The story behind the IFAS assessment of NON-NATIVE PLANTS in Florida's natural areas.

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Introduction

There is a growing awareness of the problems related to non-native invasive species: for example, the Wilcove et al. (1998) report which indicated that invasive species are second only to habitat loss as the leading threat to imperiled species the U.S., and the February 1999 Executive Order on Invasive Species. 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 effects caused by invasive plants range from negligible to catastrophic.

There are at least two categories of invasive plants that must be addressed, those currently in our wildland habitats, and those that have not yet arrived. Ideally we could predict "invasion potential" of new species and prevent the introduction of new problems, or at least identify and eradicate them as soon as they are detected. Around the world there is a concerted effort to develop such predictive models (e.g., Australian Weed Risk Assessment http://www.aqis.gov.au/docs/plpolicy/wrmanu.htm), and many of them appear to be efficient at identifying potential problem species, especially based on information such as whether a species has been a problem elsewhere. A concern about many of these models has been that they are often overly restrictive, in some cases falsely accusing up to 20% of plants that have never (at least in the studied timescales) been found to be invasive (Reichard and Hamilton 1997). 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.

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, we recognize that there are many exotic crops, for example, that do not survive without human intervention in the form of fertilizers, irrigation, etc. Contro-

versy, however, haunts the middle ground and usually surrounds those commercially 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 lead the way in classifying certain plants as "species that are invading and disrupting native plant communities in Florida" based "...on the documented ecological damage caused" - Category I, or as "species that have shown a potential to disrupt native plant communities" - Category II. These lists are revised biennially by a committee of 12 experts within FLEPPC. The lists serve a variety of purposes (see "Florida's most invasive plant list" at http://www.fleppc.org/) 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 ex-

clude 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 1999 lists only 25 out of 65 Category I and 3 out of 60 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 commercially 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 maps are available on the FLEPPC website, 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 University of Florida's (UF) Institute of Food and Agricultural Sciences (IFAS) 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 sub-committee of the IFAS Invasive Plants Working Group was established in early 1999 to develop an assessment of non-native plants in Florida's natural areas.

Purpose and objectives of the assessment.

The primary purpose of this 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 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 and reviewed by Langeland and Craddock Burks, 1998); and to identify the frequent data-gaps in our knowledge of these species which would assist in setting research priorities. We also hope that the assessment provides a tool that will help resolve some of the conflicts identified by the liaison committee between FLEPPC and the Florida Nurserymen and Growers Association (FNGA).

The requirements for this assessment were clear: it should have transparent criteria that are defendable 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 and quantitative or as written observations from three biologists, any of whom could be contacted for confirmation. It is also important to recognize that this assessment does not substitute for the FLEPPC lists, though we hope that some of the data will be useful for the FLEPPC list committee. Neither 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.

After reviewing similar assessments that have been developed elsewhere (e.g., Hiebert and Stubbendieck 1993) an early and important decision was to limit this assessment, wherever possible, to non-predictive information about existing plant populations in Florida. Predictive evaluations are certainly needed for this State, particularly focusing on species not yet introduced to Florida, but the speculation inherent in prediction would jeopardize the credibility of the whole assessment. 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). We 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 this assessment will be used at the species level, but where there are cultivars that differ in characteristics relevant to this assessment (e.g., sterile cultivars), they should be assessed separately.

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General overview of the assessment.

The complete IFAS assessment is available to view and download from the UF/IFAS Agronomy Department website (http://agronomy.ifas.ufl.edu/IFASassessmt.pdf) and we encourage people to provide suggestions for improvement of this document. The assessment has five major sections, one to define if a species is invasive in Florida, and one for each of four indices - Ecological impacts; Potential for expansion; Difficulty of management; and Commercial value, closing with the Conclusions. This 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 commercial value against ecological impacts.

Invasiveness is very broadly defined as the establishment of self-sustaining plant populations that are expanding within a natural plant community with which they had not previously been associated (Vitousek et al. 1995). Within each zone of the State (north, central, and south) invasiveness must be documented in natural areas where there has not been significant human disturbance, or the plant must have survived restoration of the natural communities. A species that does not thus qualify as invasive exits from this assessment, unless it is known to hybridize with threatened or endangered, or commercially-important species.

Continuing to assess a species separately for each zone, the ecological impacts are evaluated 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. It is important to remember that IFAS Extension programs provide information for our clientele, the end-users; local, state, and federal agencies make 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 not within our purview.

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 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 climates and habitats of that zone.

Difficulty of management and commercial value are assessed on a state-wide basis and result in scores based on 10 and 4 items, 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 re-colonization is high. Commercial value turned out to be the most challenging index because there is no tracking of state-wide sales receipts by species. Nobody, including representatives from FNGA, was very happy with the rather vague items in this section related to retail sales and importance to nursery 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.

Assessment conclusions.

Authors of IFAS Extension publications that discuss any of the species that have been assessed with this instrument will 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 which 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:

Not considered a problem invasive at this time (low impacts and potential for expansion)
Caution, prevent escape of this plant (low impacts but high potential for expansion)
Avoid use of this plant (medium to high impacts)
Do not use this plant (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. 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 "Avoid" conclusions are to be reassessed every two years. Additionally, some of the plants assigned to "Avoid" will be recommended for a formal risk-benefit analysis. Typically these plants will have medium to high ecological impacts and high commercial value, and the risk-benefit analysis should be conducted promptly. 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, will not be recommended for use.

For a few species with medium impacts and an "Avoid" conclusion, a caveat is added 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 made. Currently such circumstances seem unlikely but with educational programs, conspicuous plant labeling, and enforcement of penalties for mis-use, it is conceivable that some plants could, for example, be approved for use only as indoor foliage.

Where are we now?

The assessment has been scrutinized within IFAS and by a number of external reviewers, resulting in approval for use by the IFAS Invasive Plants Working Group. We would like to have additional input on the assessment itself, and in due course, on the data that are collected for each species.

In developing the assessment, over 20 species were tested without the formal collection of documentary evidence. This range of species represented all categories for each index and all conclusions, and it was interesting to note that there were regional differences for most species. In their formal assessment, it takes a substantial effort to collect and document the appropriate data for each species and we have several part-time staff dedicated to this task (funded by IFAS and FNGA). As results are compiled, they will be made available online. As a large number of species are assessed, we will test the structure and questions in the assessment to see if there are redundant or overly pivotal questions, or to evaluate if there are repeated data-gaps. We expect that the assessment will continuously evolve both from these 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, we will be appearing to reinvent the wheel and our assessment will reach similar conclusions. For other species there will seem to be a reduced level of concern based on our stringent criteria and requirements for documented evidence. Alarming as this may seem to managers of natural areas, we anticipate 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 vital for the managers of natural areas and should be continued. The IFAS assessment is intended to complement this system and it is hoped that the many members of FLEPPC will contribute information on their least-favorite plant(s).

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