

## TYPHACEAE—CAT-TAIL FAMILY

by Joshua D. Sulman

The family is comprised of two genera, the cat-tails (*Typha*) and bur-reeds (*Sparganium*), long treated as separate families, which together form a monophyletic lineage of Cretaceous age (Kim & Choi 2011, Sulman et al. 2013, Zhou et al. 2018). Typhaceae are perennial, rhizomatous or stoloniferous herbs of aquatic and wetland habitats. Plants dioecious, flowers/fruits small, numerous, packed into dense cylindrical or globose heads, pistillate heads proximal, staminate distal, perianth reduced, wind-pollinated; fruits specialized for wind dispersal in *Typha* and animal or water dispersal in *Sparganium*. Leaves distichous, linear, and sheathing. Hybridization, along with phenotypic plasticity, make identification of species challenging.

1 Inflorescence of 2+ globose heads, fruits >1 mm wide .....*Sparganium*

1 Inflorescence densely cylindrical, fruits <0.2 mm wide.....*Typha*

### **Sparganium – bur-reed**

Plants emergent, floating, or submerged; leaves flat and flexuous to strongly keeled and rigid; flowers and fruits borne in dense, globose heads. The inflorescence axis may be simple or branched (a ‘branch’ consisting of a lateral axis bearing 2+ pistillate and/or staminate heads, as opposed to a peduncle, which only bears one head); the staminate heads are distal and terminate the inflorescence axes. Pistillate heads may be sessile or peduncled. The pistillate heads (or

peduncles) are borne in the axil of a subtending leaf, or are supra-axillary (peduncle fused to stem axis above the subtending leaf, thus the head appears to be borne a short distance above the subtending leaf), a useful character for species identification. Fruit with persistent style and stigma forming a beak; fruits fall singly, and are water- or animal-dispersed, a food source for waterfowl. Circumboreal, in mountains through the tropics to the southern hemisphere.

Species are variable in growth form and leaf morphology; those with a typically floating growth form may produce short emergent leaves and stems when stranded by low water. Likewise, emergent species can assume a floating growth form in response to deep or flowing water, though they rarely flower under such conditions. Positive identification often requires mature fruit (Sulman & Smith 2017). Emergent species typically occur in shallow water while species with a floating growth form occur in nutrient-poor habitats and deeper water (Nichols 1999, Sulman 2010). In key, measurements of pistillate head diameter, fruit body, and beak are for mature fruits; stigma length can be used for flowers or fruits.

- 1 Stigmas 2; 2—3 mm long; mature fruit obpyramidal, apex truncate to rounded below beak; fruit body 6—10 mm, beak to 3 mm, pistillate heads 2—3.5 cm thick; plants emergent, to 2+ m tall..... *S. eurycarpum*
- 1 Stigma 1; 0.3—3 mm long; mature fruit apex acute, fruit body less than 7 mm; plants floating or emergent, to 1 m tall.
  - 2 Leaves flat, plants floating.
  - 3 Fruit body 3—4 mm, beak 0.5—1.5 mm, stigma 0.3—1.0 mm; inflorescence unbranched, pistillate heads 1—3, up to 1 cm thick, axillary, sessile or peduncled, staminate

head 1—(2). .....*S. natans*

3 Fruit beak 1.5–3 mm, staminate heads 2 or more.

5 Inflorescence branched; fruits strongly tinged with red, body dull, fusiform to obovoid-oblong, 3–4 mm, beak 1.5–3 mm, strongly curved; stigma 0.4–1.0 mm; pistillate heads 1–2 cm thick when ripe, leaves 3–7(–10) mm wide, pallid and cross-reticulate beneath; pistillate heads 1–2 cm thick, most lacking a subtending leaf; staminate heads distinct .....*S. fluctuans*

5 Inflorescence unbranched (pistillate heads often peduncled); fruit green to tan, often red-dotted below, body dull or glossy, fusiform, 3–5 mm, beak 1.5–3 mm, stigma 0.5–1.5 mm; leaves 2–5 mm wide, green beneath; pistillate heads 1–2 cm thick, at least one supra-axillary; staminate heads confluent.....  
..... *S. angustifolium*

2 Leaves keeled or triangular in cross section; plants typically erect and emergent.

6 Pistillate heads all axillary (or subtending leaf absent); inflorescence typically branched, in robust plants.

7 Fruit glossy above, dull below, the body ellipsoid-fusiform, 5.5–7 mm, often with longitudinal ribs at summit, beak curved or hooked at tip, 4–7 mm, stigma 1.5–3 mm; lateral branches with staminate heads only; pistillate heads up to 3.5 cm thick; anthers 1.1–1.4 mm ..... *S. androcladum*

7 Fruit dull, the body fusiform, 3–5 mm, not ribbed at summit, beak straight or slightly curved, 1.5–5 mm, stigma 0.8–2.0 mm; branches with both pistillate and staminate heads; pistillate heads up to 2.5 cm thick; anthers 0.6–1.1 mm

..... *S. americanum*

6 One or more pistillate heads supra-axillary; inflorescence typically unbranched  
(though heads often peduncled).

8 Staminate heads 3+, remote from distal pistillate head; pistillate heads spaced 5+  
mm apart, 1—2.5 cm thick; fruit body fusiform, constricted at equator, glossy  
above but dull below, 3—5mm, beak curved, 2—5.5 mm, stigma 0.8—2 mm ..*S.*  
*chlorocarpum*

8 Staminate heads 1(–3), usually adjacent to distal pistillate head; pistillate heads  
crowded toward stem apex, 1—2 cm thick; fruit body narrowly fusiform, slightly  
or not constricted at equator, glossy, 3—6 mm, beak straight or slightly bent, 1–  
2 mm, stigma 0.3—0.8 mm .....*S. glomeratum*

***Sparganium americanum*** Nutt. – American bur-reed

Streams, ditches, beaver ponds, lakeshores, floating vegetation on boggy lakes, marshes,  
and riverbanks; oligotrophic to mesotrophic, in water 0–1 m deep, in organic or sandy  
substrates, sometimes forming large colonies. Common and widespread in neutral to acidic,  
sandy and boggy wetlands of northern and central Wisconsin, rarer southward and mostly  
absent from regions of calcareous bedrock and till. The leaves are light-green, thick and  
spongy in cross-section, wider (to 18 mm) than in *S. chlorocarpum*, and paler than in *S.*  
*eurycarpum*. In deeper water, *S. americanum* may produce floating leaves, which are still  
keeled or triangular in cross-section. The surface of the mature fruits is dull, unlike the glossy

fruits of *S. chlorocarpum* and *S. androcladum*. Pistillate heads are axillary in unbranched plants of *S. americanum*, whereas *S. chlorocarpum* has one or more supra-axillary heads.

***Sparganium androcladum*** (Engelm.) Morong – branched bur-reed

Margins of ponds and flowages, bogs, and marshes, oligotrophic to mesotrophic, in water 0–1 m deep, often on sandy or clayey substrates; vegetatively similar to *S. americanum*, and in similar habitats, but with larger and fewer pistillate heads, larger, glossy fruits, and lower branches entirely staminate. Sporadic distribution from Buffalo, Monroe, Dane, and Walworth north to Burnett, Douglas, Bayfield, Forest, and Oconto Counties. Absent from most of eastern Wisconsin, but locally frequent in the Central Sands, Lake Superior Coastal Plain, and in the Driftless Area in marshes along the lower Chippewa River.

***Sparganium angustifolium*** Michx. – narrow-leaved bur-reed

Clear, sandy-bottomed oligotrophic lakes and ponds, occasionally in streams or ditches, in water 0–2.5 m deep. Distinctive in its very narrow, flexuous, floating leaves and stems, with only the inflorescence and upper leaves arching above the water surface. Northern Wisconsin south to Burnett, Portage, and Door Counties. Typically in oligotrophic habitats; associates include *Isoetes echinospora*, *Lobelia dortmanna*, *Eriocaulon aquaticum*, *Carex utriculata*, and *Nymphaea odorata*.

***Sparganium chlorocarpum*** Rydb. – green-fruited bur-reed (*S. emersum*, *S. acaule*)

In a wide range of oligotrophic to mesotrophic habitats including lake margins, beaver ponds,

marshes, bog moats, ditches, streams, mucky shores, floating mats of aquatic vegetation on lakes, acidic bogs, and alkaline fens, in water 0–1 m deep, often in organic or sandy substrates. Common in northern and central Wisconsin, uncommon in southern Wisconsin, and in the Driftless Area limited to the larger river valleys. Morphologically, this is our most variable species; plants 4 cm—1 m tall, typically erect and emergent; in deeper water, floating leaves have a prominent keel at least basally. Leaves 2—12 mm wide, usually strongly ascending and much exceeding the inflorescence. Often confused with *S. americanum*, *S. androcladum*, and *S. angustifolium*; a combination of emergent habit and the presence of one or more supra-axillary pistillate heads usually distinguish it from these species. Individuals of *S. chlorocarpum* with a branching inflorescence, though rare in Michigan (Voss 1972), are occasional in Wisconsin populations.

*S. chlorocarpum* has been lumped with *S. emersum* Rehmann in many recent treatments (Cook and Nicholls 1986, 1987; Kaul 1997; Voss & Reznicek 2012) but molecular evidence shows that *S. chlorocarpum* is a distinct species, sister to *S. glomeratum* (Ito et al. 2016), while *S. emersum* is a circumboreal species closely related to *S. angustifolium* and is not known to occur in Wisconsin (Gleason and Cronquist 1991, Sulman and Smith 2017). Hybrids with *S. fluctuans* are reported from Ontario (Ito et al. 2016), and hybrids with other species are suspected.

***Sparganium eurycarpum* Engelm. – common bur-reed**

Ponds, marshes, lakeshores, rivers, streams, ditches, wet spots in sedge meadows, and stagnant or slow-moving water generally. In mesotrophic to highly eutrophic habitats, water 0–1 m deep, on a wide range of substrates, throughout Wisconsin. Our tallest, most

widespread species, and the most common in highly nutrient enriched habitats, reaching a height of 2.5 m. This is the most common bur-reed in the southern two-thirds of the state. Leaves are dark green, flattened above, strongly keeled to the leaf apex.

***Sparganium fluctuans*** B. L. Rob. – floating-leaved bur-reed

Oligotrophic to mesotrophic, often tannin-stained lakes, sandy to gravelly or mucky substrate, 0.15–2 m deep; northern Wisconsin, south to Polk, Taylor, and Marinette Counties. Our only floating bur-reed with a branched inflorescence. The reddish fruits with strongly curved beaks, and leaves that are whitened and cross-reticulate beneath are distinctive.

***Sparganium glomeratum*** (Laest.) L. M. Newman – clustered bur-reed

Marshes, swales, ditches, pools, mesotrophic, in water 0–0.3 m deep, organic or clayey substrates, often with *Alnus incana*, *Salix* spp., *Carex* spp. Primarily in the Lake Superior Clay Plain in Douglas, Bayfield, and Ashland Counties, with outlying records from Sawyer and Washburn Counties. Rare (Wisconsin Threatened), but locally common in wetlands and ditches in the City of Superior. In fruit, only a short stub remains where the staminate heads were attached, thus the uppermost pistillate head appears to terminate the stem. The upper pistillate heads are usually clustered tightly at the stem apex. Olga Lakela (1965) first identified *S. glomeratum* in the regional flora in the 1930's; collected in 1917 on Madeline Island, Ashland Co., (Goessl 8040, WIS). Seeds of *S. glomeratum* have been identified from 60,000 year-old peat deposits in Minnesota (Walton 1999).

***Sparganium natans* L. – small bur-reed (*S. minimum*)**

Marshy or boggy shores, shallow lakes, protected bays, beaver ponds, wild rice beds, bog moats, with a variety of submerged, floating, and emergent aquatic vegetation; usually in soft, organic substrate; mesotrophic to somewhat oligotrophic habitats in water 0.1–1 m deep; tolerant of both highly alkaline and acidic conditions, but apparently sensitive to eutrophication and absent from many former habitats. Circumboreal, in northern Wisconsin south to Polk (historic), Barron, Taylor, Lincoln, Oconto Counties; also Adams, Walworth, and Dane County (historic); absent from the Driftless Area.

*Sparganium natans* may form extensive lawn-like colonies of submerged leaves, with only the flowering shoots extending to the water surface. It is often inconspicuous and easily overlooked among taller emergent aquatics. Pistillate heads are axillary, which helps differentiate this species from *S. angustifolium*.

**TYPHA – cat-tail**

The cylindric inflorescence is composed of a lower pistillate part, and an upper staminate part, each with thousands of flowers. The staminate portion is deciduous soon after flowering, with a persistent axis. The pistillate flowers are interspersed with many non-fertile modified carpels (carpodia) which mature into obovoid spongy structures, and form much of the outer surface of the mature cat-tail. In some species, dark-tipped bracteoles, resembling the stigmas, subtend the flowers and fruits. Cat-tails are important components of marsh vegetation in tropical to temperate regions worldwide.



Hybridization and backcrossing are common; offspring show a range of morphologically intermediate characters between the parent species (Smith 1967, 1987, 2000). Vegetative, flexuous, submersed stems and leaves are occasionally produced in deep or flowing water (Thieret & Luken 1996). The floral structures are best observed under a 20× dissecting microscope, but macroscopic characters can be viewed with unaided eye.

1 Staminate and pistillate parts of inflorescence contiguous or separate; pistillate bracteoles absent.

2 Mature plants 1.5–3 m tall; staminate and pistillate parts of inflorescence contiguous, pistillate part pale green in flower, brown in fruit, 5–25 cm x 2.5–3.5 cm at maturity; leaves 10–23 mm wide; widespread, native .....*T. latifolia*

2 Mature plants 0.8–1.3 m tall; staminate and pistillate parts of inflorescence separated by ±2 cm gap, pistillate portion orange in flower, brown in fruit, 4–6 cm x 1.5 cm at maturity; leaves 2–4 mm wide; local, introduced ..... *T. laxmannii*

1 Staminate and pistillate parts of inflorescence not contiguous, separated by a distinct gap; pistillate bracteoles present.

3 Mature plants 1.5–3 m tall; pistillate part of inflorescence dark brown in flower, medium brown in fruit, 10–20 cm x 1–2 cm at maturity; pistillate bracteole tips rounded or blunt, medium- or dark-brown; leaves green, to 4–12 mm wide; mucilage glands present on leaf sheath but absent from blade; widespread, introduced. *T. angustifolia*

3 Mature plants 1.5–4 m tall; pistillate part of inflorescence cinnamon-brown in flower, orange-brown in fruit, 6–35 cm x 1.3–2.5 cm at maturity; pistillate bracteole tips

mostly acute, straw-colored to orange-brown; leaves yellow-green, to 8–18 mm wide; mucilage glands extending from sheath up base of leaf blade; local, introduced ..... *T. domingensis*

***Typha angustifolia*** L. – narrow-leaved cat-tail

Roadside ditches, stormwater retention ponds, disturbed marshes, especially in habitats influenced by road salt runoff; likely introduced from Europe during early colonial times (Kim & Choi 2011, Ciotyr & Freeland 2016). The earliest Wisconsin collection was at Marshfield, Wood Co., by Chas. Goessl (1915, MIL). Throughout the state; listed as a Restricted Invasive Species in Wisconsin.

The hybrid of *T. angustifolia* and *T. latifolia*, ***Typha × glauca*** Godr. – hybrid cat-tail, was first collected in Wisconsin at Lake Wingra, Dane Co. by R.H. Denniston in 1922(s.n., WIS), and is now the most commonly encountered cat-tail across most of the state, outcompeting both parent species especially in disturbed, nutrient-enriched wetlands, and where water levels are artificially stabilized (Travis et al. 2010, Boers & Zedler 2008). The F<sub>1</sub> hybrid is fertile and can backcross with both parent species; thus, populations are mostly comprised of advanced generation hybrids which are difficult to distinguish from the parent species based on morphological characters (Geddes et al. 2021).

***Typha domingensis*** Pers. – southern cat-tail

Collected by S. Galen Smith in 2011 in a stormwater retention pond and shallow marsh dominated by *Typha × glauca* in Middleton, Dane Co. *T. domingensis* is listed as a Prohibited

Invasive Species in Wisconsin. Pantropical to warm-temperate, native in the southern U.S. as far north as southern Illinois, and extending its range northward recently to Ohio, northern Illinois. Reported to hybridize with *Typha latifolia* and *T. angustifolia* (Smith 2000).

***Typha latifolia* L.** – broad-leaved cat-tail

Our only native cat-tail, this species is widespread and historically abundant in oligotrophic to eutrophic ponds, shallow marshes, wet and sedge meadows, bog moats, beaver ponds, riverbanks, ditches, and lakeshores. Throughout Wisconsin; displaced by *T. x glauca* in many areas.

***Typha laxmannii* Lepech.** – graceful cat-tail

Escaped from cultivation, first collected in Wisconsin in 2017 in a shallow marsh in a highway interchange in Milwaukee County, in 2018 and 2019 in stormwater ponds in Waukesha County, and in 2020 from a private pond in Marinette County (WDNR 2022); also in northern Illinois. *T. laxmannii* is native to Eurasia, and has been sold as an ornamental; this species is listed as a Prohibited Invasive Species in Wisconsin. Notably shorter-statured than our other *Typha* spp.

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