2.17 Flowering Rush

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Butomus umbellatus L; emergent shoreline plant in its own family, Butomaceae (flowering rush); originally placed in the Alismaceae (water-plantain) family
Derived from *bous* (Greek: ox) and *temno* (Greek: "I cut"), referring to its sword-like leaves with sharp edges that cut the mouths of cattle feeding on the species

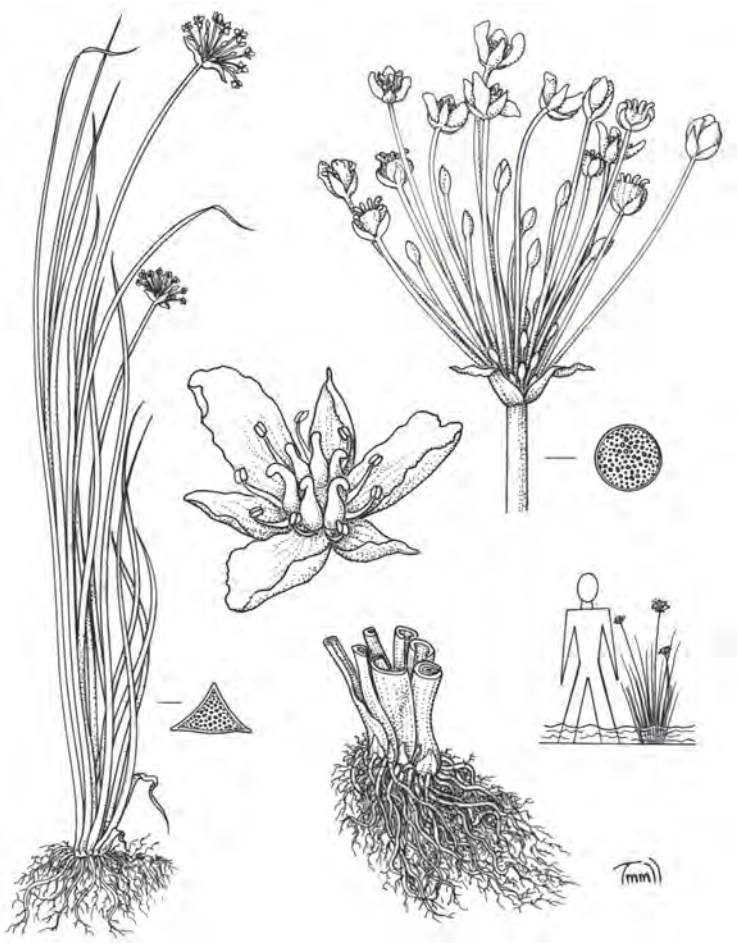
First identified along the St. Lawrence River in Quebec in 1897; likely introduced from Europe as a garden plant
Present in the northern US from Idaho to Maine and in the adjacent Canadian provinces

Introduction and spread

Flowering rush is native to Europe and Asia. It is thought that the species was first introduced to the US for use in ornamental gardens, but flowering rush thrives along shallow shorelines and in wetlands. The first observation of the species in North America occurred along the St. Lawrence River in Quebec in 1897 and botanists believe that multiple introductions have occurred since that time. By the mid-1950s, flowering rush populations were documented throughout the Great Lakes Region. Populations of flowering rush in the Great Lakes and points west are believed to be of European origin, whereas populations in the St. Lawrence River area are thought to be from Asia. Since the 1950s, flowering rush has spread to the west, north and east of the Great Lakes, with populations now found across the northern US and extending from Washington to Maine and nearly all of the adjacent Canadian provinces. Flowering rush tolerates a wide variety of shallow water and wetland settings and often forms dense stands that displace native riparian species, degrade fish and wildlife habitat, alter hydrologic patterns and interfere with recreational use of water bodies.

Description of the species

Flowering rush is a perennial monocot herb that can reach up to 5 feet in height. Plants have an extensive rhizome and root system and soil type or consistency and soil pH do not appear to affect growth. However, the species cannot grow in shade and is intolerant of saline or brackish waters. Plants become established in wet areas or along the shallow margins of lakes, ponds and streams and can grow into water up to 9 feet deep. Leaves of flowering rush are fleshy, thin and sword-like and resemble those of native bulrush (*Sparganium* spp.), but are triangular in cross-section. Submersed leaves remain limp or float on the surface of the water, whereas emergent leaves can reach to 3 feet in length and may have tips that are twisted in a spiral manner. Flowering rush is easiest to identify when it is flowering, which only occurs if plants are growing in very shallow water or along the shoreline. Plants flower between June and August, depending on temperature and latitude. The flowers are borne in an umbrella-shaped cluster (umbel). Individual flowers have three petals that are white to pink to purple in color.



Reproduction

Flowering rush is dispersed in four ways: seeds, vegetative bulblets produced on the inflorescence at the base of flower stalks, vegetative bulblets that form along the sides of rhizomes (underground stems with nodes that produce new shoots and roots), and rhizome fragments. Once established, the species expands its population size and spreads locally by rhizome elongation. Both seeds and bulblets can be transported by water currents and are long-lived, which facilitates their dispersal by wildlife, boaters and other human activities.

Eastern US populations of flowering rush are reportedly fertile diploids (with 2 sets of chromosomes), whereas sterile triploid populations (with 3 sets of chromosomes) occur in western North America. Diploid populations flower prolifically and produce both seeds and bulblets and their spread is due to dispersal of seeds and bulblets. Triploid populations in the West rarely flower and produce low numbers of seeds and bulblets. As a result, the majority of the spread of western populations is due to rhizome fragmentation, which results in clonal (genetically identical) populations.

Problems associated with flowering rush

Flowering rush can form dense infestations that compete with native riparian species and displace more desirable plants. Dense growth of the species may also allow it to outcompete threatened or endangered plant species and likely alters wildlife habitats. There are varying levels of concern about the impact of flowering rush on wetlands and fresh water habitats. For example, reports from the St. Lawrence River suggest that even high densities of flowering rush have not significantly reduced plant diversity. However, displacement of native plant species and the potential for wildlife habitat alteration make flowering rush a species of concern.

The impacts of flowering rush to water use and access may be more significant. For example, flowering rush has developed extensive monotypic populations in reservoirs with widely varying water levels in western states. The species is also currently causing economic impacts in irrigation canals and drainage ditches in the western US and large populations of flowering rush impede access to shallow lakes by colonizing shoreline areas where aquatic plants have not grown in the past. Marshlands are becoming dominated by flowering rush because the species thrives in areas with fluctuating water levels and expansion throughout littoral zones interferes with shoreline access, boating and fishing.

Management options

Active laboratory and field research on the management of flowering rush has been ongoing for the past several years, but information regarding the management of flowering rush infestations in North America is still sparse. However, the same management philosophies described for other species hold true – early detection of introductions and rapid response to new infestations provide the most effective control of flowering rush and limit further spread of the species. Flowering rush resembles many native species; therefore, accurate identification of the species is critical before initiating management efforts to avoid damaging nontarget desirable native plants. Flowering rush appears to thrive where bottom sediments are disturbed and following drawdown (Section 3.4), so preserving desirable aquatic plant populations is important to prevent establishment and spread of flowering rush.

Manual control methods include cutting (Section 3.5), hand digging and using bottom barriers (Section 3.4). These techniques are most appropriate for small infestations because rhizome fragments that are created can hasten spread. Bottom barrier can be used to control small areas of flowering rush through smothering, but this technique is not selective. Cutting will not kill flowering rush because the species will produce new growth from underground roots and rhizomes, but this method may decrease abundance and prevent seed and bulblet production by removing inflorescences. Plants should be cut below the water surface and care should be taken to remove all cut plant parts, especially rhizome fragments, from the water. Multiple cuts throughout the summer are required to provide adequate control and to prevent the formation of flowers, seeds and bulblets; also, cutting as frequently as every two weeks is necessary to reduce starch reserves in the roots and rhizomes. Large-scale cutting or harvesting efforts are often ineffective and may actually accelerate the spread of flowering rush due to the impacts to competing native plants, bottom disturbance and escaping plant fragments. Hand digging is useful only when managing individual plants or small infestations. The entire root structure must be carefully removed because fragments of roots, rhizomes or bulblets left in the sediment can rapidly regrow. All plant parts removed during cutting or hand digging must be taken out of the water and transported well away from water or wetland areas to prevent recolonization. There are currently no biological control agents (Section 3.6) that effectively control flowering rush, but research and exploration in the weed's native range of Europe and Asia is ongoing.

Herbicide treatment strategies (Section 3.7.1) include foliar applications, in-water applications and bare-ground (pre-emergent) applications during drawdown conditions. Foliar application of herbicides to control flowering rush is challenging; typically only a small part of the plant emerges above the water, so limited foliage is available for herbicide coverage and uptake, resulting in poor herbicide absorption and incomplete control. Several herbicides have been evaluated for foliar applications; of these, imazapyr has shown the greatest potential for control of above-water growth but successive years of treatment may be needed to reduce root and rhizome biomass. Diquat has been used for in-water treatments in midwestern and northwestern systems that are greater than one foot deep; one or two applications per summer control foliage and reduce root and rhizome biomass. Bare-ground treatments of imazapyr and imazamox applied during drawdowns are also effective, but two or more consecutive years of treatment may be needed to achieve

significant root and rhizome reductions. There is no product that selectively controls flowering rush without the potential to harm other plants, so care must be taken during herbicide application to avoid impacts to nontarget species.

Summary

Flowering rush is an invasive species that has steadily expanded its range across the northern US and the Canadian provinces. It closely resembles bulrush and other native species and is difficult to identify unless it is flowering. The species employs multiple reproductive strategies that have helped to expand its range over the past 50 years. All potential impacts of this invasive species on aquatic systems are not yet known, but flowering rush is capable of abundant growth that can displace native species and alter habitats. Also, dense shoreline growth of the species can certainly interfere with access and recreational uses of infested water bodies. There is limited information available regarding the management of flowering rush, but as with other invasive species, early detection and rapid response are paramount to successfully controlling new infestations. Cutting below the water surface and careful hand-digging are effective on small infestations, while selective treatment with herbicides is currently the most effective strategy to control larger infestations of flowering rush. The expansion of flowering rush has occurred primarily in the western US and it is difficult to predict how extensive the problem may become, but research is ongoing to investigate the biology of the species and to identify additional management options.

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