



# INVASIVE SPECIES

## DEFINITION CLARIFICATION AND GUIDANCE WHITE PAPER FROM THE NATIONAL INVASIVE SPECIES ADVISORY COMMITTEE

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In April 2006, the Invasive Species Advisory Committee (ISAC) submitted a document titled “Invasive Species Definition Clarification and Guidance White Paper” to the National Invasive Species Council (NISC) for adoption. A white paper is basically a term that describes a report. It is a detailed discussion that defines the subject, presents its background, and addresses the purpose or intent for the white paper. Before we get into the white paper itself let’s review the NISC and ISAC.

The National Invasive Species Council was established through Executive Order 13112. It is an inter-Departmental council that helps to coordinate and ensure complementary, cost-efficient, and effective Federal activities regarding invasive species.

The Council is composed of 13 Federal Departments and Agencies. Departments represented include; Agriculture, Commerce, Interior, State, Defense, Homeland Security, Treasury, Transportation, Health and Human Services, Environmental

Protection Agency, the U.S. Agency for International Development, the U.S Trade Representative, and the National Aeronautics and Space Administration. The Council is responsible for the development and execution of the National Invasive Species Management Plan (NISMP) which was released in 2001. The NISMP and progress reports on activities related to the plan can be obtained by visiting <<<http://www.invasivespeciesinfo.gov>>>.

The Executive Order also established the Invasive Species Advisory Committee to advise the federal government on invasive species issues and to act as stakeholder representatives. The Committee is composed of approximately thirty stakeholders from state organizations, industry, conservation groups, scientists, academia, and other interests. In their capacity to advise and aid in addressing the issues associated with administering the management plan, the “Invasive Species Definition Clarification and

Guidance White Paper” was prepared and submitted to the Council.

The purpose of the “Invasive Species Definition Clarification and Guidance White Paper” is “to provide a non-regulatory policy interpretation of the term invasive species by identifying what is meant, and just as important, what is not meant by the term.” Executive Order 13112 defines an invasive species as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” A more detailed definition within the National Invasive Species Management Plan (NISMP) states that an invasive species is “a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.” The Executive Order also has a provision for excusing a plant’s invasiveness when its benefits clearly outweigh the potential harm. Under Federal agency duties, it states that it “shall to the extent practicable and permitted by law, not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.” The intent of this provision is carried into the NISMP where it states that focus will be “on non-native organisms known to cause or likely to cause negative impacts and that do not provide an equivalent or greater benefit to society.” The ISAC white paper further states that “some non-native species are considered harmful, and therefore, invasive by some sectors of our society, while others consider them beneficial. This discontinuity is reflective of the different value systems operating in our free society, and contributes to the complexity of defining the term invasive species. While there have been numerous attempts to clarify the term

invasive species, there continues to be uncertainty concerning the use and perceived meaning of the term, and consequently over the prospective scope of actions proposed in the NISMP. Options related to private property use, pet ownership, agriculture, horticulture, and aquaculture enterprises may be affected depending upon the definition, use, and policy implications of the term invasive species. ISAC recognizes that biological and ecological definitions will not precisely apply to regulatory definitions. We believe, however, that our clarification will apply to all taxa of invasive species in all habitats and furthermore, our explanation will be functional and acceptable to most stakeholders. ISAC simply wants to clarify what is meant and what is not meant by the term invasive species in the technical sense and to provide insight into those areas where societal judgments will be necessary to implement effective public policy. The utility of our clarification should be in education, conflict resolution, and efficiency in the planning, prevention, control/eradication, and management of invasive species.”

The White Paper discusses invasive species as it applies to the perception of harm and actual environmental harm, as it relates to all of the concepts and conditions involved with identifying a plant as a weed, and as a function of biogeography. It also provides examples to support their interpretation and clarification of what they do mean and what they do not mean with respect to invasive species. The following excerpts from the White Paper are intended to keep you informed and possibly make you more aware of the issue as it is seen at the national level. The complete White Paper can be obtained by visiting <<<http://www.invasivespeciesinfo.gov>>>. At the website, go to the Council pages and click on the Invasive Species Advisory Council.

*The following information is excerpted from the “Invasive Species Definition Clarification and Guidance White Paper”*

### ***Perception to Cause Harm***

Complications concerning the concept

of invasive species arise from differing human values and perspectives. Differing perceptions of the relative harm caused or benefits gained by a particular organism are influenced by different values and management goals. If invasive species did not cause harm, we would not be nearly as concerned. Perceptions of relative benefits and harm also may change as new knowledge is acquired, or as human values or management goals change. For a non-native organism to be considered an invasive species in the policy context, the negative effects that the organism causes or is likely to cause are deemed to outweigh any beneficial effects. Many non-native introductions provide benefits to society and even among species that technically meet the definition of invasive, societal benefits may greatly exceed any negative effects (for example crops and livestock raised for food). However, in some cases any positive effects are clearly overshadowed by negative effects, and this is the concept of causing harm. Such organisms constitute a small fraction of non-native species, but as a consequence of their ability to spread and establish populations outside of their native ranges, they can be disastrous for the natural environment, the economies it supports, and/or public health. Because invasive species management is difficult and often very expensive, these worst offenders are the most obvious and best targets for policy attention and management.

### ***Feral Populations***

It is also essential to recognize that invasive species are not those under human control or domestication; that is, invasive species are not those that humans depend upon for economic security, maintaining a desirable quality of life, or survival. However, the essential test is that populations of these species must be under control. Escaped or feral populations of formerly domesticated plants and animals would be considered invasive species if all of the concepts and conditions are met as outlined in “Weeds As Examples”.

### *Weeds As Examples*

Weeds provide good examples to clarify what is meant by an invasive species because most people have a concept of what constitutes a “weed”.

Invasion can be thought of as a process that, in our example, a plant must go through to become a successful, yet harmful invader. Several barriers must be overcome for a plant to be considered an invasive weed. Invasive weeds are invasive species.

### *Large-scale geographical barriers*

First, a geographical barrier must be overcome. Examples include a mountain range, ocean, or similar physical barrier to movement of seeds and other reproductive plant parts. Plants that overcome geographical barriers are known as alien plants or alien species. Alien plants are non-native plants and alien species are non-native species. Therefore, non-native plants are those that occur outside of their natural range boundaries, and this most often is mediated by humans either deliberately or unintentionally.

### *Survival barriers*

The second set of obstacles that a non-native plant must overcome is barriers to germination and survival in its new location. These typically are environmental barriers such as adequate moisture availability to allow successful germination and survival of seedlings that will continue to grow to maturity. Other physical barriers might be soil pH, nutrient availability, or competition for resources from neighboring plants.

### *Establishment barriers*

The third obstacle that a non-native plant must overcome to be considered an invasive weed is to form a population that is self-sustaining and does not need re-introduction to maintain a population base such that it continues to survive and thrive in its new environment. Once this occurs, this population of non-native plants is considered to be established. Environmental barriers to survival and establishment are similar.

### *Dispersal and spread barriers*

Established non-native plants must overcome barriers to dispersal and spread from their site of establishment to be considered invasive plants. Additionally, the rate of spread must be relatively fast. However, this movement or spread alone does not necessarily make this non-native plant an invasive weed or invasive species.

### *Harm and impact*

Finally, a plant is deemed to be invasive if it causes negative environmental, economic, or human health effects, which outweigh any beneficial effects. For example, yellow starthistle is a source of nectar for bee producers. But the displacement of native and other desirable plant species caused by yellow starthistle leads to dramatically decreased forage for wildlife and livestock, which severely disrupts the profitability of associated businesses. These negative effects greatly overshadow the positive effects and thus, define harm caused by yellow starthistle and explain why it is considered an invasive species.

## ***A Biogeographical Context***

An invasive species may be invasive in one part of the country, but not in another. A biogeographical context must be included when assessing whether a non-native species should be considered an invasive species. Lake trout are highly desirable in the Great Lakes where they are native, but are considered an invasive species in Yellowstone Lake. They compete with native cutthroat trout for habitat, which decrease their populations. Kentucky bluegrass would be considered an invasive species in Rocky Mountain National Park in Colorado, but considered non-invasive a mere 60 miles away at a golf course in Denver. English ivy is considered a good ground cover species in the Great Plains and Midwest, but is a highly invasive weed in the forests of the Pacific Northwest and Eastern U.S. where it out competes native plants and displaces the associated animal communities.

## ***The “Gray” Area***

There are obvious examples of invasive species such as snakehead fish, yellow

starthistle, or *Phytophthora ramorum* (the organism that causes sudden oak death); and there are obvious examples of species that are not invasive, namely native plants and animals. There are, however, non-native organisms for which it will be difficult to make a determination and these should be subject to assessment. Whether these non-native organisms will be considered invasive species will depend upon human values. For example, European honeybees are cultured to produce honey and pollination services, and even though they form wild populations in many parts of the country and occasionally create problems by building hives in the walls of homes or can be a human health problem for individuals that are highly allergic to their sting, most would not consider them an invasive species because they produce a desired food product.

Chinese or Oriental clematis serves as another gray area example. Chinese clematis (virgin’s bower, orange peel) is a popular ornamental that has been planted worldwide. However, it has escaped cultivation in several western states where its populations can spread, particularly in shrubland, on riverbanks, sand depressions, along roadsides, in gullies, and along riparian forests in hot dry valleys, deserts, and semi-desert areas. Escaped populations of Chinese clematis occur in Idaho, Nevada, Utah, New Mexico, and Colorado. So far, it is considered an invasive species only in Colorado where it has spread dramatically from its site of introduction and displaced native plant species.

## ***Environmental Harm***

We use environmental harm to mean biologically significant decreases in native species populations, alterations to plant and animal communities or to ecological processes that native species and other desirable plants and animals and humans depend on for survival. Environmental harm may be a result of direct effects of invasive species, leading to biologically significant decreases in native species populations. Examples of direct effects on native species include preying and feeding on them, causing

or vectoring diseases, preventing them from reproducing or killing their young, out-competing them for food, nutrients, light, nest sites or other vital resources, or hybridizing with them so frequently that within a few generations, few if any truly native individuals remain. Environmental harm also can be the result of an indirect effect of invasive species, such as the decreases in native waterfowl populations that may result when an invasive wetland plant decreases the abundance of native plants and thus, decreases seeds and other food that they provide and that the waterfowl depend upon. Environmental harm also includes significant changes in ecological processes, sometimes across entire regions, which result in conditions that native species and even entire plant and animal communities cannot tolerate. For example, some non-native plants can change the frequency and intensity of wildfires, or alter the hydrology of rivers, streams, lakes and wetlands and that is why they are considered invasive species. Others can significantly alter erosion rates, for example, trapping far more wind-blown sand than native dune species, or holding far less soil than native grassland species following rainstorms. Some invasive plants and microorganisms can alter soil chemistry across large areas, significantly altering soil pH or soil nutrient availability. Environmental harm also includes significant changes in the composition and even the structure of native plant and animal communities. Environmental harm may also cause or be associated with economic losses and damage to human, plant and animal health.

### ***Additional Examples of Impacts Caused by Invasive Species***

Specific examples of the harm caused by invasive species are useful to further clarify the definition. The following list of examples is not meant to be comprehensive, but offers further explanation:

#### *Impacts to Human Health*

Poisonous plants: Exposure to the sap of Tree-of-heaven/Chinese sumac tree has caused inflammation of the heart muscle (myocarditis) in workers

charged to clear infested areas. Afflicted personnel experienced fever/chills, chest pain that radiated down both arms, and shortness of breath. Exposure occurred when sap from tree-of-heaven contacted broken skin. Such exposure has caused hospitalization, medical expense, and lost productivity due to absence from work (Bisognano et al. 2005).

#### *Impacts to Natural Resources*

Decreased carrying capacity for wildlife and livestock: Expansion of leafy spurge, yellow starthistle, or other unpalatable invasive weeds displace desirable forage plants and may allow fewer grazing animals to survive in infested areas (DiTomaso 2001; Lym and Messersmith 1985; Lym and Kirby 1987).

#### *Impacts to Recreational Opportunities and Other Human Values*

Emerald ash borers were first detected in the U.S. in 2002. They currently are found in Michigan, Ohio, and Indiana. Emerald ash borer larvae tunnel under bark of ash trees and could eliminate ash as a street, shade, and forest tree throughout the U.S. Estimated replacement cost in six Michigan counties is \$11 billion and an additional \$2 million in lost nursery sales (Chornesky et al. 2005).

#### *Altered business opportunities*

The concern over Sudden Oak Death Syndrome caused by the pathogen *Phytophthora ramorum* is causing drastic changes in available nursery stock by nurseries and landscape businesses. This clearly impacts the profitability of these businesses and choice by consumers and could devastate oak forests nationwide (Chornesky et al. 2005; Rizzo and Garbelotto 2003).

#### *Altered ecosystems and recreational opportunities*

The submersed aquatic plant hydrilla forms dense canopies at the water surface that raise surface water temperatures, change pH, exclude light, and consume oxygen, resulting in native plant displacement and stunted sport fish populations. This example

of an altered aquatic ecosystem caused by an invasive aquatic weed also negatively affects recreation and businesses that depend upon that human activity (Colle et al. 1987).

### ***Summary***

Invasive species are those that are not native to the ecosystem under consideration and that cause or are likely to cause economic or environmental harm or harm to human, animal, or plant health. Plant and animal species under domestication or cultivation and under human control are not invasive species. Furthermore, for policy purposes, to be considered invasive, the negative impacts caused by a non-native species will be deemed to outweigh the beneficial effects it provides. Finally, a non-native species might be considered invasive in one region, but not in another. Whether or not a species is considered an invasive species depends largely on human values. By attempting to manage invasive species, we are affirming our economic and environmental values. Those non-native species judged to cause overall economic or environmental harm or harm to human health may be considered invasive, even if they yield some beneficial effects. Society struggles to determine the appropriate course of action in such cases, but in a democratic society that struggle is essential.

Many invasive species are examples of “the tragedy of the commons”, or how actions that benefit one individual’s use of resources may negatively impact others and result in a significant overall increase in damage to the economy, the environment, or public health. In ISAC’s review of Executive Order 13112, the public domain is specifically represented; however, the implementation of the NISMP has prompted concerns over the rights of personal and private property owners. Property rights are of great importance in the U.S. and one outcome of the NISMP should be to recognize the right to self determination by property owners and promote collaboration on invasive species management. The right to self determination is an important concept in a democratic society, however, with

that right comes personal responsibility and stewardship, which includes being environmentally responsible. The natural environment that our society enjoys, recreates in, and depends upon to support commerce must be conserved and maintained. Effective invasive species management is just one aspect of conserving and maintaining our nation's natural environment, the economies it supports, and the high quality of life that our society enjoys.

In conclusion, the invasive plant issue is extremely complex and crosses many discipline and commodity boundaries. Problems have arisen with individual interpretation of the intent of the Executive Order when addressing concerns over the classification, use, and impact of invasive plants and the subsequent action that should be taken. The ISAC White Paper provides another resource to aid in our understanding and help shape the way we address the issue. It reinforces key concerns about identifying and documenting environmental harm, assessing benefits when determining action on a given species, and considering regional differences in behavior when determining whether a plant should be classified as invasive. "Weed As Examples" provides additional criteria to aid in determining invasiveness. As expressed in the White Paper, several barriers must be overcome for a plant to be considered

an invasive weed. Escaped or feral populations of formerly domesticated plants and animals would be considered invasive species if the concepts and conditions of large-scale geographical barriers, survival barriers, establishment barriers, dispersal and spread barriers, and harm and impact are met.

The information presented and discussed provides useful insight into identifying: how we as an industry can have a positive impact on minimizing the impact of harmful invasive plants; how we as an industry can address the issue both within and outside of our boundaries; and equally important, what we as an industry should expect as a set of standards in dealing with the issue from broad-based collaboration with those outside of our industry. As members of the green industry, we have an invested interest in our natural and built environments. We contribute to the quality of life at work, home, and play. It is important for us to get involved and be part of the solution.

On a final note, Amy Frankmann, MNLA's Executive Director, has been recently named to the ISAC. We would like to congratulate Amy on her appointment and extend our appreciation for her willingness and commitment to represent the green industry on this critical and complex issue. 

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