tuberosa; blazing star, Liatris spp.; and black-eyed susans, Rudbeckia hirta, are offered in seed catalogs on a limited basis. Some nurseries specializing in aquatic plants offer such native species as pickerel weed, Pontederia cordata; arrow-leaf, Sagittaria spp.; and waterlilies, including Nymphaea odorata.

Some of our native tropical epiphytes, including such bromeliads as Tillandsia fasciculata and such orchids as the cow-horn orchid, Cyrtopodium punctatum, have found favor with home growers. The almost endemic onion orchid, Encyclia tampensis, is often grown and frequently used in orchid hybridization.

But other than these few examples, it's difficult to find South Florida wildflower species in cultivation. This is curious. It makes me wonder why nobody has done selective breeding with the weedy Spanish needles, Bidens alba, to develop a beautiful hot-weather alternative to the shasta daisy. I wonder why butterweed, Senecio glabellus, and flat-topped goldenrod, Flaveria linerais, aren't being utilized as the gorgeous annual bedding plants they could be. And why aren't we growing our handsome native Iris hexagona var. savannarum, which turns the mucky depths of the Big Cypress Swamp into places of beauty each spring?

Listed below are a few of South Florida's beautiful and unusual native wildflowers which I feel have potential as cultivated plants. I am not a gardener nor am I a geneticist, so I cannot state with certainty that selective breeding will improve or overcome negative characteristics of each species so they can become useful additions to the cultivated landscape. However, as a traveler and observer in South Florida's dwindling natural habitats, I can point the way to beautiful species which I feel have potential. It's up to someone more skilled in horticulture to prove their worth.

(The Wildflower List is available from FNPS, 1203 Orange Ave., Winter Park 32789, for $1.00 and SASE.)

INSECT PESTS AND NATIVE TREES
by Wayne N. Dixon

Dr. Dixon is a Registered Professional Entomologist with the Florida Division of Forestry, Department of Agricultural and Consumer Services.

Many causal agents regularly inflict injury and damage to trees, for example, fire, flood, weather, chemicals, diseases, and animals, to name just a few. Within the animal realm, a general list would include nematodes, mites, millipedes, slugs, snails, birds, rabbits, mice, dogs, livestock, man, and insects. Insect pests are important not only because of damages to trees per se, but also their high nuisance value to landowners, loss of vegetational aesthetics, and expenditures necessary to prevent or control pest insect damage.

Native Trees

Native trees are damaged by insects. So, too, are exotic trees. In the inescapable war of people and trees versus insects, the advantages lie with having native trees growing under your care and supervision. The advantages are resistance, silviculture, and information on pest biology/habits.

Resistance of a native tree to indigenous pests is more likely to be present than for an exotic tree. Generally, resistance may be expressed in one of the following categories:

1. Preference-nonpreference
2. Tolerance
3. Antibiosis

Briefly, preference-nonpreference is the interaction of tree characters and insect responses that lead to or away from the tree for oviposition, food, shelter, or a mixture. Tolerance is the tree's ability to grow and reproduce itself or repair injury in spite of a damaging insect population. Antibiosis is the tree's characteristics in preventing, injuring, or destroying insect life, for example, reduced fecundity, decreased size, abnormal length of life, and increased mortality. Not necessarily is one type of resistance present to the exclusion of another; often it is a medley of resistance mechanisms. Indeed, the factors that confer resistance are many (Fig. 1).

RESISTANCE

Environmental Factors

Host/Alternate host abundance

Disease

Host specificity

Insect factors

Race

Senses

Physiology

Optimization

Development

Feeding reactions

Conditioning from previous list

Food utilization

Interaction

Insect-Tree factors

Toxic materials in insect food

Synchronization of development

Hypersensitivity of tree cells attached

Suitability of tree for insect development

Tree resistance to diseases vectored by insects

Silviculture of native trees is more likely to be available than for exotic trees. Important areas of silviculture are:

1. Site selection
2. Site adaptations
3. Maintenance programs

Briefly, many tree species have been studied that are native to North America such that the best sites are known for optimal tree growth. If the site is not optimal, however, native trees often successfully modify physiology or structure to adapt to the site. Often, proven maintenance programs are available and adequately tested to yield expected results in tree growth and appearance. The information required to grow desirable trees is extensive and intensive (Fig. 2).

Information on pest biology/habits is another area conducive to growing native trees, not exotic trees. Important categories include:

1. Base information
2. Control methods
3. Predictive capabilities

Briefly, base information or knowledge on general interactions of tree and insect is readily available in many cases of native trees and native pests. Answers are at hand for questions such as: Who is the pest? What damage can be expected? Where will the damage appear? Control methods, tested and efficacious, are available for insect pests of native trees. And, intensive research has provided the capability of predicting insect population responses given known changes in certain parameters, for example, weather, food quality, numbers of insects. Overall, native insects have received considerably more study — as would be expected. This has led to knowledge in several areas (Fig. 3), all of which require years of intensive research, to maximize the probability of suppression of pest insect populations.

PEST BIOLOGY / HABITS

For comparison, a listing of the disadvantages that pertain to exotic trees would include:

1. Little or no information base for many exotic tree species
2. Lack of resistance fine-tuned to one or more native pests
3. Suboptimal sites for tree growth may be all that's available
4. Control measures for pests may he
Evidence of Insect-caused Damage

There are many clues that can be used to ferret out whether insects are the responsible or causal agents of observed damages to trees. The following table is based on the particular part or component of your tree damaged and the typical damage types that can suggest insect activity. Some words of caution: There are some diseases and other causal factors that can cause similar damage types. A close observation may be necessary.

### Insect Identification

Many insects feed on trees. Rather than list the insects, typical damages, and their biology and control, I will refer the reader to two publications available from the Division of Forestry:


Please send your requests to either your local Division of Forestry office or the Bureau of Forest Education, Division of Forestry, 3125 Conner Blvd., Tallahassee, FL 32301.

Consultation with your local county or urban foresters plus referral to these publications should help you identify if an insect is at fault, and appropriate control measures

**Wild Things**

*The Return of Native Plants*

by Georgia Tasker and Stephanie True Moss, describes the trees, shrubs, and ground covers that you can plant around your South Florida home. **WILD THINGS** tells you:

- what they look like: their leaves, flowers, and fruit
- where they grow
- how much space they need

This soft-cover book, published by the Florida Native Plant Society, is illustrated with 32 pages of full-color artwork, 25 pages of black-and-white. $5.00 plus $1.00 postage. Order from Florida Native Plant Society, 1203 Orange Avenue, Winter Park, Florida 32789.

### RECLAIMED

*from page 7*

reclaimer, showed that the large contiguous expanses of disturbed land created by current mining procedures form a barrier to seed dispersal that retards natural revegetation and succession. Formerly, when mined areas were smaller and dispersed within vegetated areas, natural seeding was better. Preliminary experiments transplanting living soil blocks from areas in stages of advanced succession to areas of early wetland succession appear to have accelerated the recovery process.

The final report on this project is currently being published and will be available for distribution in late spring. Like most good research, it helped Center for Wetlands personnel organize a second project in which concepts developed during the initial study will be tested in carefully structured field trials. The second project, “Interactions of Wetlands with Phosphate Mining,” maintains the integrity of the original research group and will continue to concentrate on riparian hardwood forests, succession in clay settling areas, and seed dispersal.

The Institute of Phosphate Research has been actively involved in actual swamp and floodplain forest restoration. In 1983, FIPR awarded a grant to Dr. Mark Brown, also of the Center for Wetlands at the University of Florida, to test the efficacy of spreading organic wetland topsoil for hardwood swamp reclamation. The application of a layer of peaty “mulch” has proved to be extremely effective in introducing herbaceous aquatic vegetation into newly recontoured wetland basins in numerous marsh reclamation projects throughout the phosphate industry, but it had never been tested as an amendment for encouraging the development of hardwood swamp. Dr. Brown’s proposal, “Studies of a Method of Wetland Reconstruction after Phosphate Mining,” involved spreading mulch in two different configurations along the edge of a reclaimed lake at Occidental Chemical Company’s Suwannee River Mine in north Florida. Unfortunately, vagaries in the weather and in water requirements for Occidental’s ore processing system disrupted Dr. Brown’s research and limited the amount of practical information that the project will provide. Nonetheless, such full-scale wetland reclamation research is among the Institute’s highest priorities. FIPR is committed to improving the success of wetland reclamation by sponsoring a diverse array of innovative demonstration projects.

The largest forested wetland reclamation project undertaken by FIPR to date involves a co-operative agreement between the Institute and several federal Interior Department agencies. FIPR has been working with the U.S. Bureau of Mines, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service on a model riparian forest reclamation project at AMAX Phosphate’s Big Four Mine in Hillsborough County. The “Wetlands Reclamation Research Project,” actually a combination of three separately-funded studies, is unique in that a small stream, its associated floodplain forest, and the area’s subsurface hydrology were all monitored and evaluated before mining began on the 16-acre tributary to Lake Branch of the South Prong Alafia River. The U.S. Geological Survey began monitoring water levels in the surficial and artesian aquifers in 1982 in order to ensure that a full year’s record of groundwater data was available prior to mining. The U.S.G.S. team also installed a weir in the stream to allow them to measure discharge from the small watershed. The U.S. Bureau of Mines, working with AMAX engineers, prepared a mining and recontouring plan that will provide guidance for restructuring the subsurface strata in such a way that the infiltration and runoff characteristics of the reclaimed area will be conducive to wetland redevelopment. The U.S. Fish and Wildlife Service updated a biological survey of the site that had been conducted several years ago by AMAX, and worked with AMAX reclamation personnel to draw up a detailed experimental revegetation scheme that includes extensive trials of new reclamation techniques. The pre-disturbance data, collected before mining began in January 1984, will provide a basis for comparison when reclamation is completed in 1985.

(The remainder of this article, covering stream diversion and reclamation of uplands, will appear in the next issue of The Palmetto.)