Invasive Issues: How to Determine Which Plants Are Invasive and Where Do Cultivars Fit?©

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INTRODUCTION

An invasive plant is defined as a plant that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (National Invasive Species Council, 2001). One estimate of U.S.A. annual losses due to invasive plants exceeds $34 billion (Pimentel et al., 2005). No one disputes that invasive plants damage our natural areas and extract a huge cost in terms of management and loss of resources. However, disagreements arise over which plants are invasive and where they are invasive. Many lists of invasive plants have been compiled by government agencies or environmental groups such as "exotic pest plant councils" (a compilation of lists for the southeastern U.S.A. is available at <http://www.invasive.org/seweeds.cfm). Most lists include plants currently produced by the nursery industry.

Often it is not clear what criteria were used to determine invasiveness. This issue becomes important when laws or regulations are imposed. The U.S.D.A. National Invasive Species Information Center has a website providing summaries of international, U.S.A. and state regulations pertaining to invasive species (http://www.invasivespeciesinfo.gov/laws/main.shtml). All stakeholders would be more comfortable with these determinations of invasive plants if credible evidence and science-based criteria were clearly defined and if unbiased organizations, such as universities, evaluated plants for invasiveness.

UNIVERSITY OF FLORIDA ASSESSMENT OF NON-NATIVE PLANTS

One such effort was developed by faculty at the University of Florida: "UF-IFAS Assessment of Non-Native Plants in Florida's Natural Areas" (IFAS Assessment) (Fox et al., 2003; IFAS, 2008a). The purpose of the IFAS Assessment is to guide Florida Extension recommendations by providing a well-defined mechanism to describe and categorize non-native plants that are invading natural areas in Florida. The assessment process utilizes trained staff to document evidence of non-native plants in natural areas, including use of herbarium specimens, scientific articles, and written information from at least three experts in each hardiness zone. The IFAS Assessment evaluates non-native plants in natural areas on the basis of four primary criteria:

- Ecological impacts (i.e., determining if the plant alters an ecosystem, displaces natural vegetation at 15% or more of the area, hybridizes with native plants, is tolerant of a wide range of environments, etc.)
- Potential for expanded distribution in Florida (i.e., rapid increase of separate populations, large areas of suitable habitat surrounds the area, etc.)

- Management difficulty (i.e., the non-native plant may be difficult to control because it is widespread or resistant to herbicide or quickly re-seeds, etc.)
- Economic value (i.e., the non-native plant is sold at the retail level, grown by many producers, used for forage, biomass, etc.)

The Assessment uses a series of "if-then" questions similar to a plant identification key. Results of questions are reported as scores from which conclusions are derived, specifying what Extension recommendations can be made about each species. These Conclusions are:

- Not considered a problem species at this time and may be recommended by University of Florida faculty.
- Caution – may be recommended by University of Florida faculty but manage to prevent escape.
- Invasive and not recommended by University of Florida faculty except for any "specified and limited" use that has been approved by the IFAS Invasive Plants Working Group (i.e., for bioremediation, etc.).
- Invasive and not recommended by University of Florida faculty.

Conclusions for each non-native plant are reached separately for each region of Florida: north (U.S.D.A. Hardiness Zone 8b), central (U.S.D.A. Hardiness Zone 9a), and south (U.S.D.A. Hardiness Zones 9b/10).

As of 2008, nearly 700 species have been assessed (results are available at <http://plants.ifas.ufl.edu/assessment/>). These results have no regulatory bearing; the results only apply to Florida Extension recommendations. However, the IFAS Assessment may be used as a model by other states and potentially for future regulatory actions.

CULTIVARS AND INVASIVENESS: NANDINA AS A CASE STUDY

Cultivars of species may have characteristics making them less invasive (Wood, 2007). To investigate this aspect, University of Florida researchers Sandy Wilson, Zhanao Deng, and I have been researching invasiveness of cultivars of *Nandina domestica*, nandina or heavenly bamboo (Knox and Wilson, 2006). Nandina is an extremely popular landscape plant in U.S.D.A. Hardiness Zones 6–10. Introduced to the U.S.A. before 1804, the species has since escaped cultivation in nine states (U.S.D.A. N.R.C.S, 2008), including Florida (8 counties) (Wunderlin and Hansen, 2008). The IFAS Assessment indicates the species is invasive in north and central Florida and recommends caution if planting in south Florida (IFAS, 2008a).

However, it is cultivars of nandina that are widely used for foundation plantings, borders, and massed groupings. More than 40 cultivars of nandina exist but no information was available on the potential invasiveness of nandina across cultivars or across Florida. Our research objectives were to evaluate nandina performance, growth, flowering, fruit production, and seed viability of the wild type and 10 cultivars planted in north and south Florida. Selections used in this study included five large-growing taxa [height of 1.5 m (5 ft) or more; 'Compacta'; 'Monum', Plum Passion® heavely bamboo; 'Royal Princess'; 'Umpqua Chief'; and the wild type]; three medium selections [height of 0.8 to 1.5 m (2.5 to 5 ft); 'Fire Power', 'Gulf Stream', 'Moon Bay']; and three dwarf selections [height less than 0.8 m (2.5 ft); 'Filamentosa'; 'Harbor Dwarf'; 'Jaytee', Harbour Belle™ heavenly bamboo].

This project sought to determine if these cultivars are as potentially invasive as the wild type, and if landscape performance and potential invasiveness differ between north and south Florida. Plants were installed in replicated plantings at Fort Pierce (U.S.D.A. Hardiness Zone 9b) and Quincy (U.S.D.A. Hardiness Zone 8b) on 28 Jan 2003. Flowering, fruiting, and visual quality (plant color and form) were assessed monthly for 2 years.

Results showed that 'Filamentosa' and 'Fire Power' failed to fruit in either location, while 'Moon Bay' and 'Gulf Stream' did not fruit in south Florida. Large selections produced more fruit than dwarf and medium cultivars. Greater plant survival with generally heavier fruiting was observed in north Florida than in south Florida. The cultivars, 'Monum' and 'Compacta', produced more fruit than the wild type.

The wide variation in growth and fruiting among nandina cultivars and regions of Florida strongly suggests that future assessments of ornamentals for invasiveness should include cultivars and should be trialed in various regions. Similar research is ongoing at the University of Florida with *Lantana*, *Ligustrum*, *Ruellia*, and *Stachytarpheta* species.

APPROVAL OF NON-INVASIVE CULTIVARS?

Most invasive plant lists and assessments only apply at the species level (wild type, parent species, or full species). A science-based, unbiased assessment tool will be the best mechanism to gain official acceptance and endorsement of non-invasive cultivars by government and other agencies.

The University of Florida's assessment tool for cultivars, the IFAS Infraspecific Taxon Protocol (IFAS, 2008b), is used when a cultivar's assessment is likely to be less invasive than the species. This tool consists of a series of "if-then" questions in which responses are compared to the wild type species. The Infraspecific Taxon Protocol asks for evidence that the cultivar is readily distinguished from the species, does not readily revert, has characteristics that may reduce dispersal and/or spread, does not hybridize with native plants, and may have reduced ecological impact (i.e., from reduced cold hardiness, low seedling viability, reduced competitive ability from dwarf or weeping habit, etc.). Some cultivars may be more cold hardy, faster growing, more floriferous, etc., and so may be more likely to be invasive. The protocol uses the same conclusions as the IFAS Assessment and results will be reported in the same tables.

Nandina domestica 'Fire Power' was the first cultivar submitted to this process and it has been endorsed as non-invasive by the IFAS Infraspecific Taxon Protocol. Applications for other nandina cultivars will follow.

INVASIVE PLANT ISSUES

The nursery and landscape industries must push for government agencies to develop science-based criteria to identify invasive plants. These criteria should include mechanisms to define the region(s) where such plants are invasive. Furthermore, similar mechanisms need to be developed to recognize non-invasive cultivars of invasive ornamentals. Finally, government agencies and other organizations must be persuaded to acknowledge non-invasive cultivars and provide a means to exempt them from regulations.

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