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New Hampshire Agricultural Experiment Station

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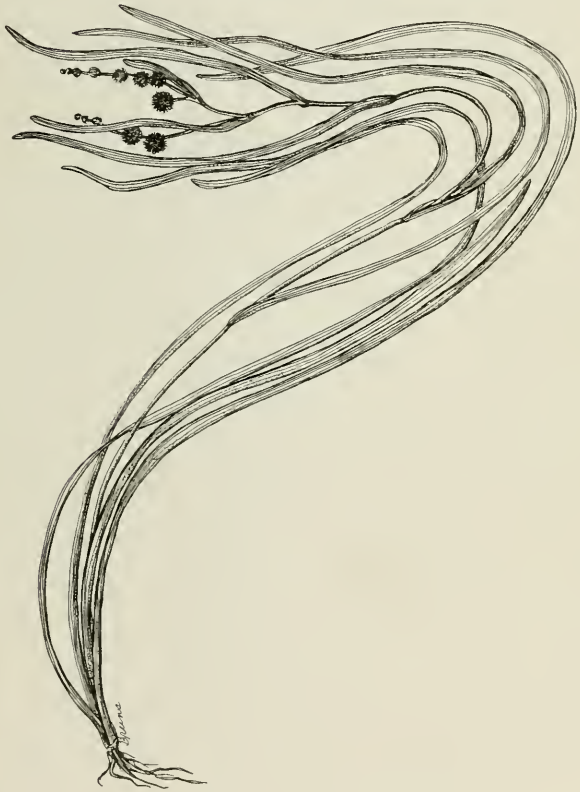

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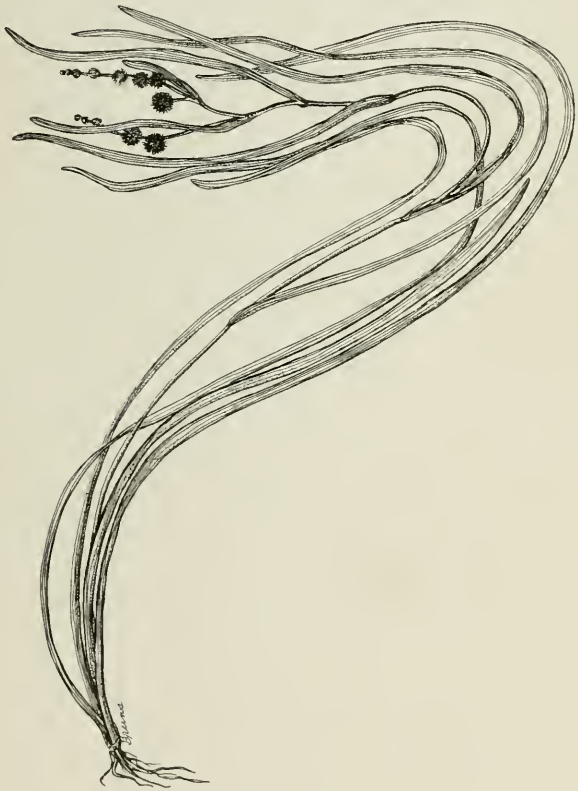

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ACKNOWLEDGEMENTS

We wish to thank Drs. Ernest O. Beal, Vernon L. Harms, Arthur C. Mathieson, and Eugene C. Ogden for their helpful comments on the manuscript. We are also grateful to the curators of the following herbaria for use of their collections: BOSC, BRU, CONN, CUW, GH, HNH, KIRI, MASS, MAINE, NCBS, NHA, NEBC, VT, YU. A special thanks is extended to Pamela Bruns who prepared the illustrations.

This Bulletin is dedicated to the late Dr. E. O. Beal who died on August 31, 1980.

ABSTRACT

This paper is the second in a series of reports on the aquatic and wetland flora of New England. It treats all species of the Typhaceae and Sparganiaceae occurring in New England and includes keys, comments on taxonomy and nomenclature, habitat and distributional information, water chemistry data, illustrations and dot maps. Those species regarded as rare and endangered in one or more of the six New England states are also noted.

One taxon, *Sparganium multipedunculatum*, previously reported as occurring in New England is excluded from the flora, based on a reexamination of the specimens.

KEY WORDS: Aquatic Plants, New England Flora, Taxonomy, Typhaceae, Sparganiaceae, *Typha*, *Sparganium*, Cat-tail, Bur-reed.

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Aquatic Vascular Plants of New England: Part 2. Typhaceae and Sparganiaceae

by

G. E. Crow and C. B. Hellquist

INTRODUCTION

This is the second in a series of reports on the aquatic and wetland flora of New England. The first part treated the Zosteraceae, Potamogetonaceae, Zannichelliaceae, and Najadaceae (N.H. Agric. Exp. Sta. Bull. 515, January 1980).

A treatment of the aquatic and wetland plants of the New England region has long been needed. The manual is being prepared to aid conservationists, fish and game personnel, consultants, botanists and students in the identification of aquatic plants. The coverage is strictly New England but is of value throughout the northeast. Data have been gathered from herbaria in New England and from personal field work.

Chemical data presented have been gathered from many waters throughout New England. The alkalinity readings are total alkalinity, expressed as milligrams per liter (mg/l) $CaCO_3$. Since pH and alkalinity vary greatly during the day, the values are only indicative of the water qualtiy. Chloride values are given where data are available and of value.

The rare and endangered plant lists referred to are those prepared for each of the six New England states by the New England Botanical Club in cooperation with the United States Fish and Wildlife Service, Office of Endangered Species, Newton Corner, MA (RI — Church and Champlin, 1978; MA — Coddington and Field, 1978; VT — Countryman, 1978; ME — Eastman, 1978; CT — Mehrhoff, 1978; NH — Storks and Crow, 1978).

We invite comments and/or criticisms on this treatment. Information on any species omitted or any known localities not documented by us will be welcomed. If anyone is interested in specific localities of any of the species indicated on the dot maps, please contact us.

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TYPHACEAE

Typha (Cat-tail)

Plants of shores, marshes, wet and intermittently wet places, both fresh and saline waters; growing from creeping rhizomes; leaves long, erect and twisted, sheathing at the base; flowers unisexual, pistillate flowers in a dense cylindrical spike borne below the staminate spike; fruit a minute stipitate achene with a long, persistent style.

Key to Species

1. Staminate and pistillate portions of spike contiguous, occasionally separated by a distance less than 5 mm (fig. 1); mature pistillate spike 12-35 mm in diameter, dark brown. ..... 1. *T. latifolia*
1. Staminate and pistillate portions of the spike separated by a distance of more than 5 mm (fig. 2A); mature pistillate spike 6-20 mm in diameter, reddish or cinnamon-brown.
   2. Stem 0.75-1.5 m tall; leaf blades 3-8 mm wide, deep green; pistillate spike 0.3-1.5 dm long. ..... 2. *T. angustifolia*
   2. Stem 2.0-3.5 m tall; leaf blades 6.5-11.0 mm wide, blue-green, glaucous; pistillate spike 1.8-5.0 dm long. ..... 3. *T.* X *glauca*

1. *Typha latifolia* L. Fig. 1, Map 1

Extremely common throughout New England. Plants of damp shores, marshes and roadside ditches. Plants with a small separation of the staminate and pistillate spikes, have been described as *Typha latifolia* forma *ambigua* (Sonder) Kronf. and may be confused with *T. angustifolia* or *T. X glauca*. Range extends from Newfoundland west to Alaska, south throughout the United States, and scattered widely in Mexico.

alkalinity: mean 39.2 mg/l; range 1.5-170.0 mg/l
pH: mean 7.4; range 5.4-9.8 mg/l

2. *Typha angustifolia* L. Fig. 2, Map 2

Common along the coast in salt marshes and inland in alkaline waters of western New England; scattered in acid regions of interior southern New England. Range extends from Nova Scotia west to southern Quebec, Ontario, southern Montana, Wyoming and south-

eastern Oregon, south to northeastern Florida, Georgia, Missouri, southern Texas, and California.

alkalinity: mean 56.0 mg/l; range 7.5-137.5 mg/l
pH: mean 7.2; range 6.1-8.2

3. *Typha* X *glauca* Godr. Fig. 2, Map 3

Scattered locations in New England along the coast from Knox County, Maine south and inland along the Champlain Valley; widely scattered and infrequent elsewhere. This taxon is a hybrid between *T. latifolia* and *T. angustifolia*. Its range in New England closely parallels that of *T. angustifolia* although it may be found without either parent species. *Typha* X *glauca*, exhibiting natural hybrid vigor, is much larger than either parent species; the leaf width and the separation between staminate and pistillate spikes is intermediate to that of the parents. Range extends from central Maine west to southern Ontario, Iowa, and Oregon, south to North Carolina, and Alabama. Reveal (1977) notes that hybrids under the name *T.* X *glauca* from Utah and California are plants resulting from *T. latifolia* X *T. domingensis*.

alkalinity: mean 56.3 mg/l; range 10.0-111.0 mg/l
pH: mean 7.4; range 7.1-8.1

Literature Cited and Selected References

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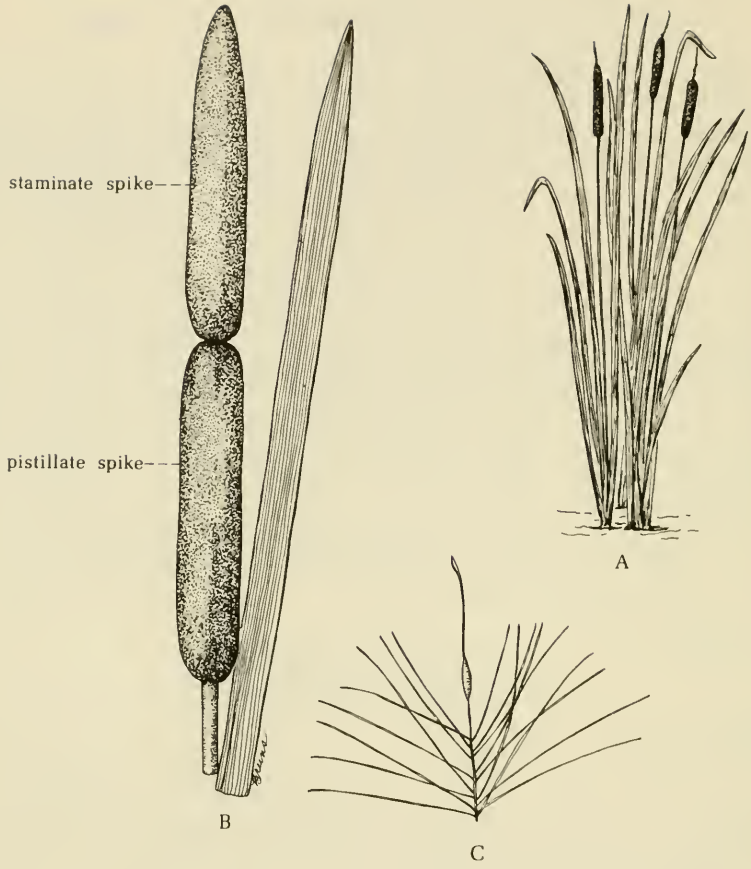


Figure 1.
Typha latifolia: **A. habit, x 1/20. B. staminate and pistillate spike, x ½. C. fruit, x 3.**

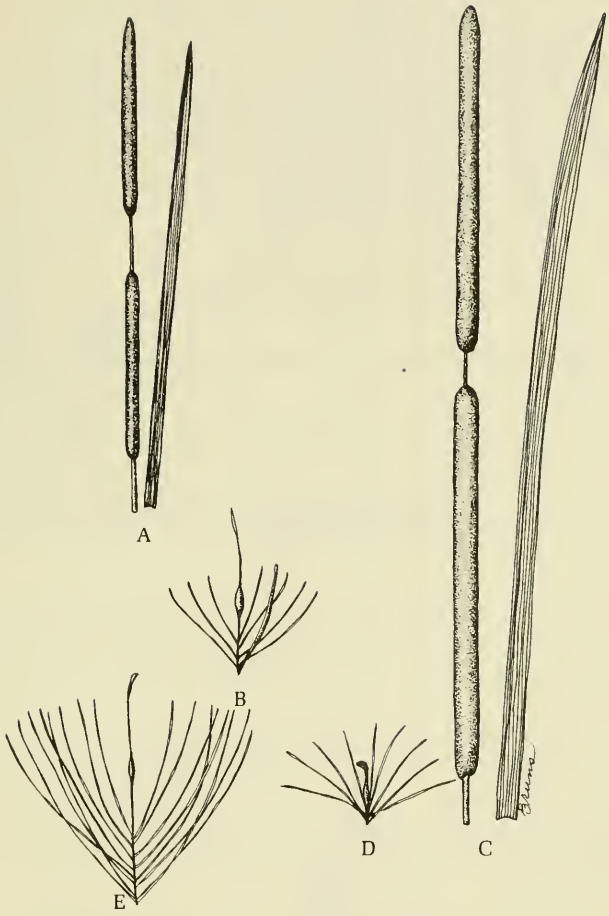
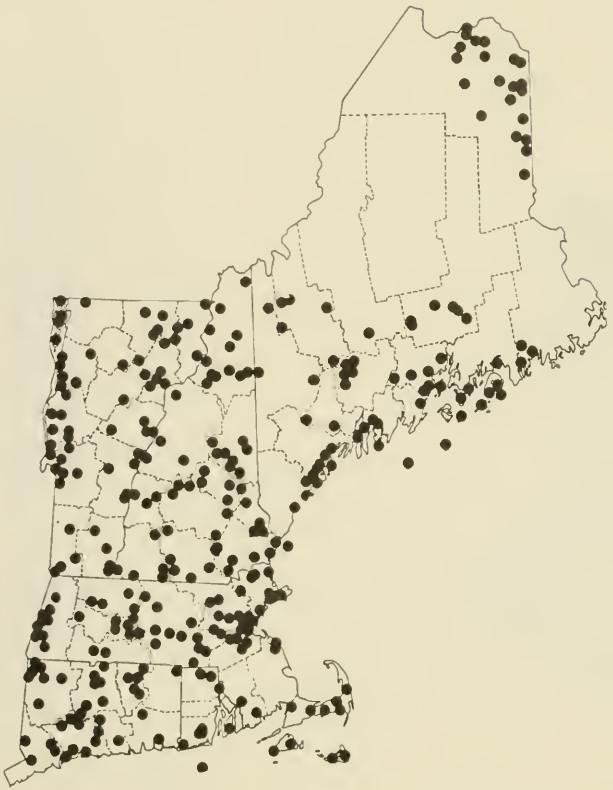
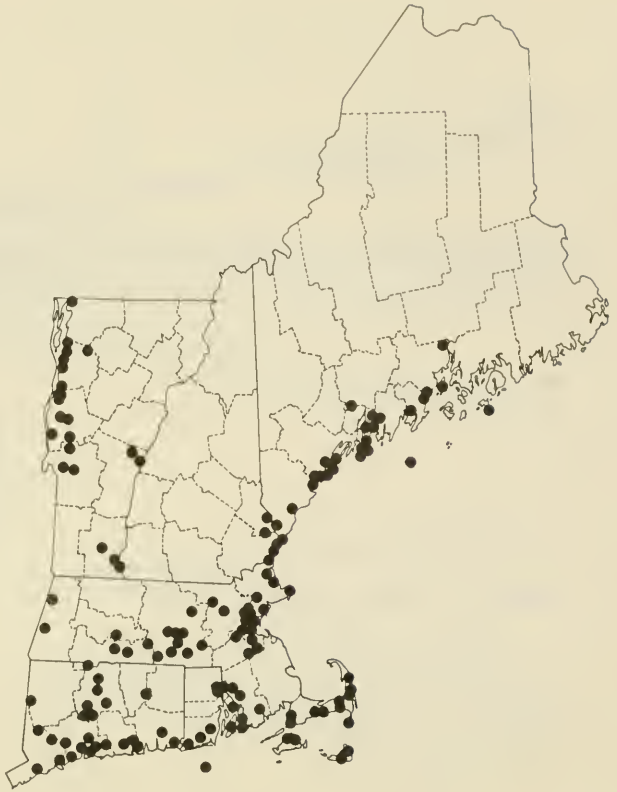


Figure 2.
Typha angustifolia: A. staminate and pistillate spike, x ¼. B. fruit, x 4.
Typha X *glauca:* C. staminate and pistillate spike, x ¼. D. flower, x 3½. E. fruit, x 3½.



Map 1.
Typha latifolia



Map 2.
Typha angustifolia

SPARGANIACEAE

Sparganium (Bur-reed)

Plants of fresh water and marshes; growing from fibrous roots or short rhizomes; stems and leaves erect or floating; flowers unisexual, borne in globose heads, staminate heads borne above pistillate heads, pistillate heads appearing bur-like; fruit obovoid or fusiform, frequently with a slight median constriction, 1-2 seeded.

Key to Species

1. Stigmas 2 (fig. 3D); fruits 4-8 mm broad, truncate (flattened on end except for beak) (fig. 3C).
   ..... 1. *S. eurycarpum*
1. Stigmas 1; fruits less than 4 mm broad, tapering to a beak (figs. 5C, 6D).
   2. Staminate head 1 (fig. 4A); fruiting heads 0.8-1.2 cm in diameter; beak of fruit 0.5-1.5 mm long.
      ..... 2. *S. minimum*
   2. Staminate heads 2-20; fruiting heads 1.2-3.5 cm in diameter; beak of fruit 1.5-6.0 mm long.
      3. Beak of mature fruit flattened and strongly curved (fig. 5C).
         ..... 3. *S. fluctuans*
      3. Beak of mature fruit round, not strongly curved.
         4. Pistillate heads borne directly in axils of leaves or bracts (figs. 6C, 7B).
            5. Fruiting heads 2.5-3.5 cm in diameter; stigmas 2.0-3.2 mm long; beak 4.5-7 mm long; body of fruit shiny (rarely dull).
               ..... 4. *S. androcladum*
            5. Fruiting heads 1.5-2.5 cm; stigmas 0.8-1.5 (—2) mm long; beak 1.5-5.0 mm long; body of fruit dull.
               ..... 5. *S. americanum*
         4. Pistillate heads (at least some) borne above the axils of leaves or bracts (supra-axillary) (figs. 8B, 9B).
            6. Fruit beak 0.5-2.0 mm long; stigmas 0.6-1.5 mm long; fruits reddish at base; stems and leaves lax, mostly floating (fig. 8A), up to 12 dm long.
               ..... 6. *S. angustifolium*
            6. Fruit beak 2.0-4.3 mm long; stigmas 2.0-4.3 mm long; fruits greenish at base; stems and leaves erect and emergent (occasionally floating), up to 8.5 dm long.
               ..... 7. *S. chlorocarpum*

1. *Sparganium eurycarpum* Englem. Fig. 3, Map 4

Common along the coastal plain and in alkaline waters of western New England. Erect, in shallow waters and on damp shores, swales and marshes. This is the tallest of the bur-reeds in New England, occasionally reaching a height of 1.5 m. Range extends from the Magdalen Islands, Quebec west to northern Alberta and southern British Columbia, south to Virginia, Missouri, Oklahoma, New Mexico, Arizona, and California.

Rare and endangered plant list: New Hampshire

alkalinity: mean 47.7 mg/l; range 17.0-108.5 mg/l
pH: mean 7.4; range 6.7-8.2

2. *Sparganium minimum* (Hartm.) Fries Fig. 4, Map 5

Scattered throughout northern New England, becoming infrequent southward, rare in Massachusetts and northwestern Connecticut. Submerged, floating or occasionally slightly erect in shallow water. Range extends from Newfoundland west to Alaska, south to northern New Jersey, northern Pennsylvania, Michigan, Wisconsin, Utah, northern Arizona, and California.

Rare and endangered plant lists: Massachusetts, Connecticut

alkalinity: mean 35.4 mg/l; range 3.5-69.5 mg/l
pH: mean 7.3; range 6.5-8.5

3. *Sparganium fluctuans* (Engelm.) Morong Fig. 5, Map 6

Scattered in waters of low alkalinity throughout northern New England, rare in southern New England. Submerged plants with floating leaves, leaf width varying from 3-11 mm, but generally broader than 5 mm. Range extends from Newfoundland west to southern Quebec and northern Alberta, south to New England, northern Pennsylvania, northern Michigan, and Minnesota.

Rare and endangered plant list: Connecticut

alkalinity: mean 13.5 mg/l; range 3.0-49.5 mg/l
pH: mean 6.9; range 6.1-7.9

4. *Sparganium androcladum* (Engelm.) Morong Fig. 6, Map 7

Rare in northern Maine, scattered in southern New England. Large erect plants up to 1.2 m growing along damp shores and in marshes. Range extends from Quebec west to Minnesota, south to southern Virginia, eastern Tennessee, Illinois, and Missouri. Reports from Oklahoma and Texas are doubtful.

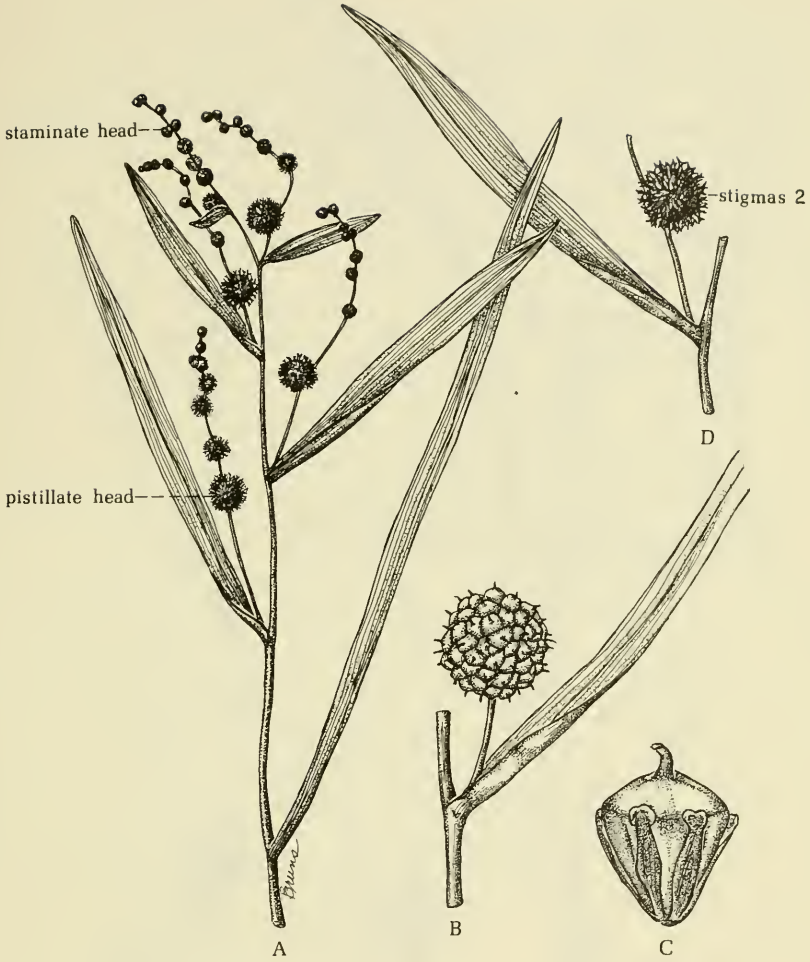
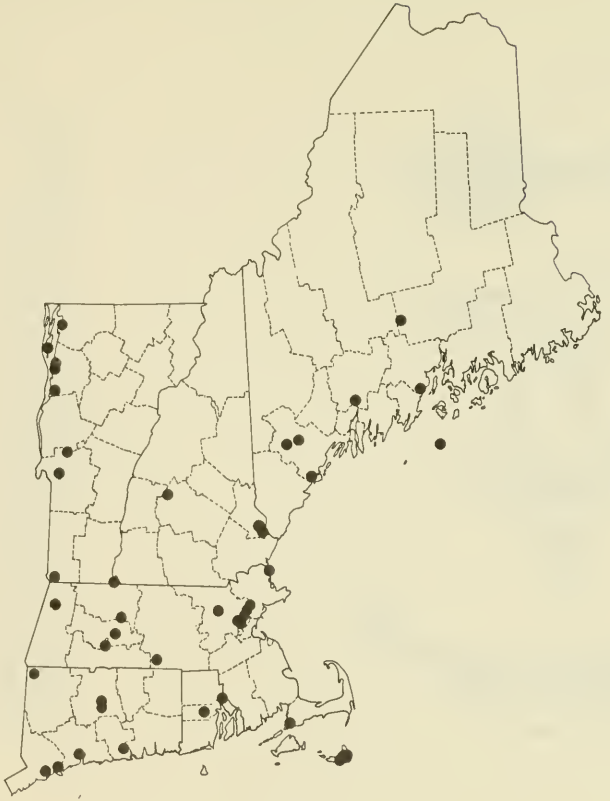
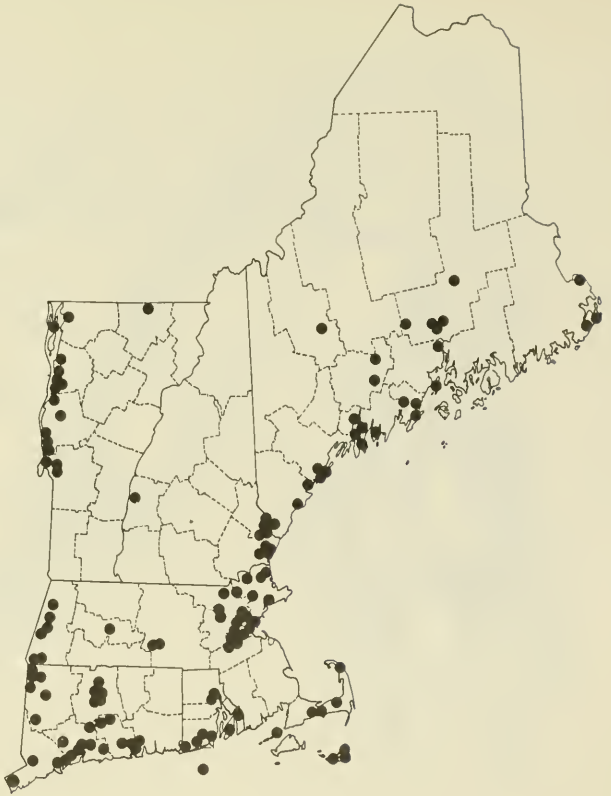


Figure 3.
Sparganium eurycarpum: **A. upper portion of plant, x ¼. B. fruiting head, x ½. C. fruit, x 2½. D. flowering head, x ½.**

Figure 4.
Sparganium minimum: A. habit of submersed plant, x ½. B. habit of emersed plant, x ½. C. fruit, x 3. D. fruiting head, x 1.



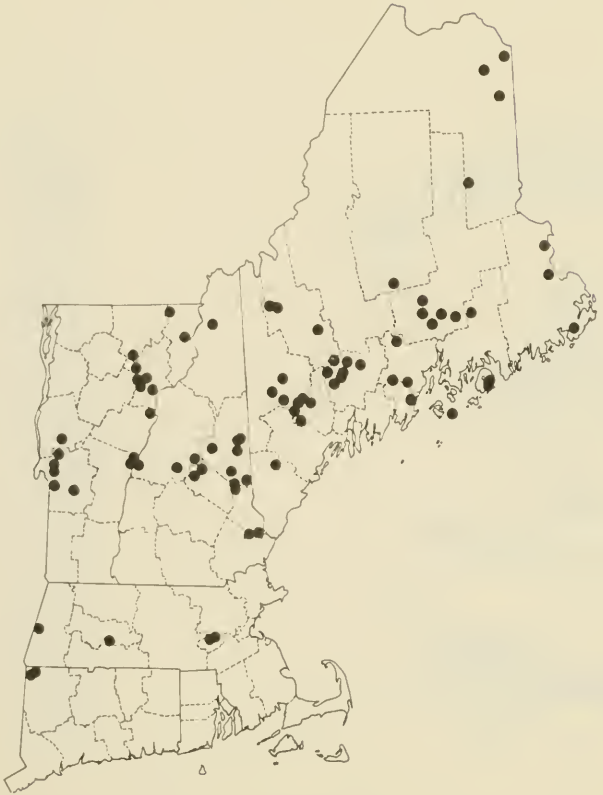
Map 3.
Typha X glauca



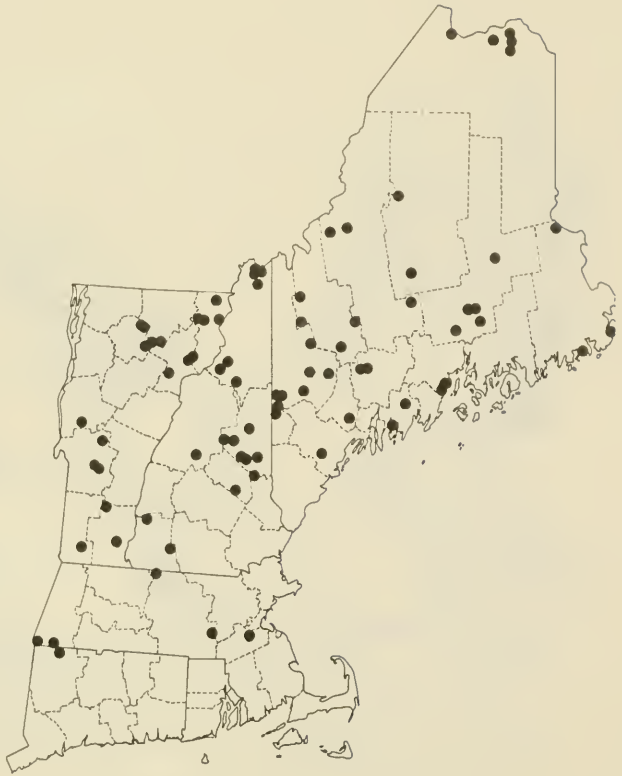
Map 4.
Sparganium eurycarpum

Figure 5.
Sparganium fluctuans: **A. habit, x ¼. B. upper portion of plant with fruiting heads, x ½. C. fruit, x 2½.**

Figure 6.
Sparganium androcladum: **A. habit, x ⅛. B. upper portion of plant, x ½. C. fruiting head, x ½. D. fruit, x 3½.**



Map 5.
Sparganium minimum



Map 6.
Sparganium fluctuans

Rare and endangered plant list: New Hampshire

alkalinity: 15.0 mg/l
pH: 6.8

5. *Sparganium americanum* Nutt. Fig. 7, Map 8

Extremely common throughout New England. Erect (rarely floating) plant of shallow water and damp shores. Floating plants, when encountered, usually found in close proximity to erect plants along the shore. Beal (1960) has reported that inflorescence branching and supra-axillary pistillate heads are not infrequent in populations of the Coastal Plain of the Carolinas. We have not observed this in plants of this species in New England. Beal (1960) also notes that the characters by which Clausen (1937) recognized his somewhat robust var. *rigidum* occur scattered throughout the range of the species and the taxon is not worthy of recognition. Range extends from Newfoundland west to Ontario, Wisconsin, Minnesota and North Dakota, south to Florida, Alabama, Oklahoma, and Texas.

alkalinity: mean 17.7 mg/l; range 0.5-123.5 mg/l
pH: mean 6.9; range 5.3-9.8

6. *Sparganium angustifolium* Michx. Fig. 8, Map 9

Abundant in northern New England, widely scattered in southern New England. Plants floating, with leaves 1.5-5 mm wide, often growing in deep water or occasionally slightly erect in shallow water. The few plants from New England previously identified as *Sparganium multipedunculatum* (Morong) Rydb. are included here since these specimens differ from typical *S. angustifolium* only in a leaf width up to 6.0 mm wide. All specimens seen were clearly floating in habit, not erect, as is often characteristic for *S. multipedunculatum*. *Sparganium multipedunculatum*, which is treated by some authors (Reveal, 1970) as a variety of *S. emersum* Rehman (=*S. simplex* Hud.) typically has larger fruiting heads (2.0-3.0 cm in diameter) and longer fruit beaks (3.0-4.0 mm). Therefore, we no longer regard *S. multipedunculatum* as occurring in the New England region. Range extends from Greenland, Newfoundland, and Labrador west to Alaska, south to northern New Jersey, northern Pennsylvania, Michigan, northern Illinois, Minnesota, Colorado, Utah, northern New Mexico, northern Arizona, and California.

alkalinity: mean 26.1 mg/l; range 2.5-103.5 mg/l
pH: mean 7.2; range 6.5-9.5

Figure 7.
Sparganium americanum: A. habit, x ⅛. B. fruiting head, x ½. C. fruit, x 2.

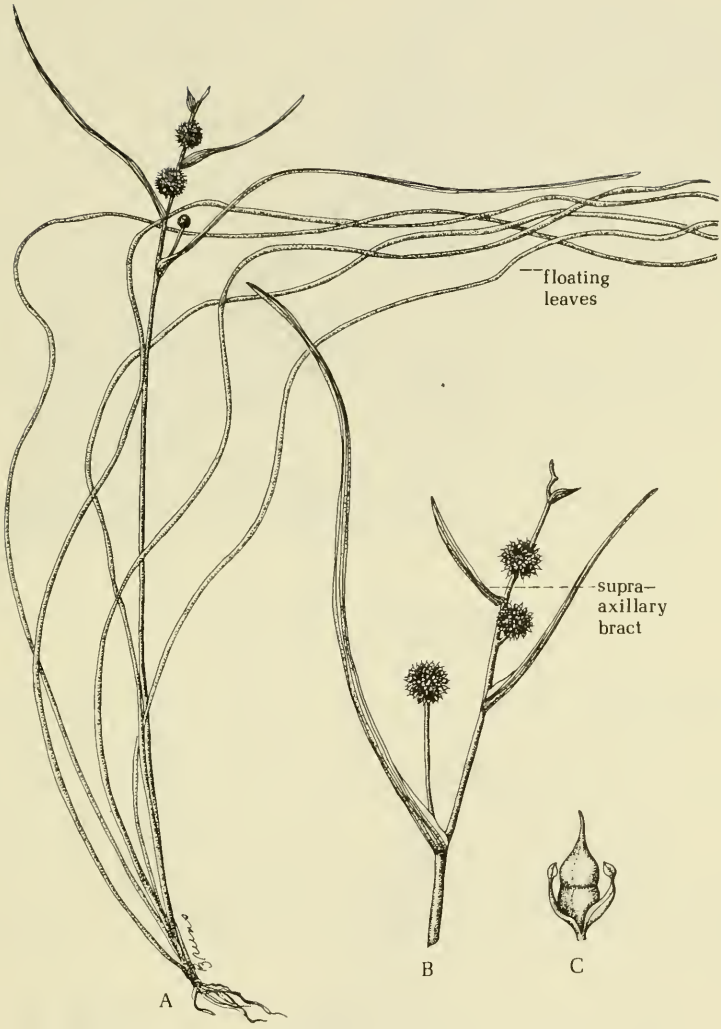
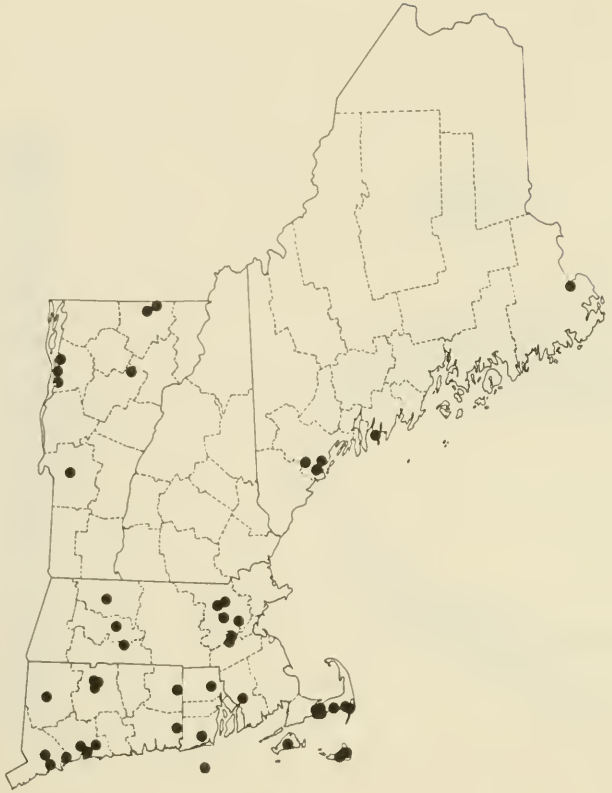
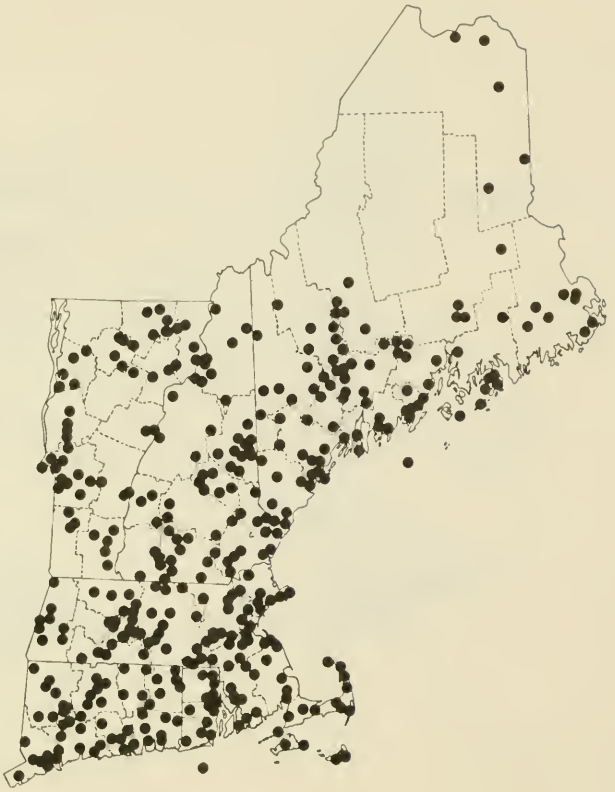


Figure 8.
Sparganium angustifolium: A. habit, x ¼. B. upper portion of plant with fruiting heads, x ½. C. fruit, x 2½.



Map 7.
Sparganium androcladum



Map 8.
Sparganium americanum

7. *Sparganium chlorocarpum* Rydb. Fig. 9, Map 10

Extremely common throughout New England. Erect plant of shallow waters and marshes or floating in deeper waters. Floating plants are often confused with *S. angustifolium*. The best characters to separate these two species are the fruit color and beak length. Plants with narrow floating leaves (5 mm or less) in southern New England are usually *S. chlorocarpum*. Much of our material would be referable to var. *acaule* (Beeby) Fern., with shortened stems and contiguous heads. However, we have noted that such plants frequently grow in mixed populations with plants referable to var. *chlorocarpum*. Similar observations have been made by W. C. Muencher and R. T. Clausen (Clausen, 1934). We do not regard these as distinct varieties and therefore follow Voss (1966; 1972) in treating the former as forma *acaule* (Beeby) E. Voss. Range extends from Newfoundland west to Ontario and Minnesota, south to North Carolina, Pennsylvania, Indiana, and Iowa.

alkalinity: mean 17.2 mg/l; range 3.0-112.5 mg/l
pH: mean 6.9; range 6.2-7.8

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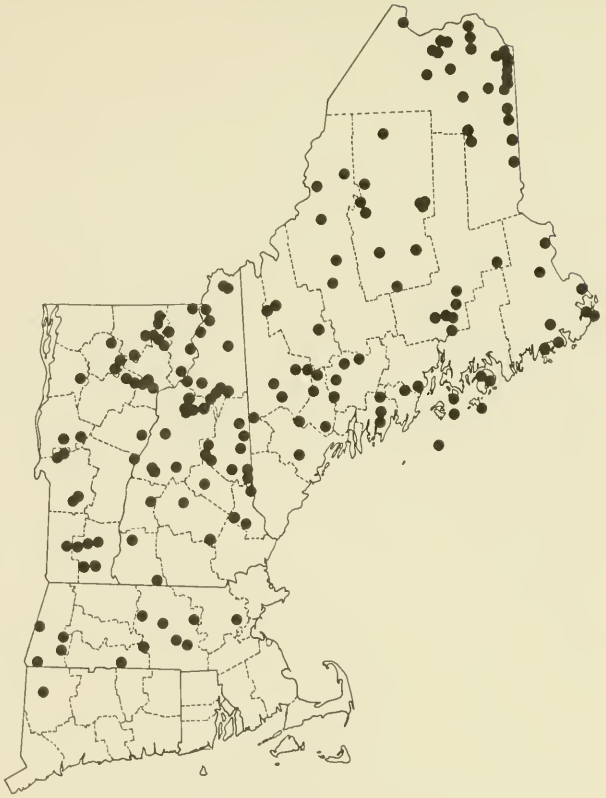
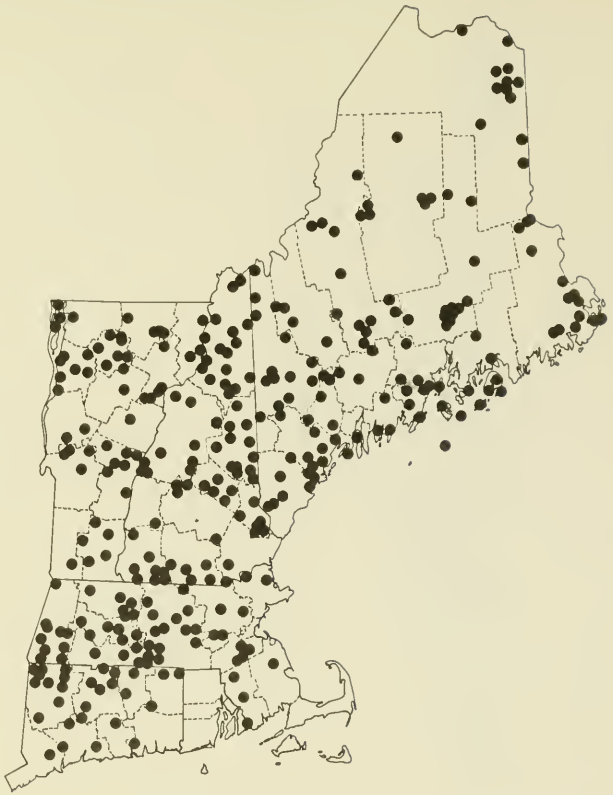
Figure 9.
Sparganium chlorocarpum: A. habit, x ⅛. B. habit of forma *acaule* showing contiguous fruiting heads, x ½ C. fruiting head with supra-axillary bract, x ½. D. fruit, x 4.



Map 9.
Sparganium angustifolium



Map 10.
Sparganium chlorocarpum

ERRATA — Aquatic Plants of New England: Part 1. Zosteraceae, Potamogetonaceae, Zannichelliaceae, Najadaceae

Page 11, lines 19-20 should read:
"(figs. 34A, 35A, 36A)"

Page 12, line 3 should read:
"Cherry Pond, Jefferson, New Hampshire"