editor's note

It's an exciting time for the Exotic Pest Plant Council. New chapters are springing up almost as fast as kudzu in the springtime. Southeast EPPC is a reality - Brian Bowen as agreed to serve as the SE-EPPC coordinator (see his article on page 15), and SE-EPPC editor, Steve Manning has agreed to serve on the editorial board of *Wildland Weeds*. Weed whackers in the Mid-Atlantic states met in March, and it sounds like they may be on the verge of forming a MA-EPPC. Look for updates on new EPPC chapters in future issues.

Regional EPPCs make sense. Many plants like *Salvinia molesta* (see Colette Jacono's article below) must be addressed regionally. If states can work together – in identification, detection, education, and control - the chances of stopping a pest plant are good. Shortly after writing this article, Colette learned that *S. molesta* has been found "molesting" several sites in Mississippi and Hawaii – two states that were previously thought to be in the clear. So...keep your eyes peeled! *–Amy Ferriter*

Salvinia molesta A Giant Among Noxious Weeds

Fig. 1. Mature giant salvinia has large, upright leaves and a chain of sporocarps attached among the underwater filaments.

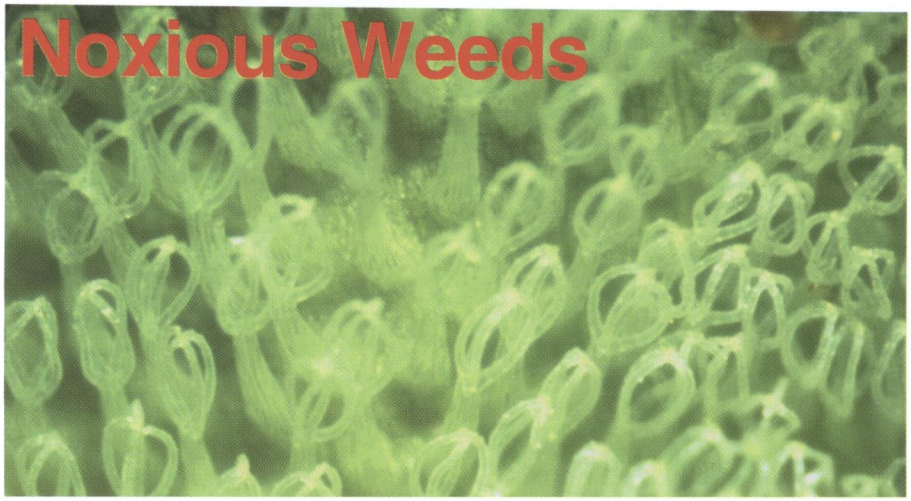

Fig 2. Cage-like hairs can be seen with a 10x hand lens and are characteristic for all *Salvinia* species listed as noxious weeds.

by Colette Jacono,
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September 1998 marked an important discovery in the history of US weed invasions. It was late summer, following a particularly droughty season, when giant salvinia (*Salvinia molesta*) was first found floating near the Louisiana shoreline of Toledo Bend Reservoir, a 186,000 acre impoundment on the Texas/Louisiana border. The first occurrence of this extremely aggressive aquatic fern in a US public water body has caused deserved alarm. Giant salvinia touts a history of well known invasions responsible for social and economic impacts in many countries (Thomas and Room, 1986).

The Toledo Bend discovery had been foreshadowed by seemingly "less important" reports earlier that summer. The species was first identified in a poly-lined schoolyard demonstration pond in Houston, Texas and soon after confirmations were made at farm ponds in the surrounding region. Autumn rains washed hidden masses of giant salvinia from sloughs and oxbows surrounding Toledo Bend into the reservoir. The same storms resulted in flooding and spilling of at least one Texas farm pond into a nearby creek. It was clear at this time that the weed was never at any level of containment. Local watersheds were just as vulnerable to infestation from private ponds as they were from large flowing water bodies. Fueled by the concern of biologists at the Texas Parks and Wildlife Department, the US Fish and Wildlife Service and the Sabine River Authority, increased field surveys resulted in new discoveries on a monthly basis in the region. Particularly critical infestations in Texas included Swinney Lake, an impounded swampland on the lower reaches of the Trinity River, and canals and bayous on the Sabine River, below the dam at Toledo Bend Reservoir. Slow waters and marshes of the lower Trinity provide important waterfowl habitat, while water from the lower Sabine is pumped eastward into Louisiana for use in rice and crayfish farms.

The release of a series of flyers helped lead to discoveries of giant

Fig 3. Variable forms of giant salvinia range from the colonizing to mat-forming stage.

salvinia in cultivation at plant nurseries in Arizona, Louisiana, Texas and North Carolina. Although designated a noxious weed by federal and state legislation, giant salvinia is making its way across the country through the water-garden trade. Awareness has increased in Florida since the discovery of giant salvinia inhabiting a canal in Naples. Florida's canals, wetlands and lakes offer suitable habitat for giant salvinia. Quiet backwater and nutrient rich areas are prime environments. However, like most aquatic invaders, giant salvinia can inhabit a broad range of freshwater regimes.

Not particularly common in its home range of southeastern Brazil (Forno, 1983), man has introduced giant salvinia to the continents of Africa, southeast Asia, Indonesia and Australia since the 1930s (Mitchell, 1972; Forno and Harley, 1979). The horticultural trade likely serves as the vehicle for introduction into the United States. Plants are not imported from Brazil, but from an eastern supplier selling giant salvinia or carrying it as a contaminant in water garden stock.

A true fern, giant salvinia has both floating and submerged leaves. Floating leaves are oblong and generally measure 1 to 3 cm long (1/2 to 1 1/4 inches) (Fig. 1). Leaf pairs are strung at nodes in equal intervals along a horizontal stem that floats just below the water surface. Each node also hosts a finely divided submerged leaf that, although appearing more like roots, has not been shown to function in the uptake of water or nutrients. The submerged leaf may act in stabilizing the plant and creating drag against wind.

The upper leaf surface is covered with rows of hairs that appear as cylindrical stalks. The top of each stalk is divided into four branches that rejoin at the tips to form a cage-like (or egg-beater) structure (Fig. 2). Overall, the upper leaf surfaces are covered with these hairs which repel water and other aqueous solutions, including herbicides.

In the absence of competition or in low light, giant salvinia leaves are smaller and lie flat on the water surface (Fig. 3) (Mitchell and Thomas, 1972). As a colony multiplies, leaves grow larger and form a keel shape. Further crowding induces leaves to fold on the midrib, compressing vertically and overlapping within nodes. At this time, most of the underside of the leaf is not in contact with the water and dense masses of plants cluster into floating mats. With maturity, chains of egg-shaped sporocarps (spore cases) develop among the submerged leaf (Fig.1). Although prolific, sporocarps are sterile (Mitchell, 1972). *Salvinia molesta*, like *S. minima*, is considered to be of hybrid origin (Schneller, 1980).

Giant salvinia grows effectively and aggressively through vegetative means. Stems fragment easily as plants mature. New plants develop from lateral buds which are prevalent at the nodes. In fact, each node harbors up to five serial lateral buds (Lemon and Posluszny, 1997), adding to the species' high potential for growth and dormancy.

Emergent leaves may be killed by a hard freeze; however, plants persist from buds on submerged stems. In laboratory experiments, submersed buds were killed only after water temperatures remained at 27 degrees F for several hours. This correlates to the worldwide distribution of giant salvinia which extends from the equator to regions experiencing frost but

not ice formation on surface waters (Whiteman and Room, 1991). Similar cold tolerance was demonstrated last spring at an outdoor nursery in North Carolina where plants rebounded in a pond that had been cleared off by winter temperatures. This episode casts a warning to mid-Atlantic and Gulf Coast states, as well as much of California where ice does not occur.

Salvinia molesta joins three similar neotropical species - *S. auriculata*, *S. biloba*, and *S. herzogii* - in a grouping called the "auriculata" complex (Forno, 1983). All four members share the characteristic feature of egg beater-like hairs. All are expected to be highly aggressive and are listed as federal and state noxious weeds. The egg beater-like hairs can be easily viewed with a 10x hand lens and provide a sure method for field determination of the prohibited *Salvinia* species.

Until the introduction of giant salvinia, *S. minima* (common salvinia, water spangles) was the only *Salvinia* established in the southern United States (Nauman, 1993). *Salvinia minima* is distinguished by its stalks on the leaf surface that divide into branching hairs that spread and are free at the tips. Many know this plant incorrectly as *S. rotundifolia*. However, *S. rotundifolia* is actually a synonym for *S. auriculata*, both having joined hairs. Unfortunately, the name had been misapplied to *S. minima* since the late 1930s (Weatherby, 1937) and continued even after Morton (1967) discovered the error, reporting that plants mistaken as *S. rotundifolia* should be called *S. minima*.

Salvinia was not recorded as part of the flora of early Florida when Chapman (1860), following 30 years of expeditions, compiled collections from North Carolina to Key West, or Baerecke (1914) documented ferns from mid-Florida. Small (1931) was the first to note *Salvinia* as naturalized in Florida in 1928, reporting it in the "Saint Johns River and some of its tributaries. How it was introduced into the Saint Johns watershed is not known." Probably not familiar with the genus, Small called the discovery *S. auriculata*. Decades later, Lakela and Long (1976) cited the introduction as *S. rotundifolia* (actually *S. minima*), which by that time was well established in the St. Johns drainage and Peninsular Florida. The first herbarium record from the Panhandle was in the late 1970s, but plants were not commonly collected there until the mid to late1980s. Well documented introductions to Louisiana (Landry, 1981) and Texas (Hatch, 1995) and problems experienced in those states speak for the recent expansion of *S. minima* in the southern United States.

Depending on geographical distribution and developmental stage, *S. minima* may lie flat or stand compressed like *S. molesta*. Because of this, the infestation of *Salvinia molesta* at Naples was first thought to be *Salvinia minima*. Likewise, nurserymen in North Carolina have purchased *S. minima* which was actually *S. molesta*. Many are not aware of the plant's notorious history or its prohibited status. Education may be our strongest resource in the campaign against further establishment and spread of giant salvinia in the United States.

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