Confidence level in the testing conducted and the information presented about the use of the proposed biological control agent in the environment.
  - If you have concerns regarding the risk of releasing this agent in North America, then provide specific comments.
- Recommendation of your Agency or organization.
- Provide the name, affiliation, telephone, fax, and email numbers of the reviewer.
- Provide the name(s) of other subject matter experts who provided comments.

**Reviewer's Overall Recommendation Checklist**

- Provide the name(s) of other subject matter experts.
- Sign and date the Comment Sheet.

Record your overall recommendation on the [TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds.](#)

Send the completed TAG-BCAW Reviewer's Comment Sheet for Petitions for the Release of Biological Control Agents of Weeds to the TAG-BCAW Chair through the TAG-BCAW Executive Secretary.

Mr. Ben Slager  
TAG-BCAW Executive Secretary  
USDA-APHIS-PPQ  
Email: [benjamin.h.slager@usda.gov](mailto:benjamin.h.slager@usda.gov)

# Test Plant List Format

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## Contents

Introduction.....	14-1
Test Plant Lists.....	14-1
Format for Test Plant Lists.....	14-2
Cover Page.....	14-2
Introduction to the Test Plant List.....	14-2
Target Weed Information .....	14-3
Test Plant List .....	14-5
Summary Table .....	14-8
Perspective of Risk .....	14-9
Strategy for Developing a Test Plant List .....	14-9

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## Introduction

The *Test Plant List Format* chapter provides the format for test plant lists for biological control agents of weeds in North America.

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## Test Plant Lists

Test plant lists are developed by researchers and petitioners for determining the host specificity of biological control agents of weeds in North America. The test plant list is done as a benefit to the researcher and as a tool to get input from Federal Agencies, whether there is benefit in doing research. This does not preclude the Federal Agencies from taking a look at the list included in the petitions when they come in.

A test plant list should be submitted early in the study (before the petition is submitted), when a researcher or petitioner is proposing to target a new weed for biological control.

When the petitioner submits a petition for field release of a proposed biological control agent of weeds, the petition will include an updated test plant list. The updated test plant list contains those plants actually tested based on the TAG-BCAW's evaluation of the original test plant list.

(Submitting a test plant list early will allow researchers to understand concerns that various Federal Agencies have in relation to the target and nontarget plants or other organisms.

Preliminary information about a target weed and a proposed biological control agent of weeds may be incomplete at this point in the research. The proposed test plant list may comprise the majority of the available information.

---

## Format for Test Plant Lists

The format for the test plant list is as follows:

- [Cover Page](#)
- [Introduction to the Test Plant List](#)
- [Target Weed Information](#)
- [Test Plant List](#)
- [Summary Table](#)
- [Perspective of Risk](#)

### Cover Page

Prepare a cover page for the test plant list with the following information. This information provides the TAG-BCAW with a contact point for questions and with references for tracking.

Include the following information on the cover page:

- Date test plant list is being submitted to TAG-BCAW.
- Name of the researcher or petitioner submitting test plant list, (address, email address, telephone number, and fax number), affiliation and a contact point within North America (address, email address, telephone number, and fax number).
- Name of the target weed, including its order, family, genus, species, and common name(s).
- State if the weed is targeted for biological control the first time.
- If this is not the first time the weed is targeted by this petitioner, then include the previous petition number assigned by TAG-BCAW.
- If any proposed biological control agent(s) of weeds, then identify the agent(s).
- Location.

### Introduction to the Test Plant List

Include the following information in the Introduction to the Test Plant List section:

- [Nature of the Problem](#)
- [Proposed Action](#)

#### Nature of the Problem

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

1. History of introduction and spread of the target weed.
2. 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 suitable target for control.

## Proposed Action

Include the following statement:

“This host plant list is to notify TAG-BCAW 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 are appreciated.”

## Target Weed Information

Include the following in the Target Weed Information section:

- [Taxonomy](#)
- [Description](#)
- [Distribution of the Target Weed](#)
- [Taxonomically Related Plants](#)
- [Distribution of Taxonomically Related Plants](#)
- [Life History](#)
- [Impacts](#)
- [Alternative Management Options](#)
- [Known Host Range of Proposed Biological Control Agent](#)

## Taxonomy

Include the target weed taxonomy information, as follows:

- Full classification (including order, family, genus, species), synonymy, and common name.
- The taxonomist who identified the target weed, including name(s), organization(s), and location(s).
- Problems in identification or present taxonomy.
- Origin and locations of herbaria containing the voucher specimens used as representative of the population that occurs in the area where the researcher has conducted the studies and the date of deposit.

## Description

Provide a general physical description of the target weed, complete enough so identification could be made by a person encountering the target weed in the field.

## Distribution of the Target Weed

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

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

### **Taxonomically Related Plants**

Include the following:

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

### **Distribution of Taxonomically Related Plants**

Describe the distribution and habitats in North America of the closely related (taxonomically related) plants and identified under [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 invasiveness.

### **Impacts**

Indicate any and all impacts of the target weed. Use the following list as a guide and indicate the impacts (not all areas listed below are applicable to all weeds).

- Beneficial uses: honeybees, forage, ground cover, fruit, etc.
- Cultural, social and recreation uses: value as ornamentals.
- Threatened and endangered species.
- Economic losses, including direct control costs.
- Health: poisonous, allergens.
- Regulatory: noxious weed, restricts trade.
- Effects on native plant populations.
- Weed control on nontarget plants.
- Ecosystem functions and ecological relationships.
- Other impacts (e.g., aesthetic).

### **Alternative Management Options**

Describe alternative options for managing the target weed and include the following:

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

### **Known Host Range of Proposed Biological Control Agent**

If known, then provide the following information about the proposed biological control agent:

- Name(s) and taxonomic classifications (order, family, genus, species).
- Literature records indicating other plants that have been attacked.
- Field collections and observations, including maps and data.

Test Plant List Format  
**Format for Test Plant Lists**

- Literature on host range of closely related species to the proposed biological control agent. If the host range of the proposed biological control agent of weeds is unknown, then indicate “the unknown.”

## Test Plant List

Refer to [ESA Section 7 Interagency Cooperation \(50 CFR 402\) Overview](#) for guidelines to comply and to expedite any review necessary because of protected species. Consult the U.S. Fish and Wildlife Service very early in the project.

Include the following under the Test Plant List section:

- [Categories of Test Plants](#)
  - [Category 1: Genetic types of the target weed species \(varieties, races, forms, genotypes, apomicts, etc.\) found in North America and the native range.](#)
  - [Category 2: Species in the same genus as the target weed, divided by subgenera \(if applicable\).](#)
  - [Category 3: Species in other genera in the same family as the target weed, divided by subgenera \(if applicable\).](#)
  - [Category 4: Threatened and endangered species in the same family as the target weed divided by subfamily, genus, and subgenus.](#)
  - [Category 5: Species in other families in the same order that have some phylogenetic, morphological, or biochemical similarities to the target weed.](#)
  - [Category 6: Species in other orders that have some morphological or biochemical similarities to the target weed.](#)
  - [Category 7: Any plant on which the proposed biological control agent or its close relatives have been previously found or recorded to feed and/or reproduce.](#)

## 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 and the native range.*

Include the following information:

- Genetic variability of the target weed
- Justification of genetic types selected for testing from those identified
- Inferences about effects on untested types based on selected types (if any)
- If many types exist, then justification of the number selected for testing
- References
- If references are not available, then provide an explanation

*Category 2: Species in the same genus as the target weed, divided by subgenera (if applicable).*

Include the following information:

- Detailed information on what is known about the phylogenetic relationship of the target weed to other species in the same genus
- Information on which species are most likely to be found in the same range and habitat as the target weed
- Information on any economically, environmentally, and culturally sensitive important plant species of North America found in the genus
- Justification of species selected for testing from those identified in the same genus as the target weed
- Discussion of how the selected species may or may **not** enable the petitioner to make inferences about effects on untested species
- If there are many species in the genus, then justification of the number selected for testing
- References
- If references are not available, then provide an explanation

*Category 3: Species in other genera in the same family as the target weed, divided by subgenera (if applicable).*

Include the following information:

- Detailed information on what is known about the phylogenetic relationship of the target weed to other groups (i.e., subfamilies, genera, species in the same family)
- Information on which groups (i.e., subfamilies, genera, species) are most likely to be found in the same range and habitat as the target weed
- Information on any economically, environmentally, and culturally sensitive important species found in the family in North America
- Justification of the species selected for testing from those identified as Category 3
- Discussion of how the selected species may or may **not** enable the petitioner to make inferences about effects on untested species
- If there are many genera in the family, then justification of the number selected for testing
- References
- If references are not available, then provide an explanation

*Category 4: Threatened and endangered species in the same family as the target weed divided by subfamily, genus, and subgenus.*

Include the following information in a table format:

- All known species in the same family as the target weed that are listed as threatened or endangered species or candidates, including the full scientific name (order, family, subfamily, genus, subgenus, species), status, and range in North America (refer to [References](#) for [Protected Species](#))
- All species in the same genus as the target weed that are listed by the U.S. Fish and Wildlife Service as threatened or endangered or candidates (refer to [ESA Compliance - Section 7 Consultations](#) and [Protected Species](#))
- 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



**Format for Test Plant Lists**

Mexican State lists (The Conservation Directory is a good resource to identify organizations that maintain such lists. Refer to Protected Species)

- Which groups (threatened or endangered species) are likely to be found in the same range and habitat as the target weed
- Justification of 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
- Justification of the surrogates based on phylogenetic, morphological, and/or biochemical similarities
- Discussion of how the selected species may or may not enable the petitioner to make inferences about effects on untested species
- If many threatened and endangered species exist, then justify the number selected for testing
- 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.*

Include the following information:

- Outline of families in the same order as the target weed
- Classification using Angiosperm Phylogeny Classification System and including any additional families listed
- If using an alternate system of classification, then justification of its use
- Which families in this order are most closely related to the target weed's family according to phylogenetic studies
- Discussion of any morphological or biochemical relationship the target weed or its family has with any group (i.e., family, genus, species) in this order;
- Which groups (i.e., family, genus, species) are likely to be found in the same range and habitat as the target weed
- Any economically, environmentally, culturally sensitive, important species in these groups (i.e., family, genus, species) found in North America
- Justification of the species selected for testing from those identified as being in Category 5
- Discussion of how the selected species may or may not enable the petitioner to make inferences about effects on untested species
- If there are many groups (i.e., species, genus, family), then an explanation of the number selected for testing
- References
- If references are not available, then provide an explanation

*Category 6: Species in other orders that have some morphological or biochemical similarities to the target weed.*

Include the following information:

- Discussion of any morphological or biochemical relationship the target weed has with any group (i.e., family, genus, species) in other orders
- Which groups (i.e., family, genus, species) are likely to be found in the same range and habitat as the target weed

## Format for Test Plant Lists

- Any economically, environmentally, and culturally sensitive, important plant species in these groups (i.e., family, genus, species) found in North America
- Justification of the species selected for testing from those identified as being in Category 6
- Discussion of how the selected species may or may **not** enable the petitioner to make inferences about effects on untested species
- If there are many groups (i.e., family, genus, species), then explain the number selected for testing
- References
- If references are **not** available, then provide an explanation

*Category 7: Any plant on which the proposed biological control agent or its close relatives have been previously found or recorded to feed and/or reproduce.*

Include the following information:

- Details, including the full scientific name and range of any plant on which the proposed biological control agent or its close relatives (within the same genus) have been previously found or recorded to feed and/or reproduce
- Proposal to test all species on which the proposed biological agent of weeds has been found or recorded to feed and/or reproduce
- Species selected for testing from the plants on which any close relatives have been recorded to feed
- Justification of the species selected from those identified
- Discussion of how the selected species may or may **not** enable the petitioner to make inferences about effects on untested groups
- If many species have been fed/reproduced on by the agents' close relatives, then provide an explanation of the number for testing

## 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).

### NOTICE

In actual host testing of proposed biological control agents of weeds, **not** all of these plants are expected to be used. Depending on the feeding behavior or life cycle of the agent, the researcher would select representative features similar to those on which the agent normally feeds.

### EXAMPLE

If the agent's larvae overwinter in a large tap root, then annual plants or those with fibrous roots could be disregarded.

## Perspective of Risk

Include the following under Perspective of Risk:

- Briefly discuss how the selected species should enable inferences to be made 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.

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## 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 Angiosperm Phylogeny Plant Classification System and the references listed in [Table 14-1](#).

1. Outline the families in the same order as the target weed using the Angiosperm Phylogeny Group classification.
2. Examine the placement of the target weed family in the Angiosperm Phylogeny Group classification.
3. If the Angiosperm Phylogeny Group places a new family in the order of the target weed, then consider that family when developing a list of Category 5 plants.
4. If only one of the systematists places a new family in the order of the target weed, then 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.
5. The references listed in [Table 14-1](#) may be useful in developing a list of test plants for each category. Refer to full [References](#) in Appendix F.

**Strategy for Developing a Test Plant List****Table 14-1 References for Developing a Test Plant List**

<b>Helpful References</b>	<b>Categories</b>
The Angiosperm Phylogeny Group Classification	5, 6
Andersen Horticultural Library's Sources List of Plants and Seeds. Issacson, 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
Families and Genera of Spermatophytes Recognized by the Agricultural Research Service. ARS Technical Bulletin 1796	3, 5
<a href="#">Germplasm Resources Information Network (GRIN)</a> . USDA Agriculture Research Service (ARS)	1, 2, 3
Gray's Manual of Botany. Fernald, M.L. (1970)	2, 3, 5
Manual of Cultivated Plants. Bailey, L.H (1951)	2, 3, 5
Mabberley's Plant Book. Mabberley, D.J. (2008)	2, 3, 5, 6
North American floras that include the release areas	2, 3, 5, 6
<a href="#">The PLANTS Database</a> . USDA NCRS. National Plant Data Center, Baton Rouge, LA 70874-4490 USA	2, 3
<a href="#">U.S. Fish and Wildlife Services Endangered Species Program Site</a> . List of endangered and threatened species, including candidate species	2, 3, 4

# Test Plant List Evaluation

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## Contents

Introduction.....	15-1
Evaluation Guidelines for Test Plant Lists.....	15-1
Questions or Concerns During a Review or Evaluation .....	15-2
Sending Test Plant Lists Out for Additional Comments .....	15-2
Recording Comments .....	15-3
Reviewer's Overall Recommendation .....	15-3
Target Weed Information .....	15-3
Evaluating Checklist for Test Plant Lists.....	15-3
Reviewer's Recommendation Checklist for Test Host Plant List.....	15-9

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## Introduction

The *Test Plant List Evaluation* chapter provides the evaluation guidelines and the evaluation checklist for TAG-BCAW members to use when evaluating a proposed test plant list. Petitioners may use the checklist to double-check their test plant lists prior to submitting to USDA-APHIS-PPQ.

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## Evaluation Guidelines for Test Plant Lists

When a test plant list is submitted by a petitioner or researcher, TAG-BCAW members must subject the test plant list to as critical a review as would be used for evaluating a petition. Starting a biological control program with the best possible test plant list will ultimately save valuable time, money, and patience for government and public supporters of biological control.

The test plant list you will be reviewing may be either of the following:

- Test plant list for TAG-BCAW evaluation submitted early in the study when a researcher or petitioner is proposing a new weed for biological control, but prior to submitting the petition for biological control agent of weeds (TAG-BCAW may make recommendations of plants to be used in the testing process); or

- Test plant list (of plants used in the testing process) to TAG-BCAW submitted for the first time along with the petition for biological control agent of weeds.

If the original test plant list is being submitted early in the study but prior to actually submitting the petition for biological control agent of weeds, then the TAG-BCAW reviewer will make recommendations on the target weed choice and comments on the proposed test plant list for host specificity testing. This provides the researcher or potential petitioner the opportunity to conduct additional research and field tests of test plants and to adjust the test plant list prior to submitting the actual petition for field release of biological control agent of weeds.

If the original test plant list is being submitted for the first time along with the petition for field release of biological control agent, then the petitioner must give complete information on the target weed and the biological control agent.

If the updated test plant list is being submitted along with the petition for biological control agent, then the petitioner must give complete information on the target weed and biological control agent and have made improvements to the list of plants that have actually been tested based on TAG-BCAW's evaluation of the original test plant list. Thoroughly justifying additions to the test plant list is important.

The evaluation guidelines provide a strategy for TAG-BCAW members to evaluate test plant lists to determine host specificity. The 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.

### **Questions or Concerns During a Review or Evaluation**

If a TAG-BCAW member reviewing a test plant list has questions or concerns that only the petitioner or researcher could answer or resolve, then contact the petitioner or researcher directly. The TAG-BCAW member will notify the TAG-BCAW Chair about the question(s) and the petitioner's or researcher's answers, so the other TAG-BCAW reviewers can be kept informed (as they may have similar questions).

### **Sending Test Plant Lists Out for Additional Comments**

TAG-BCAW members reviewing test plant lists should formulate sending test plant lists out for additional comments as follows:

1. Establish timelines for additional review of the test plant list, keeping in mind that the time frame for reviewing and evaluating petitions is 90 days. Allow time for any subject matter expert(s) to review and evaluate the petition, as well as time to synthesize comments and recommend action.
2. Decide whether to send the entire test plant list or a portion of the test plant list out for comments.
3. Prepare a request for additional comments cover letter with the following information:
  - A. Specific guidance on which part of the test plant list you need the subject matter expert(s) (SME) to review.
  - B. Your contact information in case the SMEs have questions or concerns. As a TAG-BCAW member, you should remain the individual who directly contacts the petitioner or researcher.

C. Timeline of when you expect a reply from the SME(s).

## Recording Comments

Each TAG-BCAW member reviewing a test plant list will use the [TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds](#), to record any comments.

If you sent the test plant list for additional review(s), then list the names of the subject matter expert(s) in *Block D, Comments/List of Additional Subject Matter Experts* of the comment sheet (refer to [Figure B-4](#)).

## Reviewer's Overall Recommendation

After reviewing all sections of and completing the [Evaluating Checklist for Test Plant Lists](#) and the [Reviewer's Recommendation Checklist for Test Host Plant List](#), the TAG-BCAW reviewer will then use the information to develop an overall evaluation and recommendation and record on the [TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds](#).

## Target Weed Information

To locate references about economic botany, protected species, host specificity, plant classification system, plant taxonomy and distribution, and previously submitted petitions, refer to [Table 13-1 Where to Find More Information About Target Weeds](#).

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## Evaluation Checklist for Test Plant Lists

Use the criteria below to evaluate the test plant lists.

### Cover Page

Determine if the following information is included:

- Date test plant list submitted to TAG-BCAW by the petitioner.
- Name of the researcher or petitioner submitting test plant list, affiliation, and contact point in North America (address, email address, telephone number, fax number).
- Target weed (order, family, genus, species), common names.
- First time this weed is targeted for biocontrol.
- If this is not the first time this weed is targeted for biological control, then lists the previous petition number assigned by TAG-BCAW.
- Proposed biological control agent(s) of weeds (if any).
- Location.

### Introduction to the Test Plant List

TAG-BCAW Reviewers: 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, determine if you will need a subject matter expert within your Agency or organization to review the test plant list in order to formulate an informative recommendation from your Agency's or organization's perspective.

If you need additional reviews, then follow the guidelines for [Sending Test Plant Lists Out for Additional Comments](#). To locate more information about target weeds, refer to [Target Weed Information](#).

### **Nature of the Problem**

Determine if the following information is included:

- Brief summary of the nature of the problem (history of introduction and spread of the target weed).
- Weed's present distribution in North America.
- Sectors affected and magnitude of program (e.g., agricultural, natural, rangeland).
- Consensus that the weed is suitable target for control.

### **Proposed Action**

Determine whether there is a brief summary of researcher's proposed action:

This host plant list is to notify TAG-BCAW 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 are appreciated.

### **Target Weed Information**

Determine the following:

- Test plant list for TAG-BCAW evaluation was submitted early in the study when a researcher or petitioner is proposing a new weed for biological control, but prior to actually submitting the petition for biological control agent of weeds (TAG-BCAW may make recommendations of plants to be used in the testing process).
- Test plant list (of plants actually used in the testing process) to TAG-BCAW submitted for the first time along with the petition for biological control agent of weeds.
- This weed has been previously targeted and there is either a previously submitted petition or a previously submitted test plant list.
- If there is a previously submitted test plant list or petition, then the current discussion of weed and test plant information is compared with previous discussions.

### **Taxonomy**

Determine if the following information is provided:

- Full classification (order, family, genus, species), synonymy, and common name.
- Classification goes far enough to address any concerns.
- There is evidence that the identification needs to go beyond species.
- Qualified taxonomist (person's name, organization(s), location(s) who identified the target weed).
- Problem(s) exist with the identification or present taxonomy (if any).
- Locations of herbaria containing the voucher specimen(s) used as representative of the population occurring in the area where the researcher conducted the studies, and date of specimen deposit.



## **Description**

Determine if a general physical description of the target weed is complete enough that identification could be made by a person encountering the weed in the field.

## **Distribution of the Target Weed**

TAG-BCAW Reviewers: This section should provide you with a sense of where the target weed is distributed and will potentially spread in North America.

Determine if the following information is included:

- Adequate description of the native range (map).
- Adequate description of the areas of introduction throughout the world, pattern of movement, and apparent limits (map).
- Adequate description of the present distribution in North America (map).
- Adequate description of the range areas of potential spread in North America (map).
- Adequate description of the genetic variability.
- Adequate description of the habitats or ecosystems where the weed is found in North America.

## **Taxonomically Related Plants**

Determine if the following information is included:

- Identification of economically and environmentally important plants that are closely related to the target weed.
- Identification of threatened and endangered plants that are closely related to the target weed.
- If possible, a description of how closely related economic, environmentally important species, and threatened and endangered species are to the target weed.

## **Distribution of Taxonomically Related Plants**

Determine if there is an adequate description of the distribution and habitats in North America of plants taxonomically related to the target weed and identified under *Taxonomically Related Plants*.

## **Life History**

Determine if the following are included:

- Explanation of the life history of the target weed.
- Explanation of the general biology of the target weed.
- Discussion of factors that contribute to the plant's invasiveness.

## **Impacts**

Determine if the following information is included:

- Information about the impacts made by target weeds is helpful in preparing a risk assessment and evaluating the risk associated with releasing the proposed biological control agent(s) of weeds. Use the following areas of impact as a guide. Not all areas will apply to all plants selected for testing.
- Beneficial uses—honeybees. Forage, ground cover, fruits etc.

### Evaluation Checklist for Test Plant Lists

- Cultural, 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.
- Ecosystem functions and ecological relationships.
- Other impacts (e.g., aesthetic)

### Alternative Management Options

Determine if the following information is included:

- Historical options—what has been done before.
- Current options—biological, chemical, cultural.
- Potential options—new herbicides, biological control agents used or released in other countries (researchers may **not** have information on new chemicals being developed).

### Known Host Range of Proposed Biological Control Agent

#### NOTICE

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

Determine if the following information is included:

- Name and taxonomic classification (order, family, genus, species) of the proposed biological control agent.
- Literature records indicating other plants that have been attacked.
- Field collections and observations, including maps and data.
- Literature on host range of closely related species to the proposed biological control agent of weeds.
- If host range of the proposed biological control agent is unknown, then stated.

### Test Plant List

Review the test plant list to see if the following categories of plants are covered. 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.) found in North America

- Genetic variability of the target weed.
- Justification of the genetic types selected for testing from those identified.
- Discussion of how selected types may or may not enable the petitioner to make inferences about effects on untested types.
- Justification of the number selected for testing in the event that many types exist.
- References.
- If references are not included, then an explanation.

**Category 2: Species in the same genus as the target weed, divided by subgenera (if applicable)**

- What is known about the phylogenetic relationship of the target weed to other species in the same genus.
- Which species are most likely to be found in the same range and habitats as the target weed.
- Economically, environmentally, and culturally sensitive important plant species of North America found in the genus.
- Justification of species selected for testing from those identified in the same genus as the target weed.
- Discussion of how the selected species may or may not enable the petitioner to make inferences about effects on untested species.
- If there are many species in the genus, then justification of the number selected for testing.
- References.
- If references are not included, then an explanation.

**Category 3: Species in other genera in the same family as the target weed, divided by subgenera (if applicable)**

- Details on what is known about the phylogenetic relationship of the target weed to other groups (i.e., subfamilies, genera, species) in the same family.
- Which groups (i.e., subfamilies, genera, species) are most likely to be found in the same range and habitat as the target weed.
- Economically, environmentally, and culturally sensitive important species found in the family in North America.
- Justification of the species selected for testing from those identified as *Category 3*.
- Discussion of how the selected species may or may not enable the petitioner to make inferences about effects on untested species.
- If there are many genera in the family, then the number selected for testing is justified.
- References.
- If references are not included, then an explanation.

**Category 4: Threatened and endangered species in the same family as the target weed divided by subfamily, genus, and subgenus**

- *Category 4* information should be in a table format.
- All known threatened or endangered species or candidates in the same family as the target weed, and includes the full scientific name (order, family, subfamily, genus, subgenus, and species), status, and range within North America (refer to references for [Protected Species](#)).
- All species in the same genus as the target weed that are listed by the U.S. Fish and Wildlife Service as threatened or endangered or candidates (refer to [ESA Compliance - Section 7 Consultations](#) and [Protected Species](#)).
- 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. *The Conservation Directory* is a good resource to identify organizations that maintain such lists. Refer to [Protected Species](#).

### Evaluation Checklist for Test Plant Lists

- Which groups (threatened or endangered species) are likely to be found in the same range and habitat as the target weed.
- Justification of 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).
- Justification of the surrogates based on phylogenetic, morphological, and/or biochemical similarities.
- Discussion of 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, then a justification of the number selected for testing.
- References of threatened and endangered lists consulted.

#### **Category 5: Species in other families in the same order which have some phylogenetic, morphological, or biochemical similarities to the target weed**

- Outline of families in the same order as the target weed.
- Angiosperm Phylogeny Classification System used (refer to [Plant Classification System](#)) and included any additional families listed.
- If an alternate system of classification used, then a justification of the selection.
- Which families in this order are most closely related to the target weed's family according to phylogenetic studies.
- Discussion of any morphological or biochemical relationship the target weed or its family has with any group (i.e., family, genus, species) in this order.
- Which groups (i.e., family, genus, species) are likely to be found in the same range and habitat as the target weed.
- Any economically, environmentally, and culturally sensitive important species in these groups (i.e., family, genus, species) found in North America.
- Justification of the species selected for testing from those identified as being in *Category 5*.
- Discussion of how the selected species may or may not enable the petitioner to make inferences about effects on untested species.
- If there are many groups (i.e., species, genus, family), then an explanation of the number selected for testing.
- References.
- If references are not included, then an explanation.

#### **Category 6: Species in other orders which have some morphological or biochemical similarities to the target weed**

- Discussion of any morphological or biochemical relationship the target weed has with any group (i.e., family, genus, species) in other orders.
- Which groups (i.e., family, genus, species) are likely to be found in the same range and habitat as the target weed.
- Any economically, environmentally, culturally sensitive important species in these groups (i.e., family, genus, species) found in North America.
- Justification of the species selected for testing from those identified as being in *Category 6*.
- Discussion of how the selected species may or may not enable the petitioner to make inferences about effects on untested species.

## Reviewer's Recommendation Checklist for Test Host Plant List

- If there are many groups (i.e., family, genus, species) then an explanation of the number selected for testing.
- References.
- If references are not included, then an explanation.

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

- Details, including the 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.
- Proposal to test all species on which the proposed biological agent of weeds has been found or recorded to feed and/or reproduce.
- Species selected for testing from the plants on which any close relatives have been recorded to feed.
- Justification of the species from those identified.
- Discussion of how the selected species may or may not enable the petitioner to make inferences about effects on untested groups.
- If many species have been fed/reproduced on by the agents' close relatives, then explained the number for testing.

## Summary Table

Determine if a table format summary is provided of all species recommended for testing in phylogenetic order (i.e., closely-to-distantly related to the target weed).

## Perspective of Risk

Determine if the following information is provided:

- Discussion of how the selected species should enable a TAG-BCAW Reviewer to make inferences about risk of attack on untested species.
- Estimation of the limits of allowable attack within the phylogenetic hierarchy of the test plant list and explanation why.
- References.
- If references are **not** included, then an explanation.

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## Reviewer's Recommendation Checklist for Test Host Plant List

Review the completed Evaluation Checklist for Test Plant Lists and comments made on the [TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds](#), as well as those comments made by other subject matter experts, and do the following:

- Recommend the test plant list either be approved or be returned for revision and additions. Provide reasons for revision and additions.
- Provide the name, affiliation, telephone, fax, and email numbers of the reviewer.
- Include the names of other subject matter experts who provided comments.
- Include your TAG-BCAW member identification number and date the Comment Sheet is submitted to TAG-BCAW Executive Secretary.

**Reviewer's Recommendation Checklist for Test Host Plant List**

Use the [TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds](#) to record whether the information in the Test Plant List is complete and comprehensive or if information is lacking completeness. If information is lacking, then record your comment(s) about any concern(s) on the Comment Sheet, too.

Send the completed TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Biological Control Agents of Weeds to the TAG-BCAW Chair through the TAG-BCAW Executive Secretary at the following address:

Mr. Ben Slager  
TAG-BCAW Executive Secretary  
USDA-APHIS-PPQ

Email: [benjamin.h.slager@usda.gov](mailto:benjamin.h.slager@usda.gov)

# ESA Compliance - Section 7 Consultations

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## Contents

Introduction.....	16-1
Endangered Species Act (ESA) .....	16-1
ESA Section 7 Interagency Cooperation (50 CFR 402) Overview.....	16-2
Informal Consultation .....	16-3
Formal Consultation .....	16-3
Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW) and Section 7 Consultations .....	16-4

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## Introduction

The *ESA Compliance - Section 7 Consultations* chapter provides an overview of Section 7 of the Endangered Species Act, U.S. Fish and Wildlife's role with Section 7 in the review of biological control agents; and TAG-BCAW and Section 7 Consultations.

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## Endangered Species Act (ESA)

The Endangered Species Act (ESA) 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 nations protecting imperiled species and habitat conservation. The ESA has served as a model for other nations to develop natural resource conservation programs and legislation. The core purpose of the ESA is to conserve endangered and threatened species and the ecosystems on which these species depend.

Section 7 of the ESA addresses interagency cooperation. TAG-BCAW reviewers and petitioners are encouraged to read the ESA and its implementing regulations under Title 50 of the Code of Federal Regulations, especially the implementing regulations for Section 7 in [50 CFR 402](#).

## ESA Section 7 Interagency Cooperation (50 CFR 402) Overview

### NOTICE

This overview is not all encompassing concerning the intricacies of the ESA Section 7 process but provides a general blueprint to help petitioners facilitate necessary compliance and expedite ESA reviews. It is not intended to constitute, nor does it convey, legal advice.

This overview covers what the Endangered Species Act (ESA) requires of Federal Agencies (in this case APHIS), and how petitioners can participate in the ESA Section 7 process. This includes the U.S. Fish and Wildlife Service's (FWS) role on TAG-BCAW. FWS can assist in minimizing the risk to natural ecosystems associated with the use of biological control agents.

Section 7(a)(1) requires all Federal Agencies, in consultation with and with the assistance of the Secretary of the Interior, to utilize their authorities to carry out programs for the conservation of endangered and threatened species.

Section 7(a)(2, 4) requires all Federal Agencies, in consultation with and with the assistance of the Secretary of the Interior, to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of any listed species, or destroy or adversely modify designated critical habitat<sup>1</sup>.

The scope of Federal actions and authorizations that fall under Section 7 is broad and includes, but is not limited to, the granting of any Federal permit (such as an importation permit, a containment permit, and a release permit), 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, non-Federal actions (in this case, the release of biological control agents into the environment) are affected whenever a Federal action is required to authorize such an action.

Consultation (Section 7(a)(3)) is the process through which the FWS advises Federal Agencies on whether their actions may affect listed species or critical habitats. The National Marine Fisheries Service (NMFS) becomes involved in consultations when a class of listed marine species or certain anadromous fish are potentially affected. This consultation is mediated through the production of a draft Biological Assessment (BA) which presents all the data in the petition that relates to host plant specificity and potential effects on threatened and endangered species (Section 7(c)). This BA is reviewed by FWS to determine if they concur with the decision by APHIS to move forward with permitting the release of the novel biological control agent.

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 species or destroy or adversely modify designated critical habitat. Federal actions that may affect species proposed for listing as threatened or endangered are reviewed in a conference review process (refer to [50 CFR 402.10](#)) that is similar to the consultation for listed species.

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

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<sup>1</sup> Critical habitat refers to an area designated as such, listed in [50 CFR 17](#) or [50 CFR 226](#).



## Informal Consultation

Informal consultation is comprised of all communications between a Federal Agency (e.g., USDA-APHIS) and FWS and NMFS, that serve to determine whether the formal consultation is necessary. (For implementing regulations, refer to [50 CFR 402.13](#).) A table of ESA-listed species and critical habitats potentially occurring in the area directly or indirectly affected by the action can be obtained through the [U.S. Fish & Wildlife Service Information for Planning and Consultation \(IPaC\)](#) online tool or from the local FWS Office.

If the proposed action may affect but is not likely to adversely affect listed species or critical habitat and the FWS concurs with the determination, then formal consultation is not necessary.

If listed species or habitats are present, then FWS can assist the Federal Agency by recommending project modifications that will avoid adverse impacts on species and their habitats.

A Federal Agency may designate a non-Federal representative (e.g., a petitioner) to conduct informal consultation or to prepare a biological assessment (discussed in [Biological Assessments and Effects Determination](#)) by giving written notice to the Director of the FWS. 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](#)).

## Formal Consultation

Should a Federal Agency determine that its anticipated actions may adversely affect a listed species or designated critical habitat, that Agency is required to initiate formal consultation ([50 CFR 402.14](#)) with the FWS and/or the NMFS. The Federal Agency must provide the FWS and/or the NMFS with a description of the proposed action and the area to be affected and must include an analysis of the action's effect on listed species and designated critical habitats. (The Federal Agency may also review potential effects to proposed species and proposed critical habitat during a conference. Refer to [50 CFR 402.10](#).)

Section 7 and the consultation regulations ([50 CFR 402.14\(d\)](#)) require that the Federal Agency is responsible for providing the "best scientific and commercial data available or which can be obtained." 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 Agency will frequently require that another party (e.g., petitioner) develop the required background information.

For formal consultation, the FWS and/or the NMFS has up to 90 days to complete formal consultation, and up to an additional 45 days to complete a biological opinion. Extension of the formal consultation period can be made with an agreement between agencies; however, this cannot exceed 60 days without the consent of the applicant. A biological opinion states whether the activity is likely to jeopardize the continued existence of the listed species and/ or is likely to destroy or adversely modify designated critical habitats ([50 CFR 402.02](#)). During these 135 days, the FWS and/or the NMFS reviews all relevant data, evaluates the current status of the listed species or critical habitats, and formulates a biological opinion.

To "jeopardize the continued existence of" means to engage in an action that is reasonably expected, directly or indirectly, to reduce appreciably the likelihood of survival and recovery of a

**Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW) and Section 7 Consultations**

listed species in the wild by reducing the reproduction, numbers, or distribution of that species ([50 CFR 402.02](#)).

To "destroy or adversely modify critical habitat" means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species ([50 CFR 402.02](#)).

In reaching these determinations, FWS and/or NMFS considers the status of the species, the environmental baseline (essentially, an evaluation of the past and present impacts within the action area 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 and/ or NMFS must develop reasonable and prudent alternatives that:

- 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 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.

The FWS and NMFS have a [Consultation Handbook](#) that provides in-depth information about ESA consultation. The FWS also provides an overview of the consultation process available at [Consultations/Overview](#).

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## **Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW) and Section 7 Consultations**

One of TAG-BCAW'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-BCAW has **no** legal mandates or authorities pertaining to the issuance of permits, TAG-BCAW's recommendations are strongly considered by decision makers.

Through the proactive participation of the FWS on the TAG-BCAW, and through the development of effective and efficient ways for the regulatory agencies to comply with Section 7 of the ESA, the problems hindering the development and implementation of biological control programs will be minimized in the future.

Part of the process for evaluating potential biological control agents of weeds is the development of a test plant list. Because the FWS TAG-BCAW member has input into the contents of the test plant list during review by the TAG-BCAW, this helps ensure that the appropriate listed plants or surrogates are included in the host specificity tests. Through the reviews of the test plant list and the final petition for release, the FWS has the opportunity to raise any known concerns and to

**Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW) and Section 7 Consultations**

provide for the exchange of necessary information which facilitates communications throughout the review of the proposed biological control agents of weeds program.

Petitioners should contact FWS regional offices as early in the evaluation process as possible, especially if the FWS TAG-BCAW member **did not** provide comments on the test plant list. (Refer to [Fish and Wildlife Service Offices Directory](#).)

# Biological Assessments and Effects Determination

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## Contents

Introduction.....	17-1
Biological Assessment (BA).....	17-1
Information That is Included in a Biological Assessment .....	17-2
Organization of Effects Determinations .....	17-5

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## Introduction

The *Biological Assessments and Effects Determination* chapter provides information about making effects determinations and guidelines for preparing a biological assessment or biological evaluation related to introducing biological control agents of weeds. This overview is not intended to constitute, nor does it convey, legal advice.

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## Biological Assessment (BA)

A biological assessment (BA) (sometimes referred to as a biological evaluation or BE) is a document prepared for compliance with the Endangered Species Act of 1973 (ESA) as amended. APHIS' responsibility, as the project proponent, is to prepare the BA. The purpose of a BA or a document with equivalent information, is to evaluate the effects of a project on listed species, species proposed for listing, and/or critical habitat, as well as to determine the need for formal consultation or conference (for proposed species) with the U.S. Fish and Wildlife Service (FWS) and/or the National Marine Fisheries Service (NMFS). The BA should present a line of reasoning that explains the proposed biological control agent of weed, its host specificity and potential efficacy, and how effect determinations were made for each threatened or endangered species or critical habitat that may be affected by the agent.

The permitted action for the release of a biological control agent of weeds will require both ESA and National Environmental Policy Act (NEPA) compliance. The BA should not be confused with the environmental assessment (EA) or the environmental impact statement (EIS), either of which may be required for NEPA compliance. The EA and EIS are designed to provide an analysis of multiple possible alternative actions on a variety of cultural, environmental, and social resources; and often use different definitions or standards, although impacts on listed species are included in the NEPA document. The BA, as described in detail below, is an analysis of the effects on listed and proposed species and their critical habitat.

APHIS' action which triggers the requirement to comply with the ESA, is the issuance of a permit authorizing release of a biological control agent of weeds into the environment. APHIS, as the Federal Agency, is responsible for preparing the BA and consulting with FWS and NFMS.

The BA includes an analysis of potential effects to listed and proposed species and critical habitat in the entire action area. In order to prepare a BA, the petitioner will need to provide to APHIS, the items listed under [Information That is Included in a Biological Assessment](#).

### **Information That is Included in a Biological Assessment**

Information that is included in a Biological Assessment (BA) for release of a proposed biocontrol control agent of weeds (BCAW) is at the discretion of APHIS, but should include the following:

1. Describe the action and the action area.
  - A. Describe the proposed release. Include information about the proposed biological control agent of weed, including host specificity and efficacy information, and the target weed as well as plant relatives in the project area.
  - B. Describe the action area. The action area is defined by regulation as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.”

For proposed biological control agents of weeds, the project area may be the entire contiguous United States. For proposed release of a BCAW in Alaska and Hawaii, the project area is usually considered to be the entire State. For release of a proposed BCAW in Guam, the action area is usually considered to be Guam and the Northern Mariana Islands.
  - C. Describe current management of the target weed in the action area.
  - D. Describe methods for release and post-release monitoring.
  - E. Include documents, such as risk assessments, research proposals, NEPA documents, or published literature. The TAG-BCAW petition is generally the most useful information for preparing the BA. It is critical to discuss the host specificity of the proposed biological control agent of weed to the target weed and plants related to the target in the action area.

2. What threatened or endangered (listed or proposed) species or critical habitat occur in the action area?

A request for a species list may be submitted to the FWS and/or NMFS; APHIS may develop the list. The [U.S. Fish and Wildlife Service Environmental Conversation Online System, Threatened and Endangered Species](#) website provides species lists and information on proposed species, including species profiles and critical habitat. A list of species that may occur in a proposed BCAW release area can be generated in the [U.S. Fish and Wildlife Service's Information Planning and Consultation \(IPAC System\)](#) online tool.

It is critical for the researcher to conduct host specificity testing on listed plants (if they can be obtained) that are related to the target weed or appropriate surrogate species. Listed species such as animals or arthropods that may utilize the target weed (or other non-target plants that might be attacked by the biological control agent) as food or nectar sources, as cover, etc., will also be considered in the BA. Do not assume that because the listed plant

does not occur in the same location as the target weed that there is no effect on a listed plant.

3. What Federally listed or proposed threatened or endangered species and critical habitat may be affected by the release of the BCAW, and what are those effects?

APHIS considers the potential consequences of the release of the proposed BCAW on the listed species and critical habitat.

Direct effects are those caused by the proposed BCAW and occur at the same time as its release.

**EXAMPLE**

A direct consequence could include feeding of the proposed BCAW on a listed plant which causes a decrease in size or reproduction of the plant.

A direct consequence could be a proposed BCAW that is ingested by and is toxic to a listed animal.

Indirect consequences are caused by the proposed BCAW and occur later in time, but are still reasonably certain to occur

**EXAMPLE**

An indirect consequence is feeding of the proposed BCAW on a non-listed plant species that provides breeding habitat, food, or shelter for a listed plant.

Direct or indirect consequences include any actions that could cause take (as defined by the ESA) to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct of even one individual of a listed species.

Cumulative effects are those effects of future State or private actions, not involving Federal actions, that are reasonably certain to occur within the target area.

It is important to consider whether the target weed is a primary physical or biological feature (sometimes referred to as primary constituent elements) of designated or proposed critical habitat for a listed species or whether the proposed BCAW could affect a physical or biological feature of the critical habitat. Physical and biological features of those that are essential to the conservation of the species. A BCAW may affect a physical or biological feature that could result in adverse modification of proposed or designed critical habitat and must be considered.

Sources of information about listed species and critical habitat can be found at the [U.S. Fish and Wildlife Service Environmental Conversation Online System](#), [Threatened and Endangered Species](#) website. Species profiles include [Federal Register](#) Notices, Recovery Plans, 5-Year Status Reviews, links to [NatureServe, Integrated Taxonomic Information System \(ITIS\)](#), and other useful information. Published literature, FWS and/or NMFS and other species experts can also provide information about connections among listed species and target weeds.

Under the ESA, effect determinations are made by APHIS for the proposed release of the BCAW on proposed and listed species and designated and proposed critical habitat.

- A. *No effect.* If APHIS determines that the proposed biological control agent of weed (BCAW) will have no effect, whether negative or positive, on any listed species or critical habitat, then no consultation by the FWS and/or NMFS is required and no

action is necessary by the FWS and NMFS. A no effect determination is not appropriate if there is a small effect (e.g., an effect on a simple individual), a beneficial effect on listed species, or even if an effect is unlikely to occur.

Even though consultation is not required for a no effect determination, a record of the determination should be maintained by APHIS for the administrative record and may be included in the NEPA documentation.

- B. *May affect, not likely to adversely affect.* APHIS makes this determination if the effect(s) of the proposed release of the biocontrol agent of weed (BCAW) on listed species or designated critical habitat is discountable, insignificant, or completely beneficial. Insignificant effects relate to the size of the impact and must never reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. Beneficial effects are positive effects without any adverse effects to species.

A may affect, not likely to adversely affect determination requires APHIS to seek concurrence from the FWS and/or NMFS.

If the FWS and/or NMFS agree with the determination, then they will send a concurrence letter to APHIS and the informal consultation is completed. If the FWS and/or NMFS do not concur with the APHIS finding, then the FWS and/or NMFS provide a written response and formal consultation is required.

- C. *May affect, likely to adversely affect.* This determination is made if the effect of the proposed BCAW on listed species or designated critical habitat is not discountable, insignificant, or completely beneficial. This determination requires APHIS to initiate the formal consultation process with the FWS and/or NMFS. The formal consultation process determines whether the proposed action is likely to jeopardize the continued existence of the listed species (jeopardy) or destroy or adversely modify critical habitat. Refer to [50 CFR 402.14\(c\)\(i-vi\)](#).

Briefly, the formal consultation is as follows:

- a. APHIS submits a biological assessment (BA), including a description of the proposed action, area affected by the action, effects of the action on listed species and proposed species and critical habitat, and relevant reports, studies, or information about the action, listed species, and critical habitat.
- b. FWS and/or NMFS then prepare a biological opinion that documents their opinion as to whether the proposed action is likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of critical habitat.
- c. If FWS or NMFS make a jeopardy determination, then APHIS would be provided with reasonable and prudent alternative actions that would avoid jeopardy. However, for release of a BCAW there is no possible reasonable and prudent alternative action, and the BCAW release proposal would be withdrawn.



- d. If incidental take<sup>1</sup> is reasonably likely to occur, then biological opinions provide an exemption for the incidental take of listed species through the issuance of an incidental take statement while specifying the extent of take allowed; the reasonable and prudent measures necessary to minimize impacts from Federal action; and the terms and conditions with which the action Agency must comply.

The formal consultation process takes a minimum of 135 days.

Effect determinations include a thorough analysis of effects using the best available science with a well-supported conclusion. Assume that the FWS and/or NMFS biologist is unfamiliar with the project. Fully explain the impact the project may have on listed species. The FWS or NMFS may ask APHIS to revisit its decision and provide more data for the conclusion if it is not adequately supported by biological information. If this request occurs, then the statutory deadlines for formal consultation have **not** begun.

## Organization of Effects Determinations

Providing the effects determination in a table followed by a narrative summary paragraph is recommended. An example of a may affect not likely to adversely affect (NLAA) is provided. When there is a no effect determination for a species, the information justifying that determination may be included in the B.A.

The example in [Table 17-1](#) documents listed species that occur in the action area and the effects analysis. The example in [Table 17-2](#) documents conservation measures. The information in the tables below is hypothetical to illustrate data needs and analysis details.

**Table 17-1 Effects Analysis and Agency Determination**

Common Name	Scientific Name	Listing Status	Critical Habitat	States of Occurrence	Impact/Effect to Breeding, Feeding, Sheltering, Migration, Nutrition, and Life Stage	Determination
Cuckoo, yellow-billed  (Western US DPS)	<i>Coccyzus americanus</i>	T	N	AZ, CA, CO, MT, NV, NM, OR, TX, UT, WA, WY	B=Yes F=No S=No M=No N=No L=All	May affect, likely to be a beneficial effect on species
Vireo, blackcapped	<i>Vireo atricapilla</i>	E	N	OK, TX	B=No F=No S=No M=No N=No	<b>No effect</b>  The species will not interact with [BCAW]
Vireo, least Bell's	<i>Vireo bellii pusilus</i>	E	Y	CA	B=Yes F=No S=No M=No N=No L=All	May affect, <b>not</b> likely to adversely affect

<sup>1</sup> Take that is incidental to, and **not** for the purpose of, the carrying out of an otherwise lawful activity.



Biological Assessments and Effects Determination  
**Biological Assessment (BA)**

Common Name	Scientific Name	Listing Status	Critical Habitat	States of Occurrence	Impact/Effect to <u>B</u> reeding, <u>F</u> eeding, <u>S</u> heltering, <u>M</u> igration, <u>N</u> utrition, and <u>L</u> ife Stage	Determination
Orcutt grass, California	Orcuttia californica	E	N	CA	Refer to Table	May affect, not likely to adversely affect

**Table 17-2 Conservation Measures for Species Identified in [Table 17-1](#)**

Common Name	Impact/Effect to <u>B</u> reeding, <u>F</u> eeding, <u>S</u> heltering, <u>M</u> igration, <u>N</u> utrition, and <u>L</u> ife Stage	Determination	Impact/Effects	Conservation Measure
Cuckoo, yellow-billed  (Western US DPS)	B=Yes L=All	May affect, likely to be a beneficial effect on species	Nesting of the western yellow-billed cuckoo has <b>not</b> been documented in riparian stands dominated by the target weed. The target weed reduces the quality of yellow-billed cuckoo habitat. Removal of the target weed would be beneficial.	None. Removal of <i>Arundo donax</i> may benefit this species and its proposed critical habitat.
Vireo, least Bell's	B=Yes L=All	May affect, <b>not</b> likely to adversely affect	Target weed used by the vireo for nesting. However, the target weed is rarely used. Reports indicate that less than 1% of nests occur in the target weed [ <i>Reference</i> ].	None
Orcutt grass, California	—	May affect, <b>not</b> likely to adversely affect	[BCAW] could feed on this plant, affecting its survival and reproduction. This plant occurs in the subfamily as the target weed. In host specificity testing, there was <b>no</b> development on species belonging to this subfamily. In addition, [BCAW] would be unable to survive on California Orcutt grass because part of the plant's life cycle occurs in vernal pools. <i>Orcuttia</i> plants grow underwater for three months or more and have evolved specific adaptations for aquatic growth. Finally, this grass species is an annual and could <b>not</b> support the life cycle of [BCAW].	Monitor for nontarget impacts at initial release sites. If nontarget impacts are observed, then report them to the FWS and/or NMFS

# TAG-BCAW Membership Directory

## Contents

Introduction.....	A-1
TAG-BCAW Membership Directory .....	A-1

## Introduction

The *TAG-BCAW Membership Directory* Appendix provides a list of TAG-BCAW members with their addresses and phone numbers.

## TAG-BCAW Membership Directory

**Table A-1 TAG-BCAW Membership Directory**

TAG-BCAW Members	Phone Number and Email Address
Dr. Sharlene E. Sing, TAG-BCAW Chair <b>USDA-Forest Service</b> Rocky Mountain Research Station Bozeman Forestry Sciences Laboratory 1648 S. 7th Avenue, MSU Campus Bozeman, MT 59717-2780	Phone: 406-312-9052  Email: <a href="mailto:sharlene.sing@usda.gov">sharlene.sing@usda.gov</a>
Mr. Ben Slager TAG-BCAW Executive Secretary <b>USDA-APHIS-PPQ</b>	Phone: 810-626-8841  Email: <a href="mailto:benjamin.h.slager@usda.gov">benjamin.h.slager@usda.gov</a>
Vacant <b>USDI-Bureau of Indian Affairs</b>	—
Mr. Seth Flanigan Lead Natural Resource Specialist - Invasive Species Division of Forestry, Rangeland, and Vegetation Resources (HQ-220) <b>USDI-Bureau of Land Management</b> 1387 S. Vinnell Way Boise, ID 83709	Phone: 208-373-4094  Email: <a href="mailto:sflanigan@blm.gov">sflanigan@blm.gov</a>
Mr. Nathan Harms <b>U.S. Army Corps of Engineers</b> 3909 Halls Ferry Road Vicksburg, MS 39180-0631	Phone: 601-634-2976  Email: <a href="mailto:Nathan.e.harms@erdc.dren.mil">Nathan.e.harms@erdc.dren.mil</a>

TAG-BCAW Membership Directory  
**TAG-BCAW Membership Directory**

<b>TAG-BCAW Members</b>	<b>Phone Number and Email Address</b>
Ms. Stephanie Wacker <b>USDI-National Park Service</b> Landscape Restoration & Adaptation Biological Resources Division Natural Resource Stewardship and Science 1201 Oakridge Dr., Suite 200 Fort Collins, CO 80525	Phone: 970-225-3505  Email: <a href="mailto:stephanie_wacker@nps.gov">stephanie_wacker@nps.gov</a>
Dr. Erica Kistner-Thomas National Program Leader <b>USDA-National Institute of Food and Agriculture</b> Institute of Food Production and Sustainability Kansas City, MO	Phone: 816-894-9283  Email: <a href="mailto:erica.kistnerthomas@usda.gov">erica.kistnerthomas@usda.gov</a>
Dr. Rob Bouchier <b>Agriculture and Agri-Food Canada</b> 5403 1 <sup>st</sup> Avenue South Lethbridge, AB T1J 4B1	Phone: 403-382-5487  Email: <a href="mailto:robert.bouchier@agr.gc.ca">robert.bouchier@agr.gc.ca</a>
Mr. Joseph Milan Biological Control Specialist <b>USDI-Bureau of Land Management</b> 3948 Development Avenue Boise, ID 83705	Phone: 208-384-3487  Email: <a href="mailto:jmilan@blm.gov">jmilan@blm.gov</a>
Mr. Ian Pearse <b>USGS-Fort Collins Science Center</b> 2150 Centre Ave. #C Ft. Collins, CO 80526	Phone: 970-226-9145  Email: <a href="mailto:ipearse@usgs.gov">ipearse@usgs.gov</a>
Mr. James Pieper NPS Integrated Pest Management (IPM) Coordinator <b>USDI-National Park Service</b> Biological Resources Division Natural Resource Stewardship and Science 1201 Oakridge Dr., Suite 200 Fort Collins, CO 80525	Phone: 970-267-2144  Email: <a href="mailto:james_pieper@nps.gov">james_pieper@nps.gov</a>
Dan Bean <b>National Plant Board Representative</b> Program Director, Biological Control Palisade Insectary Conservation Services 750 37 8/10 Road Palisade, CO 81526	Phone: 970-464-7916  Email: <a href="mailto:dan.bean@state.co.us">dan.bean@state.co.us</a>
Janelle Alleman Fish and Wildlife Biologist USDI-Fish and Wildlife Service Ecological Services 2105 Osuna NE Albuquerque, NM 87113	Phone: 505-527-0046  Email: <a href="mailto:janelle_alleman@fws.gov">janelle_alleman@fws.gov</a>
Jolene Trujillo National IPM Coordinator <b>USDI-Fish and Wildlife Service</b> National Wildlife Refuge System U.S. Fish and Wildlife Service 7333 Jefferson Ave. Suite 375 Lakewood, CO 80235	Phone: 703-859-1626  Email: <a href="mailto:jolene_trujillo@fws.gov">jolene_trujillo@fws.gov</a>
Mr. Jose Torres Subdirector de Diagnostico Fitosanitario <b>SADER SENASICA-DGSV</b> Carretera Federal Mexico-Pachuca, Km 37.5. C.P. 55740 Tecamac, Estado de Mexico Mexico 55740	Phone: (+52) (55) 5905 1000 ext.51402  Email: <a href="mailto:jose.torres@senasica.gob.mx">jose.torres@senasica.gob.mx</a>

TAG-BCAW Membership Directory  
**TAG-BCAW Membership Directory**

<b>TAG-BCAW Members</b>	<b>Phone Number and Email Address</b>
Heidi McMaster Acting Invasive Species/IPM Program Coordinator <b>USDI-Bureau of Reclamation</b> 1150 N. Curtis Rd. Boise, ID 83706	Phone: 208-860-9649  Email: <a href="mailto:hmcmaster@usbr.gov">hmcmaster@usbr.gov</a>
Dr. Sarah Ward <b>Weed Science Society of America</b> 12110 N. Pecos St. Westminster, CO 80234	Phone: 406-223-2899  Email: <a href="mailto:sarah.ward@colostate.edu">sarah.ward@colostate.edu</a>
Dr. Eric Rohrig National Science Program Coordinator – Biological Control/Imported Fire Ant <b>USDA-APHIS-PPQ Science and Technology</b> Domestic and Emergency Scientific Support	Phone: 352-890-2821  Email: <a href="mailto:eric.rohrig@usda.gov">eric.rohrig@usda.gov</a>
Dr. Patrick Moran <b>USDA-Agricultural Research Service</b> USDA-ARS WRRRC ISPH 800 Buchanan St. Albany, CA 94710	Phone: 510-559-6393  Email: <a href="mailto:patrick.moran@usda.gov">patrick.moran@usda.gov</a>
Vacant <b>EPA-Office of Pesticide Programs</b>	—

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## Contents

Introduction.....	B-1
TAG-BCAW Reviewer’s Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds .....	B-2
Purpose.....	B-3
Instructions.....	B-3
Distribution .....	B-3
TAG-BCAW Reviewer’s Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds .....	B-5
Purpose.....	B-6
Instructions.....	B-6
Distribution .....	B-6
Instructions for Completing an Application for an APHIS Permit .....	B-7
Applying for an APHIS Permit.....	B-7
PPQ Form 526, Application to Move Live Plant Pests or Noxious Weeds .....	B-7
Purpose.....	B-7
Distribution .....	B-8
PPQ Form 599, Import Label for Living Regulated Organisms (Red and White) .....	B-8
Purpose.....	B-9
Distribution .....	B-9

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## Introduction

The *Forms* Appendix contains examples of comment sheets and forms that are used for evaluating petitions, evaluating test plant lists, or applying for permits for the biological control of weeds.

**TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds**

## TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds

<b><u>Technical Advisory Group (TAG-W) Reviewer's Comment Sheet</u></b> <b><u>for Field Release for Biological Control Agents of Weeds</u></b>			
<b>Section 1: To be completed by the TAG Executive Secretary</b>		<b>Return Form to:</b> Gregg Goodman, Executive Secretary USDA, APHIS, PPQ 4700 River Rd, Unit 133 Office 4C-01.48 Riverdale, MD 20737-1236 Fax (301) 734-5269 Email: <a href="mailto:Gregg.B.Goodman@aphis.usda.gov">Gregg.B.Goodman@aphis.usda.gov</a>	
Designation Number:	Date Request Received:		
Date Sent to Reviewers:	Review Due Date:		
Due Date Revised:			
Biological Control Agent(s): _____			
Target Weed: _____			
Petitioner's Name and Affiliation: _____			
Please rate your review with one of the following categories: A = Acceptable      CM = Concerns Met UA = Unacceptable      CNM = Concerns Not Met      NE = Not Evaluated			
<hr/> <b>Section 2: To be completed by the TAG Reviewers (if needed, use additional sheets). Please change the circle to an "X" to acknowledge your choice.</b>			
<b>A. <u>Accuracy, Completeness, and Comprehensiveness:</u></b>			
Target Weed	A	UA	NE
Information Comments: _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Biological Control Agent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information Comments: _____			
Experimental Methodology	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
& Analysis Comments: _____			
Test Plant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments: _____			
Results & Discussion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments: _____			
Potential Environmental	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Impact(s) Comments: _____			
Petitioner's Conclusion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments: _____			

**Figure B-1 Technical Advisory Group (TAG-BCAW) Reviewer's Comment Sheet - Petition for Field Release of Biological Control Agents of Weeds (front)**

**TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds**

Please rate your review using one of the categories.			
	CM	CNM	NE
B. Thoroughness of Addressing Agency Concerns Comments: ____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Recommendation of Your Agency Comments: ____			
D. Comments/list of Additional specialists': ____			
Please change the circle to an "X" to acknowledge your choice.			
Recommend without reservations	<input type="radio"/>		
Recommend with reservations (Please make specific comments)	<input type="radio"/>		
Not recommended	<input type="radio"/>		
TAG #: _____			
Date: _____			
Thank you for taking the time to review this petition and document your recommendations.			

**Figure B-2 Technical Advisory Group (TAG-BCAW) Reviewer's Comment Sheet - Petition for Field Release of Biological Control Agents of Weeds (back)****Purpose**

The [TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds](#) is used by TAG-BCAW reviewers to comment, evaluate, and recommend action for petitions for field release of biological control agents of weeds.

**Instructions**

The TAG-BCAW comment sheets are used along with the [Evaluation Checklist — Petitions for Field Release of Biological Control Agents of Weeds](#) and [Evaluating Checklist for Test Plant Lists](#).

**Distribution**

The TAG-BCAW Executive Secretary distributes a fillable PDF of the TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds to TAG-BCAW members.

Forms

**TAG-BCAW Reviewer's Comment Sheet - Petition for Field Release of Proposed Biological Control Agents of Weeds**

Mr. Ben Slager  
TAG-BCAW Executive Secretary

E-mail: [benjamin.h.slager@usda.gov](mailto:benjamin.h.slager@usda.gov)

TAG-BCAW reviewers return the completed [TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds](#) to the TAG-BCAW Executive Secretary. The TAG-BCAW Executive Secretary will log in and file the recommendations, then forward to the TAG-BCAW Chair.



# TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds

## TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds

<b>Technical Advisory Group (TAG-W) Reviewer's Comment Sheet</b> <b>for Test Host Plants Lists for Biological Control Agents of Weeds</b>			
<b>Section 1: To be completed by the TAG Executive Secretary</b>		<b>Return Form to:</b> Gregg Goodman, Executive Secretary USDA, APHIS, PPQ 4700 River Rd, Unit 133 Office 4C-01.48 Riverdale, MD 20737-1236 Fax (301) 734-5269 Email: <a href="mailto:Gregg.B.Goodman@aphis.usda.gov">Gregg.B.Goodman@aphis.usda.gov</a>	
Designation Number:	Date Request Received:		
Date Sent to Reviewers:	Review Due Date:		
	Due Date Revised:		
Biological Control Agent(s):			
Target Weed:			
Petitioner's Name and Affiliation:			
Please rate your review with one of the following categories: A = Acceptable      CN = Concerns Met UA = Unacceptable      CNM = Concerns Not Met      NE = Not Evaluated			
<hr/>			
<b>Section 2: To be completed by the TAG Reviewers (if needed, use additional sheets). Please change the circle to an "X" to acknowledge your choice.</b>			
<b>A. Accuracy, Completeness, and Comprehensiveness:</b>			
	A	UA	NE
Target Weed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information Comments:			
<hr/>			
Test Plant List	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:			
<hr/>			
Summary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comments:			
<hr/>			
Perspective of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Comments:			
<hr/>			
Please rate your review using one of the categories.			
	CN	CNM	NE
<b>B. Thoroughness of Addressing</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agency Concerns Comments:			
<hr/>			
<b>C. Recommendation of Your</b>			
Agency Comments:			

Figure B-3 TAG-BCAW Reviewer's Comment Sheet for Test Host Plant Lists for Proposed Biological Control Agents of Weeds (front)

**TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds**

D. Comments/list of  
Additional specialists':

Please change the circle to an "X" to acknowledge your choice.

Recommend without reservations

☐

Recommend with reservations  
(Please make specific comments)

☐

Not recommended

☐

TAG #: \_\_\_\_\_

Thank you for taking the time to review this petition and document your recommendations.

**Figure B-4 TAG-BCAW Reviewer's Comment Sheet for Test Host Plant Lists for Proposed Biological Control Agents of Weeds (back)**

## Purpose

The [TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds](#) is used for TAG-BCAW members to comment, evaluate, and recommend action about test host plant lists.

## Instructions

[TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds](#) is used along with the [Evaluation Guidelines for Test Plant Lists](#) and [Evaluating Checklist for Test Plant Lists](#).

## Distribution

The TAG-BCAW Executive Secretary distributes a fillable PDF of the [Evaluating Checklist for Test Plant Lists](#) to TAG-BCAW reviewers.

The TAG-BCAW reviewers return their completed TAG-BCAW Reviewer's Comment Sheet for Test Host Plants Lists for Proposed Biological Control Agents of Weeds to the TAG-BCAW Executive Secretary using either of the following:

**Instructions for Completing an Application for an APHIS Permit**

Mr. Ben Slager, TAG-BCAW Executive Secretary  
**USDA-APHIS-PPQ**

Email: [benjamin.h.slager@usda.gov](mailto:benjamin.h.slager@usda.gov)

The TAG-BCAW Executive Secretary then logs and files the comments, and sends the TAG-BCAW reviewers' comment sheets to the TAG-BCAW Chair.

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## Instructions for Completing an Application for an APHIS Permit

As part of the U.S. Department of Agriculture's (USDA) overall eGovernment initiative to transform and enhance delivery of its programs, services, and information, the Animal and Plant Health Inspection Service (APHIS) launched its electronic permitting system (eFile). eFile is a web-based tool that gives customers the ability to apply for a permit, check the status, and view the application online. All PPQ permits are processed through the eFile system, however, there are two ways to apply for an APHIS permit: on-line or on paper.

### Applying for an APHIS Permit

Guidance and step-by-step instructions for obtaining regulated soil and organism permits can be found at [Regulated Organism and Soil Permits](#).

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## PPQ Form 526, Application to Move Live Plant Pests or Noxious Weeds

Download a fillable version of [PPQ Form 526, Application to Move Live Plant Pests or Noxious Weeds](#).

### Purpose

[PPQ Form 526, Application to Move Live Plant Pests or Noxious Weeds](#), is the application used to request a USDA-APHIS-PPQ permit for the following activities:

- Import plant pests, including but not limited to the following living organisms: biological control organisms, earthworms, honeybees and other pollinating bees, insects, mites, nematodes, slugs, snails; microbes pathogenic to plants or invertebrates; parasitic plants, or other Federal noxious weeds into the environment of the United States.
- Ship interstate any of the above with the exception of a few no permit required cases (honeybees and organisms identified in [7 CFR 330](#)).
- Release any organisms including those for biological control purposes, from containment into the environment of the United States.

### NOTICE

Do not use this form (PPQ Form 526) for genetically engineered plants or genetically engineered plant pests.

Use APHIS Form 2000 for genetically engineered plants or genetically engineered plant pests.

## Distribution

Refer to [Instructions for Completing an Application for an APHIS Permit](#).

## PPQ Form 599, Import Label for Living Regulated Organisms (Red and White)

Figure B-5 Example of PPQ Form 599, Import Label for Living Regulated Organisms (red and white shipping label) (adhesive label issued before September 9, 2014, but valid until expiration date on permit)

Figure B-6 PPQ Form 599, Import Label for Living Regulated Organisms (red and white label) Mailing or Shipping (new plain paper (nongummed) or special adhesive (gummed) label issued starting September 9, 2014)

## Purpose

[PPQ Form 599, Import Label for Living Regulated Organisms \(Red and White\)](#), is a red and white shipping label issued by the USDA-APHIS-PPQ Permit Unit to denote shipping or mailing regulated articles into the U.S. The PPQ Form 599 label designates a package as containing living organisms regulated under an APHIS PPQ permit (refer to [PPQ Form 526, Application to Move Live Plant Pests or Noxious Weeds](#)). The organisms (plant pests or pathogens) usually fall into one of the following categories: bees, biological control agents, live insects, noxious weeds, parasitic plants, plant pathogens, plant pests, select agents, snails, or worms.

For shipping or mailing, the red and white label includes the APHIS permit number and the address where inspection is authorized. Inspections usually (but not always) occur at a PPQ plant inspection station. The label authorizes movement of a secure and intact package to the address on the label.

APHIS is phasing in the use of printable plain paper (nongummed) labels for permitted Plant Protection and Quarantine imports that require a label. The new, plain paper labels are the eFile system's default choice. The plain paper labels are sent via email to the permittee as a PDF attachment. The permittee may then distribute permit labels to shippers by email or regular mail. The shipper is instructed to print the plain paper label using a color printer, and then attach the label to the package exterior using clear tape. The permittee may request and be issued plain paper labels, special gum labels, or a combination of both.

The permittee needs to specify either plain paper labels or special gum labels for each request. There may be a slight change in appearance of the plain paper (nongummed) labels, because printer ink may vary in color and intensity and the labels will be affixed using clear tape. If there is a failure to print the labels in color, then shipments can and will be refused and/or ordered destroyed.

## Distribution

PPQ Form 599, Import Label for Living Regulated Organisms (Red and White Label), is distributed by the USDA-APHIS-PPQ Pest Permitting Branch.

# NAPPO Standard

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## Contents

Introduction.....	C-1
Requirements .....	C-1

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## Introduction

The *NAPPO Standard* Appendix provides the North American Plant Protection Organization (NAPPO) standard that may be used as a reference. This document is a regional (North American) plant protection standard agreed upon by Canada, Mexico, and the United States, outlining the minimum requirements for information to be included in a petition to regulatory officials. Additional information may be required by regulatory officials in one or more of these countries.

### NOTICE

Petitioners in Canada and Mexico are required to follow the NAPPO Standard, RSPM 7, which is similar to the format in [Format for Petitions for Field Release](#) and [Format for Test Plant Lists](#).

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## Requirements

Each petition should be preceded by a title page, a table of contents, and a summary or abstract.

Petitioners from the United States will follow the procedures as stated in [Format for Petitions for Field Release](#) and [Format for Test Plant Lists](#). Submitting a TAG-BCAW petition (following the procedures as stated in [Petitions for Field Release Format](#) of this manual) satisfies the NAPPO standard for proposed environmental releases in the U.S.

Petitioners from Canada and Mexico will follow the NAPPO standard, RSPM 7 Guidelines for Petition for First Release of Non-indigenous Phytophagous or Phytopathogenic Biological Control Agents from the [NAPPO Regional Standards for Phytosanitary Measures. RSPM 7](#).

# Fish and Wildlife Service Offices Directory

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## Content

Introduction.....	D-1
U.S. Fish and Wildlife Service (FWS) Regional Offices.....	D-1

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## Introduction

The *Fish and Wildlife Service Offices Directory* Appendix directs users to a list of U.S. Fish and Wildlife Service (FWS) Regional Offices and contact information.

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## U.S. Fish and Wildlife Service (FWS) Regional Offices

Petitioners and researchers may contact the appropriate U.S. FWS Regional Office early in the petition process for advice and input regarding Section 7 of the Endangered Species Act. For an up-to-date list, please refer to the following webpage: [Ecological Services | Contact Us | U.S. Fish & Wildlife Service](#).

# Plant Classification System

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## Contents

Introduction.....	E-1
Plant Classification System.....	E-1
References.....	E-2

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## Introduction

The *Plant Classification System* Appendix provides information about the plant classification systems that are in use today.

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## Plant Classification System

The risk of nontarget impacts is examined through host specificity testing of the proposed biological control agent of weeds. Post-release monitoring of control agents has shown that the highest level of risk is to those plants most closely related, in terms of phylogenetic (evolutionary) relatedness, to the target plant (Pemberton 2000). Construction of the host test plant list gives higher emphasis to those plants closely related to the target weed and less emphasis to more distantly related non-target plants. This method of test plant list construction is called the “Wapshere method” (after Wapshere (1974) who first proposed the method) or the “centrifugal phylogenetic method.” Two things are required for this method to be effective: accurate identification of the target weed and an accurate understanding of the target’s phylogenetic relationship with nontarget plants.

The field of plant taxonomy and systematics has undergone major changes in the last 30 years. The most profound is the development of molecular taxonomy and a corresponding systematics that has led to a large source of new data for use in phylogenetic analyses and a better understanding of the evolutionary relationships among plant groups.

Changes in nomenclature and modification of phylogenetic hypotheses are ongoing. As a result, the best sources of current taxonomic nomenclature and plant phylogenies are Web sites that are updated frequently.

For the current nomenclature of a target weed, petitioners should use accurate databases and consult with a plant taxonomist.



The use of molecular methods has also resulted in changes to our understanding of the evolutionary relationships among plants. In particular, molecular data have identified a number of traditional taxonomic groups that are polyphyletic and comprised of unrelated molecular lineages, that is, groups that have similar morphology due to convergent evolution but do not share a most recent ancestor. Conversely, some groups that appear morphologically dissimilar have been found to be closely related. A recent example of a major change to a traditional family is the breakup of the family Scrophulariaceae. Previously, this family contained a number of weedy genera, such as *Linaria*, *Verbascum*, and [now] *Plantago*. Recently, based on molecular data, it has been shown to have been composed of at least five distinct monophyletic groups (Olmstead et al. 2001). While the family Scrophulariaceae still exists, it is now comprised of only a few small genera, as each of the monophyletic groups has been merged with other families to which they are more closely related.

A recent description of the phylogeny of plant families based on the latest molecular data was published by Haston et al. (2007) where an evolutionary tree illustrating the phylogeny was presented. Petitioners should consult this paper to learn what families are most closely related to the target weed's family.

Any changes and updates to Haston et al. are posted on [Angiosperm Phylogeny Website](#), a website maintained by Peter Stevens of the Missouri Botanical Garden. Petitioners are to check this website and cite as follows:

“Stevens, P. F. (date of access). Angiosperm Phylogeny Web site. Version #, date of last update.”

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## Contents

Introduction.....	F-2
General References .....	F-2
Articles.....	F-2
Books .....	F-3
Websites .....	F-4
Biological Control Agents.....	F-4
Articles.....	F-4
Audiovisual Materials.....	F-5
Books and Periodicals.....	F-5
Recognized Taxonomic Institutions.....	F-6
Websites .....	F-7
Biological Control of Weeds.....	F-7
Articles.....	F-7
Books .....	F-8
Website.....	F-9
Economic Botany.....	F-10
Books .....	F-10
Websites .....	F-11
Plant Taxonomy and Distribution .....	F-11
Articles.....	F-11
Audiovisual Materials.....	F-11
Books .....	F-11
Websites .....	F-12
Protected Species .....	F-13
Websites .....	F-13

Risk Assessment.....	F-13
Articles.....	F-13
Books .....	F-15
Websites .....	F-16
Testing Methodology for Biological Control.....	F-16
Articles.....	F-16
Books .....	F-18
Websites .....	F-18

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The *References* Appendix contains a list of reading material suggested by the Technical Advisory Group for Biological Control Agents of Weeds (TAG-BCAW).

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## Recognized Taxonomic Institutions

### United States

USDA, ARS, Plant Sciences Institute  
Systematic Entomology Laboratory  
Bldg. 005, Room 133, BARC-West  
10300 Baltimore Blvd.  
Beltsville, MD 20705-2350

USDA, ARS  
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# Glossary

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## Introduction

Use this glossary to find the meaning of specialized abbreviations, acronyms, terms, and words used in this manual.

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## Definitions, Terms, and Abbreviations

**abiotic.** Not pertaining to life or specific life conditions.

**APHIS.** Animal and Plant Health Inspection Service, USDA.

**ARS.** Agricultural Research Service, USDA.

**BCDC.** Biological Control Documentation Center.

**BIA.** Bureau of Indian Affairs, USDI.

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

**biological control agent.** A natural enemy, antagonist, or competitor, or other organism, used for pest control (FAO Glossary, 2010; ISPM 3:1995; revised ISPM 3:2005).

**biological evaluation (BE).** A generic term for all other types of analyses (other than a biological assessment). If a listed species or critical habitat is likely to be affected, then the Agency must provide the Services (USFWS and NMFS) with an evaluation on the likely effects of the action. Often this information is referred to as the BE.

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

**biotype.** A group of organisms having the same genotype, but varying characteristics (e.g., strain differences or different physiological characteristics). The organisms sharing a specified genotype; also: the genotype shared or its distinguishing peculiarity. ([www.merriam-webster.com/dictionary](http://www.merriam-webster.com/dictionary)).

**BLM.** Bureau of Land Management, USDI.

**BR.** Bureau of Reclamation, USDI.

**CBP.** Customs and Border Protection

**CFR.** Code of Federal Regulations

**COE.** Army Corps of Engineers.

**conference.** A process which involves informal discussions between a Federal Agency and the FWS/NMFS under Section 7(a)(4) of the Act (ESA) regarding the impact of an action on proposed species or proposed critical habitat and recommendations to minimize or avoid the adverse effects.

**confinement (of a regulated article).** Application of official measures for regulated articles to prevent escape. [CPM, 2012]

**containment.** Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 1995)

**containment facility.** Laboratory, greenhouse, or other type of secure installation designed to effectively prevent the escape or entry of organisms. (NAPPO 2012; RSPM 7: 2008; RSPM 12:2008; RSPM 22: 2011; RSPM 27: 2007; RSPM 29: 2008)

**control (of a pest).** Suppression, containment, or eradication of a pest population. [FAO, 1995]

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

**CSREES.** Refer to [NIFA](#).

**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).

**ecosystem.** A dynamic complex of plant, animal and micro-organism communities and their abiotic environment interacting as a functional unit. [ISPM 3:1995; revised ICPM, 2001]

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

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

**environmental impact.** Effects on the agriculture, human health, and the environment.

**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 or action is not likely to jeopardize the survival of listed species or is **not** likely to adversely modify or destroy their critical habitat.

**exotic species.** Alien in origin, to the specific ecosystem under consideration.

**FACA.** Federal Advisory Committee Act. TAG-BCAW meetings shall be conducted in compliance with the Federal Advisory Committee Act (FACA).

Glossary  
**Definitions, Terms, and Abbreviations**

**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.

**habitat.** Part of an ecosystem with conditions in which an organism naturally occurs or can establish. [ICPM, 2005]

**host range.** Species capable, under natural conditions, of sustaining a specific pest or other organism (FAO, 1990; revised ISPM 3:2005).

**host specificity testing.** The process by which the species of plants at risk from a biological control agent in the field is determined. (NAPPO Glossary, 1999)

**incidence (of a pest).** Proportion or number of units in which a pest is present in a sample, consignment, field, or other defined population. [CPM, 2009]

**infestation (of a commodity).** Presence in a commodity of a living pest of the plant or plant product concerned. Infestation includes infection [CEPM 1997; revised CEPM, 1999]

**IPPC.** International Plant Protection Convention as deposited with FAO in Rome in 1951 and as subsequently amended. [FAO, 1990]

**ISPM.** International Standard for Phytosanitary Measures [CEPM, 1996; revised. ICPM, 2001]

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

**material.** Includes living organisms and toxins.

**monitoring.** An official ongoing process to verify phytosanitary situations. [CEPM, 1996]

**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.

**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.

**NIFA.** National Institute of Food and Agriculture. Formerly CSREES (Cooperative State Research, Education, and Extension Service.)

**NPS.** National Park Service, USDI.

**NMFS.** National Marine Fisheries Service.

**NRCS.** Natural Resources Conservation Service, USDA.

**natural enemy.** An organism which lives at the expense of another organism in its area of origin and which may help to limit the population of that organism. This includes parasitoids, parasites, predators, phytophagous organisms, and pathogens. [ISPM 3:1995; revised ISPM 3:2005]

**official.** Established, authorized, or performed by a national plant protection organization. [FAO, 1990]

**organism.** Any biotic entity capable of reproduction or replication in its naturally occurring state. [ISPM 3:1995; revised ISPM 3:2005]

**parasite.** An organism which lives on or in a larger organism, feeding upon it. [ISPM 3:1995]

**parasitoid.** An insect parasitic only in its immature stages, killing its host in the process of development, and free living as an adult [ISPM 3:1995]

**pathogen.** Micro-organism causing disease [ISPM 3:1995]

**pest.** Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products. Note: In the IPPC, plant pest is sometimes used for the term pest [FAO, 1990; revised FAO 1995; IPPC, 1997; revised CPM, 2012]

**petition.** A formal, written application to a regulatory Agency seeking approval to release an exotic biological control agent. [NAPPO Glossary, 1999]

**phytophagous.** Organisms that eat plants.

**planting.** Any operation for the placing of plants in a growing medium, or by grafting or similar operations, to ensure their subsequent growth, reproduction, or propagation. [FAO, 1990; revised CEPM, 1999]

**plants.** Living plants.

**polyphagous.** Feeding on or utilizing a variety of plants.

**positive control.** Where the target is present at every step in the test process (i.e., treatment in which you would expect a positive response).

**PPD.** Policy and Program Development.

**PPQ.** Plant Protection and Quarantine.

**quarantine.** Official confinement of regulated articles for observation and research or for further inspection, testing or treatment. [FAO 1990; revised FAO, 1995; CEPM 1999]

**release.** (into the environment) Intentional liberation of an organism into the environment. [ISPM 3:1995]

**replicate.** Replication of an experimental condition so that the variability associated with the phenomenon can be estimated.

**reference specimen.** Specimen, from a population of a specific organism, observed and accessible for the purpose of identification, verification, or comparison. [ISPM 3:2005; revised CPM 2009]

**seeds.** A commodity class for seeds for planting or intended for planting and not for consumption or processing. [FAO, 1990; revised ICPM, 2001]

**suppression.** The application of phytosanitary measures in an infested area to reduce pest populations [FAO, 1995; revised CEPM, 1999]

**spread.** (of a pest) Expansion of the geographical distribution of a pest within an area [FAO, 1995]

**standard operation procedure (SOP).** Codified best laboratory practices for handling biological control agents in quarantine or containment. (NAPPO 2012: NAPPO Glossary, 1999)

**SPRO.** State Plant Regulatory Official. Contact information for these officials can be found on the [National Plant Board Website](#). There is also a list of these officials in the [Postentry Quarantine Manual](#).

**survey.** An official procedure conducted over a defined period of time to determine the characteristics of a pest population or to determine which species occur in an area. [FAO, 1990; revised CEPMP, 1996]

**take.** To harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any of these activities.

**test.** Official examination, other than visual, to determine if pests are present or to identify pests. [FAO, 1990]

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

**USDA.** United States Department of Agriculture.

**USDC.** United States Department of Commerce.

**USDI.** United States Department of the Interior.

**USGS.** United States Geological Survey, USDI.

**voucher specimens.** A series of individuals from a specific population deposited in the National Collection(s) of the country. (NAPPO 2012; RSPM 19: 2012; RSPM 27:2007).