



---

Regulatory Exclusion of Harmful Non-Indigenous Plants from the United States by USDA APHIS PPQ

Author(s): Randy G. Westbrooks and Robert E. Eplee

Source: *Castanea*, Vol. 61, No. 3 (Sep., 1996), pp. 305-312

Published by: [Southern Appalachian Botanical Society](#)

Stable URL: <http://www.jstor.org/stable/4033683>

Accessed: 29/09/2014 15:38

---

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



*Southern Appalachian Botanical Society* is collaborating with JSTOR to digitize, preserve and extend access to *Castanea*.

<http://www.jstor.org>

## Regulatory Exclusion of Harmful Non-indigenous Plants from the United States by USDA APHIS PPQ

RANDY G. WESTBROOKS and ROBERT E. EPLEE

U.S. Department of Agriculture, Animal and Plant Health Inspection Service,  
Plant Protection and Quarantine, Whiteville, North Carolina 28472

### ABSTRACT

Many plant species that have been moved beyond their historical ranges by humans survive only under cultivation. However, some introduced species do naturalize and become a threat to the biodiversity of natural areas and/or production capacity of developed or agricultural ecosystems. Such invaders may be termed **biological pollutants**. One example of a new arrival that has become a biological pollutant in the southeastern United States is tropical soda apple (*Solanum viarum* Dunal) (TSA). TSA is a native of South America that has recently been reported in Florida, Georgia, Alabama, Mississippi, and South Carolina, and poses a threat to all of the South. One objective of APHIS is to prevent the entry and establishment of foreign weeds such as TSA in the United States under authority of the Federal Noxious Weed Act (FNWA). Regulatory strategies that are utilized to protect the United States from foreign weeds include **prevention** (production of weed free commodities overseas); **preclearance** of high risk commodities at foreign ports of export; **port of entry inspections**; **treatment or other mitigation systems**; and finally **early detection, containment, and eradication** of incipient infestations that become established in the United States. Over the past several years, efforts have been made to eradicate 12 Federal Noxious Weeds at localized sites in the United States through cooperative projects with affected states.

### INTRODUCTION

Serious problems caused by introduced plants, animals and disease agents have increased concern about the movement of species around the world (Elton 1958; Eplee and Westbrook 1990; Mooney and Drake 1986; Schmitz 1990; Westbrook 1981, 1991, 1993; Westman 1990; Zamora et al. 1989). While most intentionally introduced species are (so far) benign or are beneficial to human society and do not become invasive, hundreds of introduced species now cause serious problems in agricultural and/or natural ecosystems. Throughout history, humans have been both knowing and unwitting agents of dispersal of thousands of species which have been moved far beyond their natural ranges to other biogeographical realms. In the absence of co-evolved predators and parasites that keep them in check in their natural ranges, introduced species that find suitable habitats may

thrive and even outcompete or displace native taxa. While change and disruption in ecosystems have occurred throughout history, the biological invasions that are now resulting from human commerce are truly different with regard to origins, rate of introduction, types of organisms, abruptness and magnitude of change (Wagner 1993).

Recognized harmful, non-indigenous species (HNIS) that pose a threat to agricultural and managed ecosystems, or threaten the biodiversity of natural ecosystems have been termed **biological pollutants** (Westbrooks 1991, 1993). Unlike chemical pollutants that typically begin to degrade upon their release into the environment, biological pollutants have the ability to grow, multiply, adapt and spread, and cause worsening problems.

Some examples of introduced species that have become biological pollutants in the United States include invasive plants such as witchweed [*Striga asiatica* (L.) O. Kuntze] and common reed [*Phragmites australis* (Cav.) Trin. ex Steudel], non-indigenous vertebrates such as feral horses (*Equus caballus*), invertebrates such as zebra mussel (*Dreissena polymorpha* Pallas), and exotic insects such as imported fire ant (*Solenopsis invicta* Buren). These and other species have been introduced to new countries by accident or by design. In either case, they usually receive little attention until they begin to cause major problems (Eplee and Westbrooks 1990). By that time, eradication is often impractical, and aggressive control measures must be utilized to cope with their effects.

In depauperate communities such as oceanic islands, exotic, herbivorous mammals often become ecologically dominant, causing wholesale extinctions within several trophic levels, and severe degradation of the environment. In mainland environments, such taxa are more likely to cause extirpation of sensitive or endangered species in addition to degradation of the environment (Coblentz 1990). The same effects are often seen when invasive plants are introduced to a new environment.

## ECONOMIC SIGNIFICANCE OF HARMFUL NON-INDIGENOUS PLANTS

Throughout recorded history, humans have had a penchant for exotic plants for use as ornamentals, food, fiber, and shelter. In America, European colonists continued this tradition by bringing familiar crops and ornamentals with them. By the 1600s, several European species, first introduced as “essential herbs” by English colonists, began to naturalize. Dandelion (*Taraxacum officinale* Wigg.) and wild carrot (*Daucus carota* L.) are two of these early immigrants that are now widespread in the United States (Haughton 1978, Josselyn 1672). In 1897, the U.S. Department of Agriculture established a program for introduction of new plants into the United States. Initially, the goal of collecting trips was to obtain new forage and grain crops. However, by the 1930s, the emphasis was shifted toward the collection of exotic ornamentals (Ryerson 1967). Overall, the program was responsible for over 300,000 plant introductions between 1898 and 1967 (Gordon and Thomas 1994, Winters 1967). Intentional introductions by the federal government and private collectors still continue today with scarcely any provisions for estimating the potential invasiveness of newly introduced species.

A few species introduced as ornamentals, or as crops that have become very

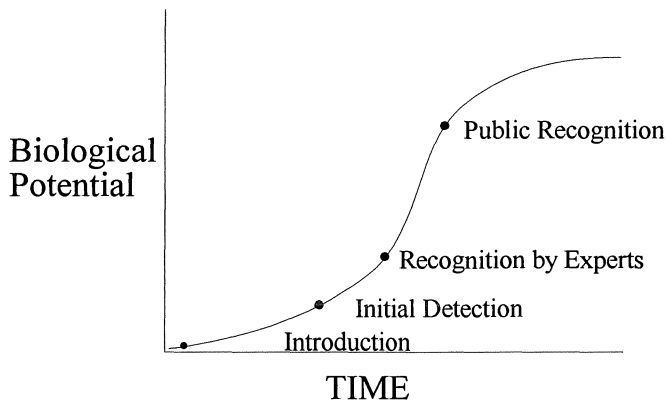


Figure 1. Typical responses following the introduction of an exotic pest plant. (Courtesy J. Asher, Bureau of Land Mgt. Portland, Oregon.)

serious invaders in the southern United States, include kudzu [*Pueraria montana* (Lour.) Merr. var. *lobata* (Willd.) Maesen & S. Almeida], water hyacinth [*Eichhornia crassipes* (C. Martius) Solms-Laub.], hydrilla [*Hydrilla verticillata* (L.f.) Royle] and multiflora rose (*Rosa multiflora* Thunb. ex Murray). Kudzu, is now known as “the vine that ate the South”. However, it was once touted as a valuable plant for erosion control and as a cattle forage with the ability to replace “king cotton” in importance throughout the South. By the early 1960s, the invasiveness of kudzu was apparent, and its official use was discontinued. In 1970, it was listed by the U.S. Department of Agriculture as a “common weed” throughout the southeastern United States (USDA 1971).

According to the U.S. Congress Office of Technology Assessment, there are at least 4,500 species of foreign plants and animals that have established free-living populations in the United States since the beginning of European colonization. Of that total, at least 675 (or 15%) cause severe harm. In economic terms, 79 species of harmful non-indigenous species (HNIS), or 12% of the total, caused documented losses of \$97 billion from 1906 to 1991 (OTA 1993). According to the Weed Science Society of America, crop losses and costs associated with weeds are about \$7.2 billion per year (with herbicide control). Since harmful non-indigenous plants account for about 63% of the total weed flora, losses and costs due to introduced species are about \$4.5 billion per year. Without herbicide control, crop losses and costs due to weeds would be about \$19.6 billion per year (Bridges 1992). Since 1980, more than 205 additional non-indigenous species have been detected in the United States. Of this total, at least 59 species are expected to cause serious economic or environmental harm (OTA 1993). Prevention is the ideal strategy for minimizing the effects of introduced invasive plants on natural ecosystems and/or agricultural sustainability. Prevention will also reduce the need for the large scale use of pesticides that would have been needed to control them. Typical public responses to the introduction of invasive exotic plant species are illustrated in Figure 1.

## REGULATORY STRATEGIES FOR EXCLUSION OF FOREIGN WEEDS

The Animal and Plant Health Inspection Service (APHIS) is an agency of the United States Department of Agriculture. One of its missions is to prevent the entry of certain foreign pests into the United States. Foreign pests regulated by APHIS include harmful non-indigenous weeds, insects, plant diseases, animal diseases, and mollusks. Plant Protection and Quarantine (PPQ) is an operational section of APHIS that has the responsibility to exclude these taxa from the United States. Regulatory strategies for protecting the United States by preventing the entry of harmful non-indigenous species include:

- **prevention** (requiring and encouraging the production of pest free commodities in foreign countries to minimize the world movement of recognized pests);
- **preclearance** (inspection/certification in the country of origin or at the port of export, prior to being shipped to the United States);
- **exclusion** (port of entry inspections and treatments, etc., to detect the presence of quarantine significant pests in imported commodities; to mitigate pest risk of infested shipments);
- **detection** (conducting surveys and communicating with scientists and state agencies for early detection of incipient infestations of quarantine significant pests);
- **containment** (establishment of regulatory programs to prevent the spread of prohibited species from a defined area);
- **eradication** (elimination of incipient infestations of prohibited species by appropriate means); and,
- **biological control** (utilizing biological agents for long term management of pests species).

## REGULATORY AUTHORITY FOR EXCLUSION OF FOREIGN WEEDS

APHIS, PPQ was assigned the general responsibility for excluding foreign weeds in 1975 after passage of the Federal Noxious Weed Act (FNWA) in 1974. Authority to exclude selected foreign weeds from the United States is also provided under the **Federal Seed Act** of 1939 and the **Federal Organic Act** of 1944. Responsibility for inspection of imported seed shipments was transferred from the USDA Agricultural Marketing Service to APHIS, PPQ in 1982.

## PLANT TAXA LISTED AS FEDERAL NOXIOUS WEEDS

In 1976, 26 taxa of foreign weeds were designated as Federal Noxious Weeds. The FNW list now includes 94 taxa with 89 species, all species of the parasitic genera *Aeginetia*, *Alectra*, and *Striga*; plus all species of *Cuscuta* and *Orobanche* that are not native to the United States. *Melaleuca* [*Melaleuca quinquenervia* (Cav. T. Blake)], an Australian tree species in the Myrtaceae and causing major problems in the Florida Everglades, was added to the FNW list in 1992. Tropical soda apple (*Solanum viarum* Dunal) was added to the list in 1995.

## FOREIGN WEEDS INTERCEPTED BY USDA APHIS PPQ

Since the mid-1980's, PPQ Officers at major international airports, maritime ports, and land border crossings in the United States have become increasingly proficient at intercepting certain FNWs. Noxious weeds that are routinely intercepted include: water-spinach (*Ipomoea aquatica* Forsskal), giant hogweed (*Heracleum mantegazzianum* Sommier & Levier), turkeyberry (*Solanum torvum* Swartz), onionweed (*Asphodelus fistulosus* L.), *Avena* spp., *Pennisetum* spp., *Setaria* spp., and *Oryza* spp. (only rice spikelets with a red pericarp or bran are prohibited) (Fowler 1990, Westbrooks 1993).

Repeated interceptions of a regulated species as contaminating imported commodities such as sesame (*Sesamum indicum* L.) and Niger thistle [*Guizotia abyssinica* (L.f.) Cass] seed has led to the development of regulatory treatments to devitalize the contaminants prior to release into the United States. In one case in 1995, repeated interceptions of *Ipomoea triloba* L. in shipments of sesame from Guatemala led to the development of a hot water treatment for decorticated (removal of the outer epidermis with caustic soda) sesame, and a dry heat treatment for natural sesame. Such treatments permit the importation of pest free sesame and other commodities into the United States.

## THE NOXIOUS WEED INSPECTION SYSTEM

Between 1976 and 1988, resource materials available to APHIS personnel in enforcing the FNWA included a list of target species, a short list of high risk commodities, and sampling procedures for inspecting commodities for noxious weeds. At that time, greasy (raw) wool, soil contaminated equipment, aquatic plant shipments, and seed shipments had been recognized as high risk pathways for the introduction of foreign weeds (Westbrooks 1989, Westbrooks and Eplee 1991).

In the mid to late 1980s, a Noxious Weed Inspection System (NWIS) was developed to enhance the ability of PPQ Officers to detect weed contaminants in high risk commodities at ports of entry. The purpose of the system is to provide officers with information on potential associations of target weeds and commodities that originate in similar habitats where such weeds grow. The NWIS is based on the principle that certain weeds are likely to be associated with certain commodities from certain countries. The NWIS is comprised of a **Federal Noxious Weed Inspection Guide**, a **Federal Noxious Weed Identification Guide** with monographs, line drawings, and range maps on all listed species, and a **Noxious Weed Seed Collection**. Each PPQ work station at U.S. ports of entry has at least one set of NWIS materials (Westbrooks 1989, 1993; Eplee and Westbrooks 1991; Westbrooks and Eplee 1987, 1991).

## FEDERAL/STATE NOXIOUS WEED ERADICATION PROJECTS

If FNWs enter the United States despite regulatory efforts to exclude them, the next goal is to *detect, contain and eradicate incipient infestations* before they can spread. Currently, about 45 species of the 94 taxa that are listed as FNWs are known or reported to occur in the United States to a limited degree.

Over the past few years, APHIS has been involved in cooperative federal/state efforts to eradicate 12 of these species. These include:

- **Witchweed** [*Striga asiatica* (L.) O. Kuntze]. 177,000 ha infested in North Carolina and South Carolina; now reduced to 11,000 ha in 17 counties in North Carolina, and in three counties in South Carolina;
- **Branched broomrape** (*Orobanche ramosa* L.), 283 ha infested in Karnes County, Texas;
- **Goatsrue** (*Galega officinalis* L.). 16,000 ha infested in Cache County, Utah;
- **Common crupina** (*Crupina vulgaris* Cassini). In Idaho (22,000 + ha), Washington state (162 ha), Oregon (3,238 ha), and California (8 ha); (biological control is the preferred management strategy for large infestations);
- **Mediterranean saltwort** (*Salsola vermiculata* L.). 550 ha infested in San Luis Obispo County, California;
- **Hydrilla** [*Hydrilla verticillata* (L. f.) Royle]. 310 km of canals infested in the Imperial Irrigation District, Imperial Valley, California; now 99% eradicated in California; still abundant in warm areas of the southeast;
- **Japanese dodder** (*Cuscuta japonica* Choisy). 1 ha infested in the South Carolina Botanical Garden, Clemson, South Carolina;
- **Small broomrape** (*Orobanche minor* Smith). Spot infestations in Washington County, Virginia; Pickens, Abbeville, and Aiken Counties, South Carolina; and in Baker County, Georgia;
- **Catclaw mimosa** (*Mimosa pigra* L. var. *pigra*). 405 ha infested in Martin and Palm Beach Counties, Florida;
- **Asian common wild rice** (*Oryza rufipogon* Griffith). A rhizomatous red rice; 0.5 ha infested in the Everglades National Park, Florida.
- **Wild sugarcane** (*Saccharum spontaneum* L.). A rhizomatous wild sugarcane; 13 spot infestations along the southeastern shore of Lake Okechobee in Martin County, Florida, totaling less than 1 ha.
- **Kariba Weed** (*Salvinia molesta* D.S. Mitchell). A small floating fern that forms thick mats on the surface of water bodies; a 0.1 ha infestation in a private pond in Colleton County, South Carolina.

According to Coblenz (1993), the only ecologically responsible action against harmful exotic species is control, at a minimum, or preferably eradication. Practical approaches for weed management include eradication measures on incipient infestations and biological control for widespread infestations.

#### SUMMARY

Harmful non-indigenous plants, that may be termed biological pollutants, threaten agricultural production and the biodiversity of natural ecosystems in the United States. Efforts are being made by USDA, APHIS to exclude selected undesirable foreign weeds from the United States. APHIS also cooperates with affected states to combat incipient infestations of Federal Noxious Weeds before they become too widespread to eliminate. Tropical soda apple is a recently introduced biological pollutant that is causing severe problems on rangelands and pastures in Florida and is being spread to other states by livestock and other contaminated articles. The most effective way to deal with such plants is to

prevent their introduction from other countries, to detect incipient infestations at an early stage, and to eradicate them before they begin to spread to other farms, counties, and states.

#### LITERATURE CITED

- BRIDGES, D. (ed.). 1992. Crop losses due to weeds in the United States. Weed Science Society of America, Champaign, Illinois. 403 p.
- COBLENTZ, B. 1991. Exotic organisms: A dilemma for conservation biology. *Conserv. Bio.* 4:261-265.
- COBLENTZ, B. 1993. Invasive ecological dominants: Environments boar-ed to tears and living on burro-ed time. p. 223-224. *In: McKnight, B.N. (ed.). Biological pollution: the control and impact of invasive exotic species. Proc. Symp. Biological Pollution. Indiana Acad. Sci. Oct. 25-26, 1991.*
- ELTON, C. 1958. The ecology of invasions by plants and animals. Methuen and Co., Ltd. London, England. 181 p.
- EPLER, R. and R. WESTBROOKS. 1990. Federal noxious weed initiatives for the future. *Proceedings of the Weed Science. Society North Carolina.* p. 76-78.
- EPLER, R. and R. WESTBROOKS. 1991. Recent advances in exclusion and eradication of Federal Noxious Weeds. *WSSA Abstracts* 31:31.
- FOWLER, L. 1990. APHIS foreign weed interceptions. *WSSA Abstracts* 30:34.
- FOWLER, L. 1991. APHIS foreign weed interceptions. *WSSA Abstracts* 31:30.
- GORDON, D. and K. THOMAS. 1994. Introduction pathways for invasive non-indigenous plant species. p. 29-43. *In: Schmitz D. and T. Brown (eds.). An assessment of invasive non-indigenous species in Florida's public lands. Florida Dep. Env. Prot. Tech. Rpt. TSS-94-100.*
- HAUGHTON, C. 1978. Green immigrants. Harcourt, Brace, and Jovanovich, New York. 450 p.
- JOSSELYN, J. 1672. New England rarities discovered. London. Facsimile ed. by the Massachusetts Historical society. Boston. 1972. 33 p.
- MOONEY, H. and J. DRAKE (eds.). 1986. Ecology of biological invasions of North America and Hawaii. Springer-Verlag, New York. 321 p.
- OTA. 1993. Harmful non-indigenous species in the United States. U.S. Congress, Office of Technology Assessment. OTA-F-565. Washington, D.C. U.S. Government Printing Office. 391 p.
- RYERSON, K. 1967. The history of plant exploration and introduction in the United States Department of Agriculture. p. 1-19. *In: Proceedings of the International Symposium on Plant Introduction. Tegupancigalpa, Honduras. November 30-December 2, 1966. Escuela Agricola Panamericana, Honduras.*
- SCHMITZ, D. 1990. The invasion of exotic aquatic and wetland plants in Florida: history and efforts to prevent new introductions. *Aquatics* 12:6-13, 24.
- USDA. 1971. Common weeds of the United States. USDA ARS. Dover Publicatiuons, Inc., New York. 463 p.
- WAGNER, W.H., JR. 1993. Problems with biotic invasives: a biologist's viewpoint. p. 225-241. *In: McKnight, B.N. (ed.). Biological pollution: the control and impact of invasive exotic species. Proc. Symp. Biological Pollution. Indiana Acad. Sci. Oct. 25-26, 1991.*
- WESTBROOKS, R. 1981. Introduction of foreign noxious plants into the United States. *Weeds Today* 14:16-17.
- WESTBROOKS, R. 1989. Regulatory exclusion of Federal Noxious Weeds from the United States. Ph.D. dissertation. Department of Botany, North Carolina State University, Raleigh, North Carolina. 335 p.



- WESTBROOKS, R. 1991. Plant Protection Issues. I. A commentary on new weed in the United States. *Weed Technology* 5:232-237.
- WESTBROOKS, R. 1993. Exclusion and eradication of foreign weeds from the United States by USDA APHIS. p. 225-241. *In*: McKnight, B.N. (ed.). *Biological pollution: the control and impact of invasive exotic species*. Proc. Symp. Biological Pollution. Indiana Acad. Sci. Oct. 25-26, 1991.
- WESTBROOKS, R. and R. EPLEE. 1987. Effective exclusion and detection of Federal Noxious Weeds. *WSSA Abstracts* 27:34.
- WESTBROOKS, R. and R. EPLEE. 1991. USDA APHIS Noxious Weed Inspection System. 1991 update. *WSSA Abstracts* 31:29.
- WESTMAN, W. 1990. Park management of exotic plant species: problems and issues. *Conservation Biology* 4:251-260.
- WINTERS, H. 1967. The mechanics of plant introduction. p. 49-53. *In*: *Proceedings of the International symposium on plant introduction*. Tegucigalpa, Honduras. November 30-December 2, 1966. Escuela Agricola Panamericana, Honduras, 1-9.
- ZAMORA, D., D. THILL, and R. EPLEE. 1989. An eradication plan for plant invasions. *Weed Technology* 3:2-12.