

The Story Behind the IFAS Assessment of Non-native Plants in Florida's Natural Areas¹

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Introduction

This paper provides the background for, and a summary of, the IFAS Assessment of Non-native Plants in Florida's Natural Areas (hereafter referred to as the IFAS Assessment). The initial IFAS Assessment document, now referred to as the status assessment, was developed in 1999 (revised in 2001, 2004, 2005, and 2008) by a subcommittee of the IFAS Invasive Plants Working Group, and is available to view and download from the IFAS Assessment of Non-native Plants in Florida's Natural Areas Web site (<http://plants.ifas.ufl.edu/assessment.html>) or the UF/IFAS EDIS Web site (<http://edis.ifas.ufl.edu/AG234>). Through research efforts made by members of the IFAS Invasive Plants Working Group, in 2008 two new components were added to the IFAS Assessment, the predictive tool and the infraspecific taxon protocol.

There is a growing awareness of the problems related to non-native invasive species. For example, the Wilcove et al. (1998) report indicated that invasive species are second only to habitat loss in the United States as the leading threat to threatened and endangered species. U.S. federal government recognition of these issues was emphasized by President Bill Clinton's *Executive Order on Invasive Species* (<http://www.nps.gov/plants/alien/pubs/eo.htm>) issued in 1999. This attention emphasizes the importance of acknowledging that only a small percentage of introduced species create a problem in natural areas (Lippincott 1996), and that quantifiable ecological and economic impacts caused by invasive plants range from negligible to catastrophic.

At least two categories of invasive plants should be recognized: those currently in our wildland habitats, and those that have not yet arrived. Ideally, we could predict "invasion potential" of new species

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and prevent the introduction of new problems, or at least identify and eradicate them as soon as they are detected. Several such predictive models are being developed (e.g., Australian Weed Risk Assessment: <http://www.daff.gov.au/ba/reviews/weeds/system>; Tucker and Richardson 1995; Parker et al. 2007), and many of them appear to be efficient at identifying potential problem species, especially based on information such as whether a species has been invasive elsewhere. A concern about many of these models has been that they are often overly restrictive, in some cases falsely accusing up to 20% or 30% of plants that have never (at least in the studied timescales) been found to be invasive (Reichard and Hamilton 1997, Gordon et al. 2008a). Managers of natural areas may not consider this to be much of a flaw, but this is unacceptable to the many people who believe that supplies of plants for food, fiber, and landscaping should not be unnecessarily restricted.

If predictive models have their difficulties, it seems that it should be easier to identify, describe, and assess invasive plants after they have escaped from cultivation and are appearing in natural areas. However, non-native plants are spread across a continuum of invasiveness that often changes with time. Also, invasiveness is a relatively subjective term, so different people have varying perspectives of what constitutes minor versus significant impacts. It is not hard to recognize the extremes. The invasive "no-brainers" are typically well-established and little-disputed species, many of which are already subject to state and/or federal regulation (i.e., melaleuca - *Melaleuca quinquenervia*, kudzu - *Pueraria montana*, cheatgrass - *Bromus tectorum*, etc.). On the other hand, many crop species of non-native origin do not survive without human intervention in the form of fertilizers, irrigation, etc. Controversy, however, haunts the middle ground and usually surrounds those economically important species that are either just starting to escape or that appear in natural areas but with unknown or poorly documented impacts.

Is Another Assessment Needed?

Since 1984, the Florida Exotic Pest Plant Council (FLEPPC) has been classifying certain plants as Category I ("invasive exotics that are altering

native plant communities" based "...on the documented ecological damage caused") or as Category II ("invasive exotics that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species"). These lists are revised biennially by a committee of experts within FLEPPC. The lists serve a variety of purposes (see Florida Exotic Plant Pest Council Invasive Plant Lists at <http://www.fleppc.org/list/list.htm>) with the precautionary objective to alert managers of natural areas to currently or potentially problematic species. Many natural areas within Florida are managed with a policy to remove and exclude all exotic plants. The FLEPPC lists assist managers in prioritizing invasive species for management, since few resource budgets allow removal of all exotic plants.

Things become more controversial when these lists are adopted for other purposes, such as the development of local ordinances banning the use of certain non-native plants. With a large gap between the FLEPPC lists and the state and federal regulations (on the 2007 lists, only 28 out of 67 Category I species and 7 out of 71 Category II species are government-regulated), it is not surprising that proactive local organizations have embraced the Category I list. Such regulations have alarmed ornamental horticulturalists and landscape designers, who question why some economically important species such as coral ardisia (*Ardisia crenata*), heavenly bamboo (*Nandina domestica*), and lantana (*Lantana camara*) are on the Category I list. Their concerns are magnified because, while distribution information is available on the FLEPPC Web site, systematic written criteria and documentary evidence on which the FLEPPC lists are based are not available.

Conflicting opinions with regard to certain species have been mirrored within the IFAS Assessment where some faculty may be recommending certain non-native species for landscaping, while others are supporting the FLEPPC lists and are developing control programs for the same species. In an effort to resolve these internal conflicts, a subcommittee of the IFAS Invasive Plants Working Group was established in early 1999 to develop a tool for assessing non-native plants in Florida's natural areas.

Purpose and Objectives of the IFAS Assessment

The IFAS Assessment is comprised of three components: the status assessment (the initial component), the predictive tool, and the infraspecific taxon protocol. The primary purpose of the IFAS Assessment is to provide a mechanism to be used within UF to develop consistent descriptions of, and recommendations for, the use and management of non-native plants in Florida. Secondary objectives are to: 1) provide a level of information that is intermediate between simple presence or absence on a list and all the data that are available on any given species (such as in the FLEPPC / Department of Environmental Protection [DEP] database, or as reviewed by Langeland et al. 2008); and 2) to identify the frequent data-gaps in our knowledge of these species which would assist in setting research priorities. We also hope that the IFAS Assessment provides a tool that will help resolve some of the conflicts identified by the liaison committee between FLEPPC and the Florida Nursery, Growers and Landscape Association (FNGLA).

The requirements for the IFAS Assessment are clear: it should have precisely defined criteria that are defensible by all UF/IFAS faculty, and all evidence and decisions should be documented and archived for anyone to review. Far less is published about most invasive species than desired for an assessment, and anecdotal information can be difficult to defend without further substantiation. Thus, we have defined documentary evidence as being either published or as written observations from three biologists, any of whom could be contacted for confirmation. It is also important to recognize that the IFAS Assessment does not substitute for the FLEPPC lists, though some of the data may be useful for the FLEPPC list committee. Nor would this process be a sufficient replacement for formal (and much more costly and complex) risk-benefit analysis, such as is performed in the development of state regulations prohibiting the use of a species.

General Overview of the Status Assessment

After reviewing similar status assessments that have been developed elsewhere (e.g., Hiebert and Stubbendieck 1993), an early and important decision was made to limit the initial status assessment, as much as possible, to non-predictive information about existing plant populations in Florida. Predictive evaluations were certainly also necessary, particularly focusing on species not yet introduced to Florida, but the speculation inherent in prediction is different from the clear evidence approach of the status assessment. As a result, it was decided to separate the two processes. (As of 2008, the IFAS Assessment includes the predictive tool that now accompanies the status assessment, see below). Additional lessons learned from other assessments were to provide quick exits from the evaluation for non-invasive species, use multiple questions with simple choices (usually yes or no) but with mechanisms to acknowledge some uncertainty, and uncouple the level of impacts of a species from its current extent of invasion (so an early invader is not automatically rated as of less concern than a widespread established species). It was also decided to divide Florida into three zones (roughly corresponding to USDA growing zones) for which species would be assessed separately, a geographic distinction that was coincidentally incorporated into the 1999 FLEPPC lists. Typically, the IFAS Assessment is used at the species level, but where there are cultivars that differ in characteristics relevant to this assessment (e.g., cultivars, varieties, or sub-species), they should be evaluated separately using the newly added infraspecific taxon protocol.

Status Assessment

The status assessment has five major sections: 1) define if a species is invading in Florida, 2) describe ecological impacts, 3) identify the potential for expansion, 4) outline management difficulties, and 5) assess the economic value. The status assessment is intentionally broader than just determining whether a species is invasive (e.g., the latter two indices provide important information that does not address that issue), and there is no intention to offset economic value against ecological impacts.

An invading species is defined in Section I as one capable of establishing self-sustaining plant populations that are expanding within a natural plant community with which they had not previously been associated (Vitousek et al. 1995). To be declared as invasive, a plant must be documented in natural areas where there has not been significant human disturbance, or it must have survived restoration of the natural communities. This is evaluated within each of the three zones of the state (north, central, and south). A species that does not thus qualify as invading exits from the status assessment, unless it is known to hybridize with threatened or endangered, or economically important species.

While continuing to assess a species separately for each zone, the ecological impacts are evaluated in Section II based on the worst known site(s), without or before any control effort. Scores are assigned to six items in this section that address disruption of ecosystem processes, impacts on threatened or endangered species, competitive displacement, changes in community structure, and hybridization with native species. This impact score is increased if the species can invade a broad range of habitats. If the worst impacts are found in only a small proportion of all invaded sites and if such sites can be defined and avoided, then limited uses of the plant may be specified to reduce the likelihood of such impacts occurring, but this is unlikely to apply to many species.

In zones that a plant has invaded, an assessment of high or low potential for further expansion (one of very few "predictive" questions) is based, in Section III, on the number of new sites reported to be infested in the last five years (using reports from the FLEPPC / DEP database and other surveys). For zones where a species has not yet invaded, the potential for expansion is based on the likelihood that it could survive and cause impacts in the climate and habitats of that zone.

Difficulty of management and economic value are assessed on a state-wide basis and result in scores based on 10 and 4 items, in Sections IV and V respectively. A species is considered more difficult to manage if non-target damage is hard to avoid, if access and methods of control are costly, if there are

large or dispersed areas to be managed, or if the likelihood of regrowth and recolonization is high. Economic value turned out to be the most challenging index because there is no tracking of statewide sales receipts by species. Nobody, including representatives from FNGLA, was very satisfied with the rather vague items in this section related to retail sales and importance to growers or farmers. Thus, an analysis of the economic impact of potentially invasive plants in the ornamental nursery industry has been proposed as an important area for future research.

Predictive Tool

In 2008 the predictive tool was added to the IFAS Assessment to compensate for the status assessment excluding species that have not escaped into Florida's natural areas. This component is applied when species are either recent arrivals to the state or are known to be pests elsewhere with similar habitats and climate to Florida. The Australian Weed Risk Assessment (Pheloung et al. 1999) was adapted and tested for use in Florida (Gordon et al. 2008b) to complete the evaluation of such species.

Similar to the Australian Weed Risk Assessment, the predictive tool consists of 49 questions regarding the biogeography (e.g., history of use and weediness, distribution, cultivation, etc.), biology, and ecology of the proposed plant species. A comprehensive literature review is employed to answer the 49 questions and determine the invasive potential of non-native plant species to natural areas of Florida. Each of the 49 questions is awarded a score between -3 and 5 points, and the final point total leads to one of three outcomes: *accept* (<1 point), *reject* (>6 points), or *evaluate further* (1-6 points). These outcomes of the predictive tool have been equated to the conclusions used in the status assessment. The status assessment is applied separately to three zones in Florida; thus, any *accept* or *reject* outcomes should be recorded for a species similarly across all zones unless the outcome would clearly vary across the zones because the species would be intolerant of environmental conditions (i.e., frost intolerance). Also, species receiving the *evaluate further* outcome automatically result in a re-evaluation of the species by zone and are further

analyzed with the Pacific Second Screening developed by Daehler et al. (2004). The use of the Pacific Second Screening helps to identify species as low- or high-risk pests of natural areas and agricultural (or other cultivated) lands.

Intraspecific Taxon Protocol

The intraspecific taxon protocol (hereafter referred to as the ITP) was also added to the IFAS Assessment in 2008. It was designed to examine intraspecific taxa, such as cultivars, varieties, or sub-species, which are known to have different outcomes from the “resident species” (a.k.a. “parent species”). The ITP consists of three sections: Section 1) identity of intraspecific taxon that is distinguishable from the resident species, Section 2) identity of intraspecific taxon that is not distinguishable from the resident species, and Section 3) zonal differences of the intraspecific taxon.

The ITP is initiated when the IFAS Assessment Team is requested to evaluate an intraspecific taxon. The request must be supported by as much evidence as possible (i.e., publications, photographs, etc.) signifying that the intraspecific taxon can be recognized as a separate entity from the resident species, and can be consistently and verifiably identified and labeled. Additional evidence that must be included in the request are: reasons for expecting the intraspecific taxon to behave differently, and thus, have a different conclusion from the resident species, information about the date of the first introduction of the intraspecific taxon to Florida (or the United States if Florida data are not available); and if necessary, the names and contact information of at least three expert botanists/field experts familiar with the taxon (this is necessary to answer question 1.1 with a “yes” response). If the evidence provided to IFAS Assessment Team can be used to clearly answer Sections 2 and 3 and complete the assessment, then a draft of the results is provided to the requestor for an accuracy check prior to their being posted on the IFAS Assessment website. If, however, the request can not be completed because of a lack of appropriate evidence, lack of three suitable experts, or lack of agreement between the experts, then the intraspecific taxon is not listed separately from the resident species and it is assumed to have the same

conclusions per zone as the resident species. If the requestor is not satisfied after the application of the ITP, any and all appeals must be addressed to the IFAS Invasive Plant Working Group for a case-by-case review. As in the predictive tool, the conclusions of the ITP have been equated to the conclusions used in the status assessment. Conclusions for intraspecific taxa that have been independently assessed using the ITP will be listed separately from the resident species in the conclusions table on the IFAS Assessment Web site.

IFAS Assessment Conclusions

Authors of IFAS Extension publications that discuss any of the species that have been assessed with this instrument will be instructed to review, and where appropriate, use the language designated in the conclusions section. For all indices other than ecological impacts, the scores for a species are assigned to a high or low category. Scores for ecological impacts, the index that drives the development of conclusions, are assigned to low, medium, high, or very high categories. Based on the permutations of these high, low, etc. categories for each index, one of the following conclusions is designated by zone for a species (Note: Species within the conclusion table that have not received a conclusion are now directed by the status assessment to be evaluated using the predictive tool (these species were originally assessed prior to the development of the predictive tool):

- *Not considered a problem invasive at this time* (low impacts and potential for expansion);
- *Caution, manage to prevent escape* (low impacts but high potential for expansion);
- *Invasive and not recommended by IFAS faculty unless a specified and limited use has been approved by the IFAS Invasive Plants Working Group* (medium to high impacts);
- *Invasive and not recommended by IFAS faculty* (high to very high impacts).

While this language has no regulatory authority and is obviously superseded by any state or federal prohibitions, it is intended to provide consistent

guidance to IFAS Extension personnel in making recommendations for use of these plants. It is important to remember that IFAS Extension programs provide information for our clientele, the end-users, whereas local, state, and federal agencies make regulatory decisions about what species can be planted and where. That an invasive plant may not cause problems in one particular part of Florida is the type of information that we, at a university, can provide. Whether or not the planting of that species should be permitted is an issue for the regulatory agencies.

All species will be reassessed as new information becomes available (especially in relation to new sites or impacts) and at least every 10 years. Plants with *caution* or *invasive and not recommended by IFAS faculty unless a specified and limited use has been approved by the IFAS Invasive Plants Working Group* conclusions are to be reassessed every two years.

For a few species with medium impacts and a conclusion of *invasive and not recommended by IFAS faculty unless a specified and limited use has been approved by the IFAS Invasive Plants Working Group*, a caveat is included that if specific conditions for use could be defined from which escape and invasion could be prevented, then specific and limited-use recommendations could be proposed. Such proposals would have to be approved by the IFAS Invasive Plants Working Group. Currently no such proposals have been made, but with educational programs, conspicuous plant labeling, and enforcement of penalties for misuse, it is conceivable that some plants could, for example, be approved for use only as indoor foliage.

Species that are rated with very high impacts, that score highly on all indices, or that have a combination of medium to high impacts, high potential and low value, are invasive and not recommended for use.

Where Are We Now?

The initial status assessment was scrutinized within IFAS and by a number of external reviewers, resulting in revisions and approval for use by the IFAS Invasive Plants Working Group in 2001.

Further revisions have been made over the last seven years, including the wording of the conclusions in 2004, some minor terminology changes in 2005, and the addition of the predictive tool and the infraspecific taxon protocol in 2008. Additional input on the IFAS Assessment itself and on the data that are collected for each species is welcome. Other states, such as Ohio and Indiana, have shown interest in adapting this assessment for local use (Fox et al. 2003).

Since developing the IFAS Assessment, more than 650 species have been tested with the formal collection of documentary evidence (conclusions available at:

<http://plants.ifas.ufl.edu/assessment/conclusions.html>)

. These species represent all categories for each index and all conclusions. Regional differences are seen in the conclusions for many species. As data collection and documentation for each taxon requires a substantial effort, there is full- and part-time staff dedicated to this task (funding for this project is currently provided by the IFAS Office of the Dean for Research and the University of Florida Tropical and Subtropical Agricultural Trade and Policy Center T-STAR grant, and was previously funded by Florida DEP and FNGLA). Permanent funding for these positions would be advantageous, to ensure continuous and consistent assessment of species. As further results are compiled, they are made available on the IFAS Assessment Web site. It is expected that the IFAS Assessment will continuously evolve both from internal evaluations and from external input, hence the long-term objective of having an interactive Web-based version rather than just the printable format currently available.

There is no doubt that for many species on the FLEPPC Category I list, the IFAS Assessment reaches similar conclusions. For a few other species there may appear to be a reduced level of concern based on stringent criteria and requirements for documented evidence. This may seem alarming to managers of natural areas, but it is anticipated that this could provide the impetus to gather more evidence, especially for species with expanding ranges, so that problem species are quickly reassessed and recognized. The precautionary approach of the FLEPPC lists is important for the

managers of natural areas and should be continued. The IFAS Assessment is intended to complement this system and it is hoped that many people will contribute information on their least-favorite plants.

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