



The compact flower clusters and opposite leaves are characteristics to focus on when identifying this species.

NEW INVADER PROFILE:

Japanese Chaff Flower – *Achyranthes japonica*

By Christopher Evans and David D. Taylor, Photos by the authors

Sometimes a weed comes along that puts real fear in the souls of land managers. The Gulf Coastal Plain is the battleground for a number of these; species such as cogongrass, bush killer, giant salvinia, and the Old World climbing ferns. Managers to the north keep a wary eye to the south, hoping these weeds do not move northward.

Now we have a problem plant moving from north to south. Be on the lookout for Japanese chaff flower, *Achyranthes japonica* (Miq.) Nakai, in your neighborhood. It can invade a wide variety of habitats and can be easily introduced unintentionally by hikers, campers, and others.

Japanese chaff flower is a native of eastern and southeastern Asia. It is one of two species in the genus *Achyranthes* found in the United States (the other is *A. aspera*, an exotic species found in upland environments of the Southeast coastal plain). Japanese chaff flower was first discovered in North America 30 years ago this summer on the banks of Tug Fork of the Big Sandy River, Martin County, Kentucky (near West Virginia). It was collected in Pike County, Kentucky, and in Mingo County, West Virginia, the following year. This species likely arrived along the Tug Fork via railroad traffic and spread quickly throughout the region by floodwaters, animal movement, and humans. The finding, reported in a short article several years later (Medley et al. 1985), was largely forgotten. The authors noted:

“This species will probably be found eventually in all Kentucky and West Virginia counties bordering Tug Fork and the lower Big Sandy River; it may ultimately be found along the banks of the Ohio River downstream from the mouth of the Big Sandy.”

Unfortunately such predictions are often ignored and the pest of concern (plant, animal, or disease), is left to spread over a much larger area. By the early 1990s, chaff flower was dominant along large stretches of the Tug Fork River and was no longer confined to frequently flooded forested environments. Plants were invading edge environments, roadside ditches, logging roads, and even cracks in sidewalks (personal observations by the authors). Chaff flower quickly spread throughout the lower Ohio River Valley (likely through flood events), and other regions of the southeast United States (likely through human-aided dispersal).

Pat Haragan, then at the University of Louisville, brought an odd plant to a Kentucky Native Plant Society meeting around 1995-1996, concerned that large colonies were found along the Ohio River in Louisville. Botanists identified it as Japanese chaff flower. The plant had moved about 350 river miles in 15 years or less. Unfortunately, it was still viewed as something of a curiosity, but with the understanding that it was probably a bad actor.

By 2008, chaff flower had made it into Illinois with an initial discovery at the Chestnut Hills State Nature Preserve by retired Department of Natural Resources (DNR) botanist, John Schwegman. In 2010, a survey by the River to River Cooperative Weed Management Area (CWMA) and Illinois DNR found chaff flower present in every county adjacent to the Ohio River in Illinois and common in floodplain forests alongside the river, often occurring in large stands. Surveys conducted in the fall of 2011 confirmed that chaff flower has crossed the Mississippi River and is now found in southern Missouri.

An aggressive educational campaign was launched to learn more about this plant. Species alerts, literature reviews,

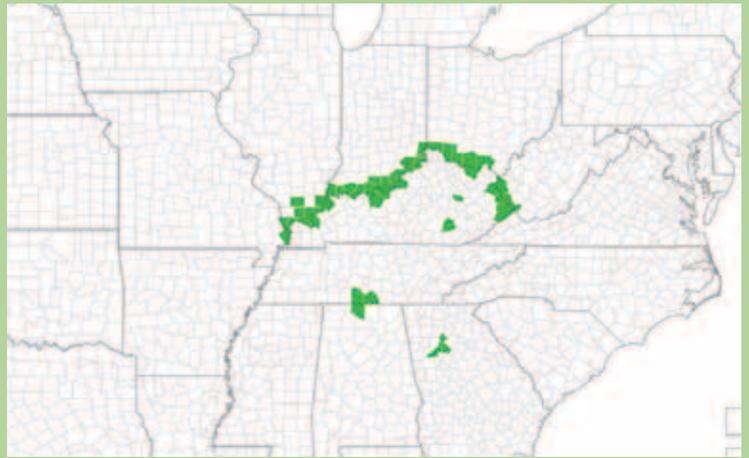
presentations, and emails were used to ascertain additional locations of this species. Currently chaff flower has been reported in 48 counties in 9 states, mainly concentrated along the Big Sandy and Ohio Rivers. In all likelihood, this is a gross underestimate of the actual distribution of chaff flower in the United States. Until recently, no species alerts, descriptions, or profiles were widely available, so few people know about this plant or how to identify it.

In the fall of 2010, William Overbeck, a student at Eastern Kentucky University in Richmond, discovered a population of chaff flower in the Daniel Boone National Forest (DBNF) along the Red River. This observation was reported in EDDMapS and was noted by the authors. Had it been a herbarium record (important in its own right) without wider notice, it could have gone unnoticed by land managers for months or years. Actions to reduce the plant's impact have been taken at the site, although work is still ongoing.

This plant has great potential to become a serious problem along the entire Mississippi basin, at least from central

Missouri and Illinois south. Given that it is spread by water, animals (including birds and people) and probably in soil, this year's floods may have carried seed from existing populations along the Ohio River and tributaries to flooded land along the Mississippi. Existing populations in Kentucky, West Virginia and Ohio, as well as Indiana and Illinois would provide seed for such an invasion. We encourage land managers, extension agents, citizen scientists and others to watch for this species, report it in EDDMaps if found, and eradicate it.

The unusual deflexed fruit with paired spiny bracts make identification easy.



Known distribution of Japanese chaff flower. Map courtesy of www.eddmaps.org

Already, outliers occur in Tennessee and Alabama along the Tennessee River system.

Japanese chaff flower is easy to identify. First impressions are that it is an opposite-leaved pigweed. As with pigweed, the stem at the ground is red, even in seedlings. It is a perennial herbaceous plant that does not appear to be rhizomatous. Young plants are single stemmed, but older plants seem to have multiple stems arising from the same root crown. Plants can be up to 2 meters tall (particularly in sunny areas). The leaves are opposite, simple, and entire along the margins. Venation of the leaves is somewhat arcuate, reminiscent of the venation on dogwood leaves. Stems are thin and somewhat wiry (especially late in the season). The entire plant is slightly pubescent. The flowers occur on erect spikes at the end of the stems and upper branches. Flowers are small, lack petals, and occur in a tight cluster at the end of the spike. The flowers diverge at nearly a right angle from the spike, giving the flowers a bottle-brush look. As the fruit is formed, the spikes elongate greatly and the fruits lie flat against the spike, giving the plant a look similar to the native lopseed (*Phryma leptostachya*). The fruits are slender and dry, with a single hard seed. Each fruit has a pair of stiff bracts that aid the fruit in attaching to clothes or fur. Many plants observed in the field appeared never to have flowered; all of these were smaller than plants that had flowered. This suggests it may take one or two years to reach flowering size from seed.

Chaff flower starts growing in late spring and peaks in mid-summer. Flowering begins in late summer. Flowers continue to develop into early fall, even after the spike elongates and the first flowers start maturing into seed. As the plants senesce in the fall, the leaves wilt away, and the remaining stems and fruits turn orange-brown. The dead thatch remains erect even into winter, making this plant easily recognizable almost any time of year. Heavy floods or snow can cause the thatch to break apart or lie down flat. The bracts on the seeds allow them to easily cling to clothing, shoes, hair, or animal fur any time from early fall to late





[from top] Chaff flower can form dense infestations in bottomlands, ditches, riparian areas, and other habitats; Seed-bearing plants can be covered in silt from flooding, resulting in clusters of seedlings around the buried plant; Chaff flower seed can easily attach to clothing or animal fur; New shoots emerging from root crown. Older plants often exhibit multiple shoots.

winter. Wool and loose-weave or knit fabrics collect the most seed. Tight-weave poly/cotton blends were relatively resistant to the bracts.

Many stems are broken by flooding. Seed-bearing stems buried in silt can result in dense patches of seedlings. Several plants showed evidence that late fall/early winter burial by silt allows a portion of the previous year's stem to survive winter. Several plants with silt deposition had new growth originating from the previous year's stem, 2-3 cm above the crown. Plants without silt deposition originated new growth at the crown.

Chaff flower is usually found in areas with partial shade and moist soil, making it an ideal floodplain weed. It will also grow in drier areas in sun, and in densely-shaded areas. Dense infestations have been found in bottomland forests, on riverbanks, at the edges of fields and in ditches and swales. Because it forms dense populations and grows tall, chaff flower competes with other floodplain species and likely shades many out. Deer seem to prefer these thick stands for browsing. During the Illinois surveys along the Ohio River in 2010, almost every stand showed significant deer browse and insect feeding. The plant resprouts and produces seed even after being browsed.

Fruits counted from plants in the DBNF suggest a large plant can produce more than 1,000 seeds. Preliminary research from Gibson and Shupert, Southern Illinois University (pers. comm. to C. Evans), from an infestation at Cypress Creek National Wildlife Refuge, indicates that infestations can reach densities over 70 plants per square meter (very dense considering each plant can be very wide with many stems and side branches) with an abundance of seedlings below. They also found incredibly high seed production potential (over 16,000 seeds per square meter). Nearly 100% of seeds were viable and almost 65% germinated in initial tests. We do not yet know the longevity of seeds or how flooding or winter affect viability and germination, but are investigating these aspects.

If you find chaff flower, do not let it go to seed while devising your plan of attack. As always, eradication while a population is small is the best tactic. Since this is a new species actively expanding its range, spread prevention and Early Detection/Rapid Response are the best management strategies. Thoroughly cleaning clothing, boots, and pet fur after hiking in infested areas is vital to preventing spread. Monitoring programs should focus on trails, campgrounds, and riverine and stream systems as these are the most likely places for introductions.

Little is known about effective control efforts. Because of the well-developed root system, digging or pulling large stands is not feasible, though it works for seedlings or small populations. Seedlings were somewhat difficult to pull, but could generally be removed with the entire root. Adult plants cannot be pulled, even from moist, sandy silt loam and must be dug out. Initial treatments of triclopyr at 2% solution appear to be effective. Preliminary trials are underway to test several different herbicides and rates.

Accurate distribution information is crucial for monitoring. If you find Japanese chaff flower, report the location in EDDMapS, alert other land managers and interested persons in your area, and help eradicate the population. Hopefully this species will not become established further south, but be prepared should it appear on your horizon.

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