

# **The Practical Streambank Bioengineering Guide**

## **User's Guide for Natural Streambank Stabilization Techniques in the Arid and Semi-arid Great Basin and Intermountain West**

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# The Practical Streambank Bioengineering Guide

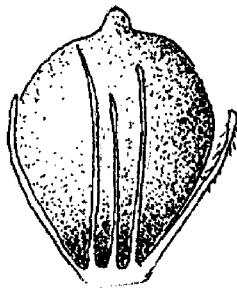
## Appendix B Plant Datasheets and Illustrations



Fremont Cottonwood  
*Populus fremontii*



# Herbaceous Species Plant Data Sheets



seed  
10x

Threesquare Bulrush  
*Scirpus pungens*



2x



# Water Sedge - *Carex aquatilis*

## Characteristics

### Habit:

A short to medium-sized perennial, 10 to 40 inches in height. Rhizomatous, usually occurring in large stands or turf.

### Stems:

Slender and triangular.

### Leaves:

Alternate, nearly flat and green.

### Spikes:

Borne on spikes, usually 1 male spike above the 2 or 3 female spikes, all sessile.

Flowering period: June to August.

## Habitat

### Distribution:

A fairly common species that can be found at elevations from 5,000 to 10,000 feet. Normally occurs at higher elevations than Nebraska sedge. Often occurs with blue-joint reedgrass and beaked sedge.

### Community:

Pond and stream edges, marshes, and wet meadows. Grows on a range of moist soils from loams to silt. Will grow on gravel/sand soils at low elevations.

### Hydrology:

Usually found in areas with water depths of 1 to 3 inches season-long. Will decline in water that is 25 in deep. Needs moisture within 8 in of the soil surface.

## Wildlife Benefits

### Food (seeds, rhizomes):

Waterfowl, upland game birds, and songbirds.

### Food (plants):

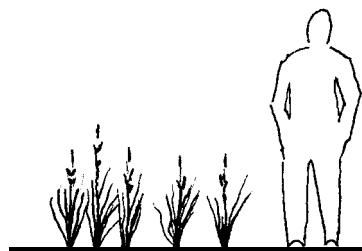
Livestock and other grazers. Fair to good palatability and high production.

### Cover:

Nesting waterfowl and small mammal cover.

## Comments

Moderate to good tolerance for acidic, saline, and alkaline soils. Biomass below ground is 4x the above ground growth. Can withstand fire without much damage because of the high watertable.



# Water Sedge - *Carex aquatilis*

## Propagation and Planting

### Fruits:

Achenes are oval, tan to brown and approximately 1/16 inch long. Collect by cutting the seedheads with a clipper. A 1/2 to 3/4 grocery bag of bulk material will yield about 1 to 2 cups of seed.

### Propagation:

Remove perigynia with sandpaper box. Wet prechill seed for 30 days in a mixture of distilled water and sphagnum moss in a cooler (34 to 38° F). Sprinkle seed on top of soil and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 to 3 months.

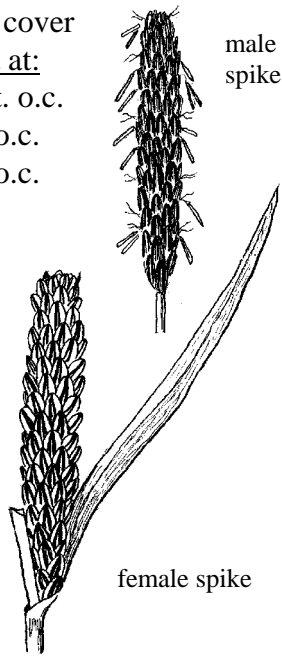
### Transplanting:

This species has a slow rate of spread.

### Suggested spacing:

For uniform ground cover

|           | <u>Plant at:</u> |
|-----------|------------------|
| in 1 yr.  | 0.5 ft. o.c.     |
| in 2 yrs. | 1 ft. o.c.       |
| in 3 yrs. | 2 ft. o.c.       |



# Nebraska Sedge - *Carex nebrascensis*

## Characteristics

### Habit:

A short to medium-sized robust perennial, 8 to 40 inches in height. Rhizomatous, usually occurring in dense, multispecies stands.

### Stems:

Stout and triangular.

### Leaves:

Flat, alternate, triangular, and ranging in color from green to blue.

### Spikes:

Borne on spikes, sessile, usually with 1-2 male spikes above the 2-5 female spikes.

Flowering period: May to August.

## Habitat

### Distribution:

A common species that can be found at elevations from 3,500 to 10,000 feet.

### Community:

Pond and stream edges, marshes, wet meadows, seeps, and ditches. Grows on a range of moist, fresh, fine textured soils. Generally does not establish well on gravel or clay soils.

### Hydrology:

Usually found in areas with season-long saturated soils, although tolerant of a range of hydrologic regimes. It can tolerate total inundation for up to 3 months.

## Wildlife Benefits

### Food (seeds, rhizomes):

Waterfowl, upland game birds, small mammals and songbirds.

### Food (plants):

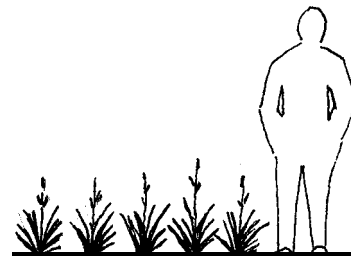
Muskrats, geese, livestock and other grazers. Palitability and production are high.

### Cover:

Nesting waterfowl and small mammal cover.

## Comments

Tolerates alkaline soils. Excellent soil stabilizer. Forms dense deep root system with root biomasses up to 3000 g/m<sup>2</sup> in top 20 cm of soil. Used by native americans for mats, bedding, and food.



# Nebraska Sedge - *Carex nebrascensis*

## Propagation and Planting

### Fruits:

Achenes are lenticular, tan to brown and approximately 1/16 of an inch long. Collect by cutting the seedheads with a clipper. A 1/2 to 3/4 grocery bag of bulk material will yield about 1 to 2 cups of seed.

### Propagation:

Remove perigynia with sandpaper box. Wet prechill seeds for 30 days in a mixture of distilled water and sphagnum moss in a cooler (34 to 38<sup>o</sup> F). Sprinkle seeds on top of soils and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 to 3 months.

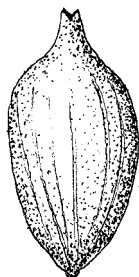
### Transplanting:

This species has a rapid rate of spread.

Suggested spacing:

For uniform ground cover

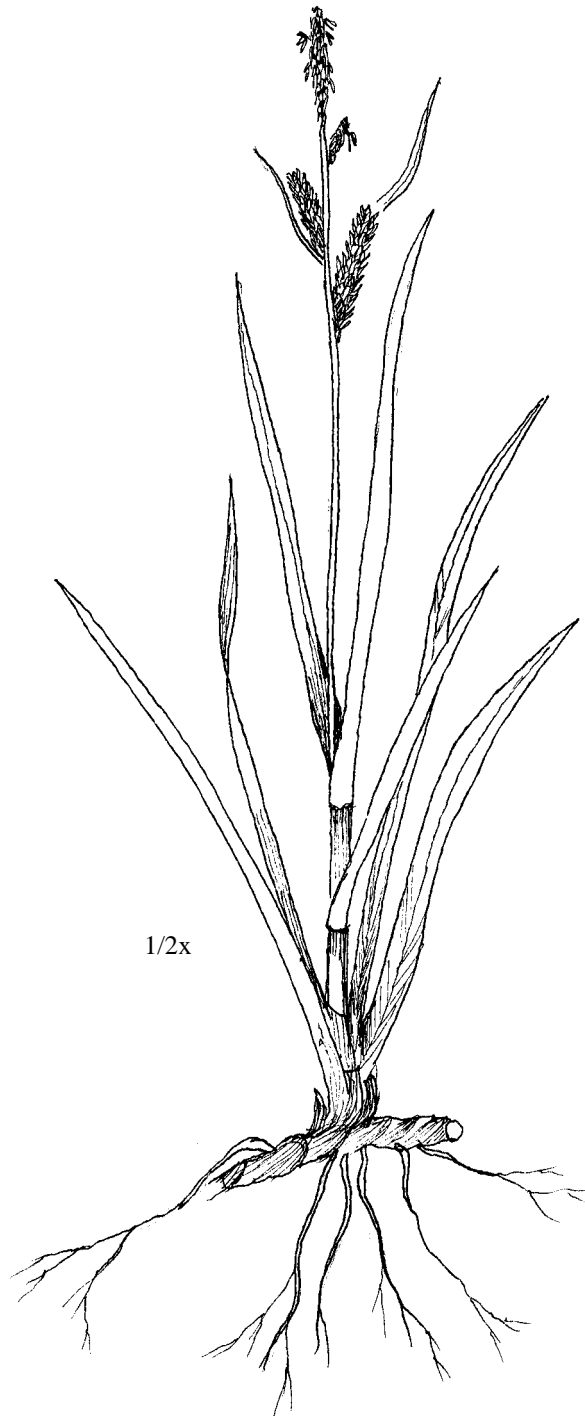
|           | <u>Plant at:</u> |
|-----------|------------------|
| in 1 yr.  | 0.5 ft. o.c.     |
| in 2 yrs. | 1 ft. o.c.       |
| in 3 yrs. | 2 ft. o.c.       |



Seed  
10x



1x



1/2x



# Beaked Sedge - *Carex utriculata*

Synonym: *Carex rostrata*

## Characteristics

### Habit:

A medium-sized perennial, 10 to 50 inches in height. Rhizomatous, usually occurring in large, dense monotypic stands.

### Stems:

Slender to stout and triangular.

### Leaves:

Alternate, long, nearly flat, and yellowish green in color.

### Spikes:

Borne on spikes, usually 2 or 3 male spikes above the 2 or 3 female spikes. Flowering period: June to August.

## Habitat

### Distribution:

A fairly common species that can be found at elevations from 5,000 to 10,000 feet. Normally occurs at higher elevations than Nebraska sedge.

### Community:

Pond and stream edges, marshes, wet meadows, and springs. Grows on a range of moist soils from loams to silt. Does not occur on gravel/sand or clay soils.

### Hydrology:

Generally found in areas with season-long saturated soils, tolerates a range of hydrologic regimes. Can grow in water that is 15-30 in. deep.

## Wildlife Benefits

### Food (seeds, rhizomes):

Waterfowl, upland game birds, small mammals, and songbirds.

### Food (plants):

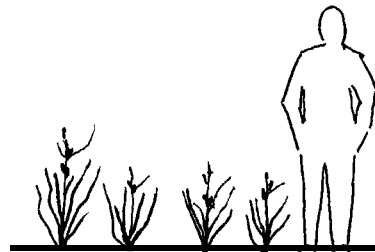
Big game and other grazers early in the season. Protein levels are low to moderate.

### Cover:

Nesting waterfowl and small mammal cover.

## Comments

Moderate tolerance for acidic and alkaline soils. Can spread by fragmentation. Rhizomes and roots are 2-5x the biomass of the above ground growth. Excellent plant for creating overhanging banks on streams. Difficult to burn.





# Beaked Sedge - *Carex utriculata*

## Propagation and Planting

### Fruits:

Achenes are triangular, tan to brown and approximately 1/8 inch long. Collect by cutting the seedheads with a clipper. A 1/2 to 3/4 grocery bag of bulk material will yield about 1 to 2 cups of seed.

### Propagation:

Remove periygnia with sandpaper box. Wet prechill seed for 30 days in a mixture of distilled water and sphagnum moss in a cooler (34 to 38° F). Sprinkle seeds on top of soil and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 to 3 months.

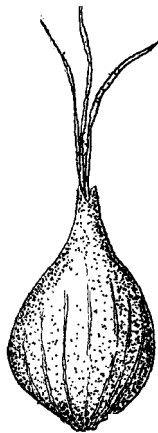
### Transplanting:

This species has a medium rate of spread.

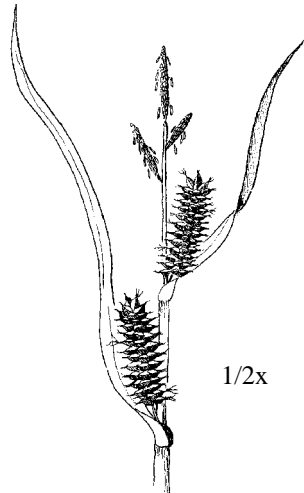
### Suggested spacing:

For uniform ground cover      Plant at:

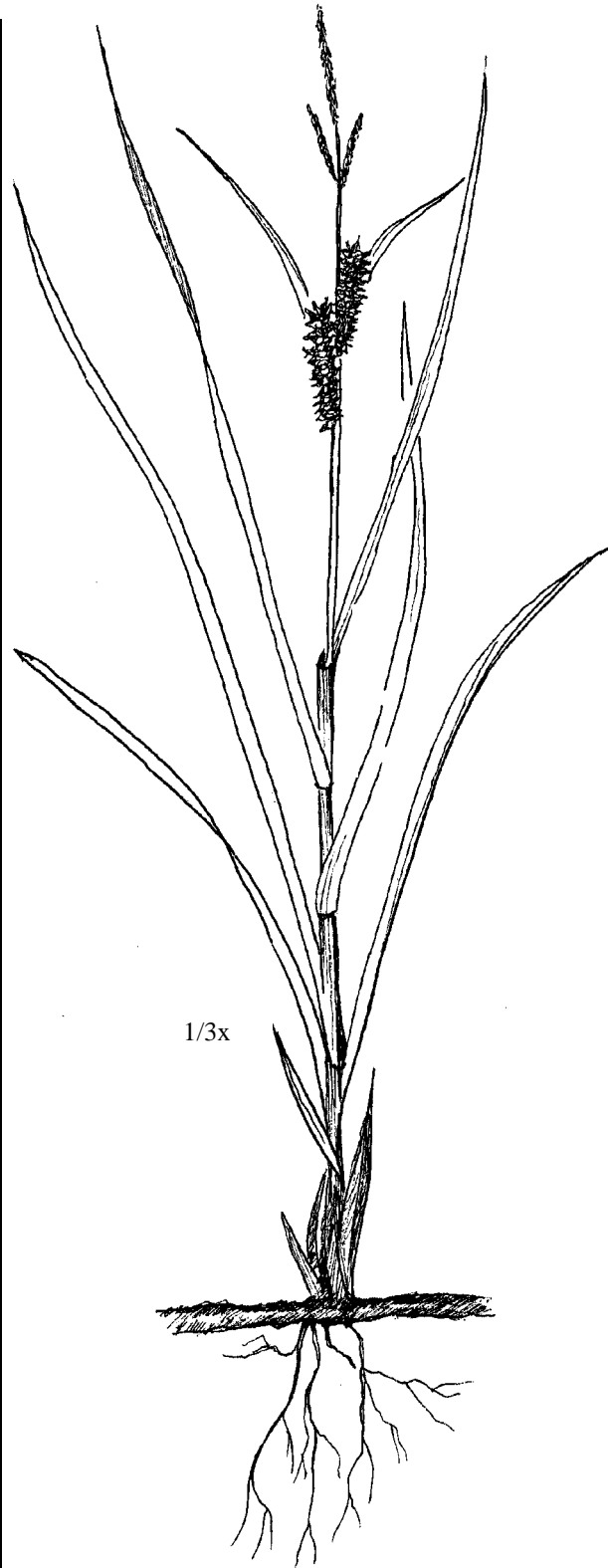
|           |              |
|-----------|--------------|
| in 1 yr.  | 0.5 ft. o.c. |
| in 2 yrs. | 1 ft. o.c.   |
| in 3 yrs. | 2 ft. o.c.   |



seed  
10x



1/2x



1/3x



# Creeping Spikerush - *Eleocharis palustris*

## Characteristics

### Habit:

An erect perennial, 4 to 40 inches in height. Rhizomatous, usually occurring in monotypic stands.

### Stems:

Dark green, oval.

### Leaves:

Small, with reddish basal sheath.

### Spikes:

Solitary terminal spikelets, 0.25 to 0.75 inches long. Perfect flowers (contain both female and male parts).

Flowering period: June to August.

## Habitat

### Distribution:

Very common species that can be found at elevations from 3,000 to 10,000 feet.

Widespread over central and northern US.

### Community:

Wet meadows, pond, and stream edges, lake basins, and stream margins. Grows on a range of moist, fine textured soils.

Uncommon on gravel or clay soils.

### Hydrology:

Generally found in areas with season-long saturated soils or standing water up to 6 inches deep, although it will tolerate long periods of flooding.

## Wildlife Benefits

### Food (seeds, rhizomes):

Ducks and geese.

### Food (plants):

Rabbits, muskrats, big game, and other grazers. High spring protein content.

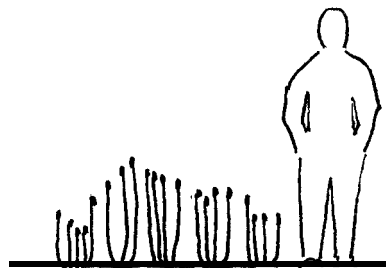
### Cover:

Small mammal, nesting waterfowl, and songbird cover.

## Comments

Excellent tolerance for alkaline and saline soils. Can fix atmospheric nitrogen.

Good around troughs and ponds because it resists trampling.



# Creeping Spikerush - *Eleocharis palustris*

## Propagation and Planting

### Fruits:

Achenes are flattened and approximately 1/16 inch long including the tubercle. Collect by cutting the tops with a grass clipper. A grocery bag of spikes will produce about 2/3 to 1 cup of seed.

### Propagation:

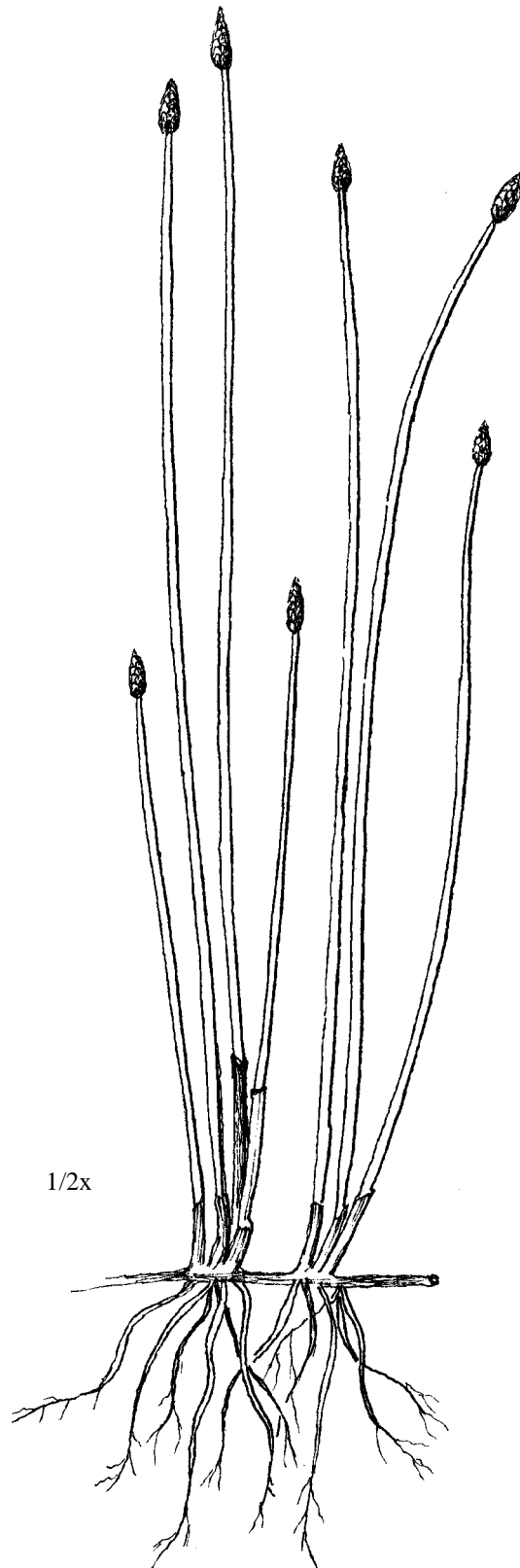
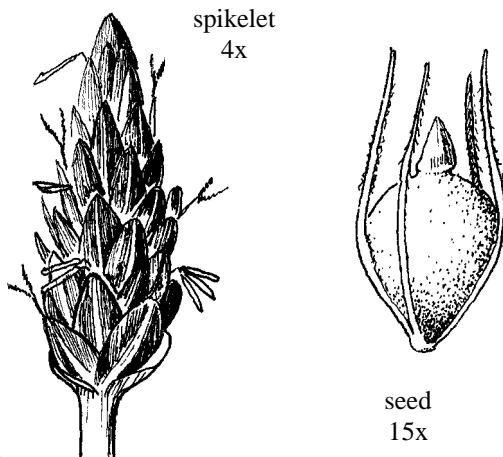
Wet prechill seeds for 30 days in a mixture of distilled water and sphagnum moss in a cooler (34 to 38<sup>o</sup> F). Sprinkle seed on top of soil and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 to 3 months.

### Transplanting:

This is an excellent species for transplanting because of its dense rhizomes and high growth rate.

Suggested spacing:

| <u>For uniform ground cover</u> | <u>Plant at:</u> |
|---------------------------------|------------------|
| in 1 yr.                        | 1 ft. o.c.       |
| in 2 yrs.                       | 2 ft. o.c.       |
| in 3 yrs.                       | 3 ft. o.c.       |



# Baltic Rush - *Juncus balticus*

## Characteristics

### Habit:

A medium-sized perennial, 18 to 30 inches in height. Rhizomatous, usually occurring in large, dense monotypic stands.

### Stems:

Dark green, round and either straight or wiry.

### Leaves:

Short, linear basal sheaths, very insignificant.

### Panicle:

Loose to compact, sessile lateral panicles. Seeds held in a capsule. Flowering period: May to September.

## Habitat

### Distribution:

A very common species that can be found at elevations from 3,000 to 10,000 feet throughout the US.

### Community:

Pond and stream edges, marshes, wet meadows, wet depressions, and springs. Grows on a range of moist soils from sand to silt, uncommon on very coarse substrates.

### Hydrology:

Generally found in areas with season-long saturated soils. Will tolerate wide variety of flooding or drought conditions. Can survive water tables 3 m or more below the surface.

## Wildlife Benefits

### Food (seeds, rhizomes):

Waterfowl, upland game birds, small mammals, and songbirds.

### Food (plants):

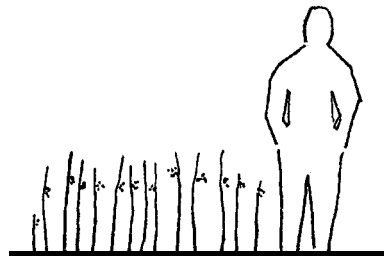
Waterfowl, big game and other grazers (early spring). Palatability declines over the season.

### Cover:

Waterfowl, songbirds, and small mammal cover.

## Comments

Good tolerance for alkaline and acidic soils. Excellent soil stabilizer with deep roots. Can be used around water troughs and ponds to decrease effects of trampling. Native Americans use it for mats and weaving baskets.



# Baltic Rush - *Juncus balticus*

## Propagation and Planting

### Fruits:

Seeds range in color from gray to reddish or brown. Very, very small seeds. Collect by cutting the seedheads with a clipper. Care must be taken since the seeds are so small; many may be lost in the folds of paper bags.

### Propagation:

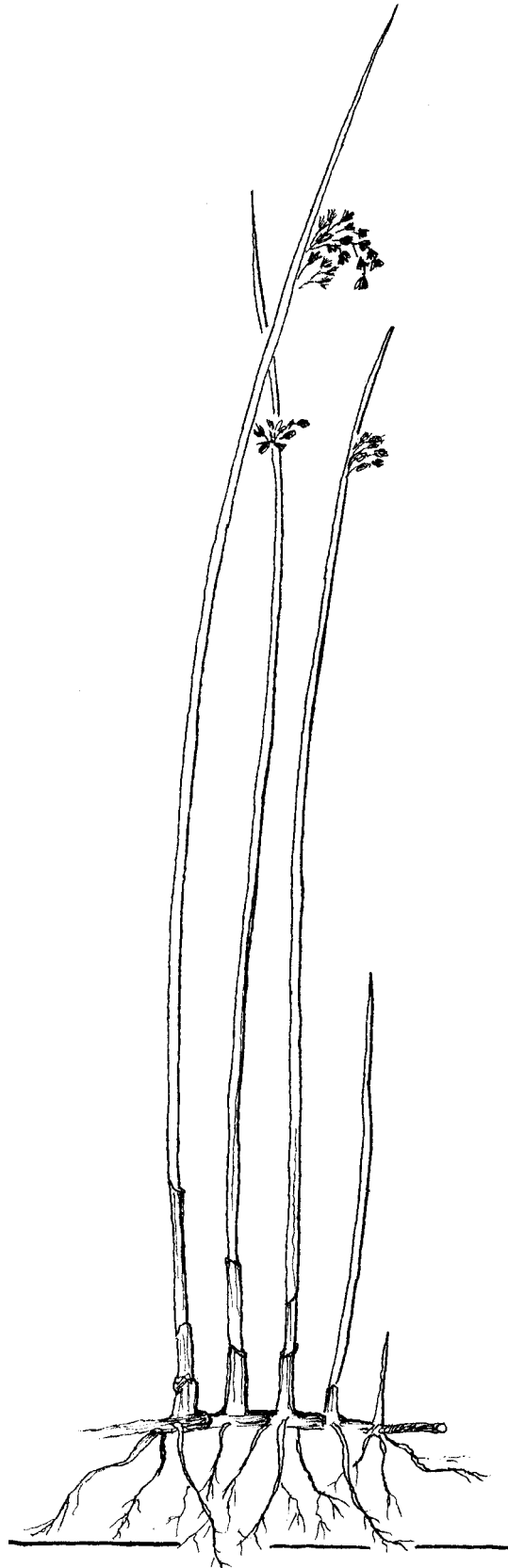
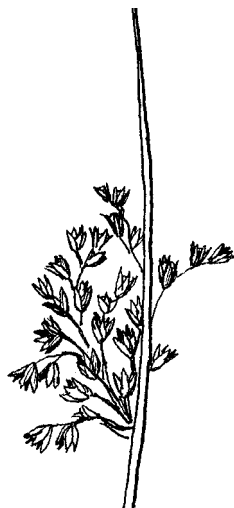
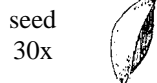
Wet prechilling is not necessary for this species. Soak seeds in water for 3-5 days before seeding. Sprinkle seeds on top of soil and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 to 3 months.

### Transplanting:

This species has a rapid rate of spread.

### Suggested spacing:

| <u>For uniform ground cover</u> | <u>Plant at:</u> |
|---------------------------------|------------------|
| in 1 yr.                        | 0.5 ft. o.c.     |
| in 2 yrs.                       | 1 ft. o.c.       |
| in 3 yrs.                       | 2 ft. o.c.       |



# Hardstem Bulrush - *Scirpus acutus*

Synonym: *Schoenoplectus acutus* var. *acutus*

## Characteristics

### Habit:

A tall, stout perennial, up to 9 feet in height. Rhizomatous, usually occurring in large, monotypic stands.

### Stems:

Round and pithy, up to 2 inches in diameter at the base.

### Leaves:

Short, linear basal sheaths, very insignificant.

### Spike:

Terminal spike with up to 50 or more spikelets on a short pedicel.  
Flowering period: June to mid-August.

## Habitat

### Distribution:

Very common species that can be found at elevations from 3,000 to 9,000 feet. Widespread in the US, most common in the western US.

### Community:

pond and stream edges, marshes, and lake margins. Often occurs with cattails. Grows on moist silty soils. Usually not found on gravel/sand.

### Hydrology:

Generally found in areas of standing water. Can tolerate water up to 5 feet deep. Requires standing or slow moving water.

## Wildlife Benefits

### Food (seeds, rhizomes):

Waterfowl, upland game birds, songbirds, beaver, and muskrats. It is a very important plant for Western Grebes.

### Food (plants):

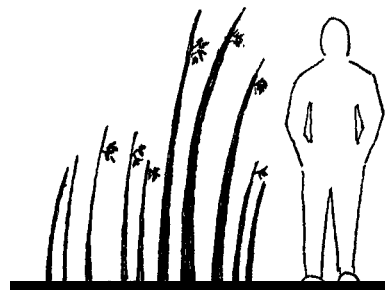
Muskrats.

### Cover:

Nesting waterfowl, fish, and small mammal cover.

## Comments

Excellent tolerance for alkaline, brackish, and saline soils. A very important wildlife species. Will recover readily after fire. Excellent protection from wave action.



# Hardstem Bulrush - *Scirpus acutus*

## Propagation and Planting

### Fruits:

Achenes are lenticular, light green to dark brown and approximately 1/8 inch long. Collect by cutting the seedheads with a clipper. A grocery bag of bulk material will yield about 1 to 2 cups of seed.

### Propagation:

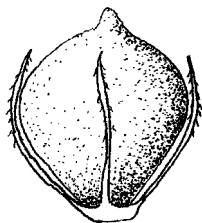
Wet prechill seed for 30 days in a mixture of distilled water and sphagnum moss in a cooler (34 to 38<sup>o</sup> F). Sprinkle seed on top of soils and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 months.

### Transplanting:

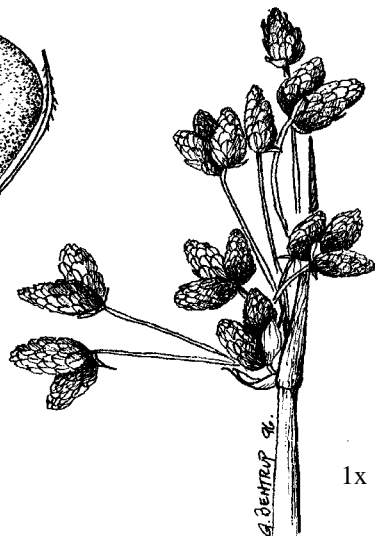
This species has a rapid rate of spread.

Suggested spacing:

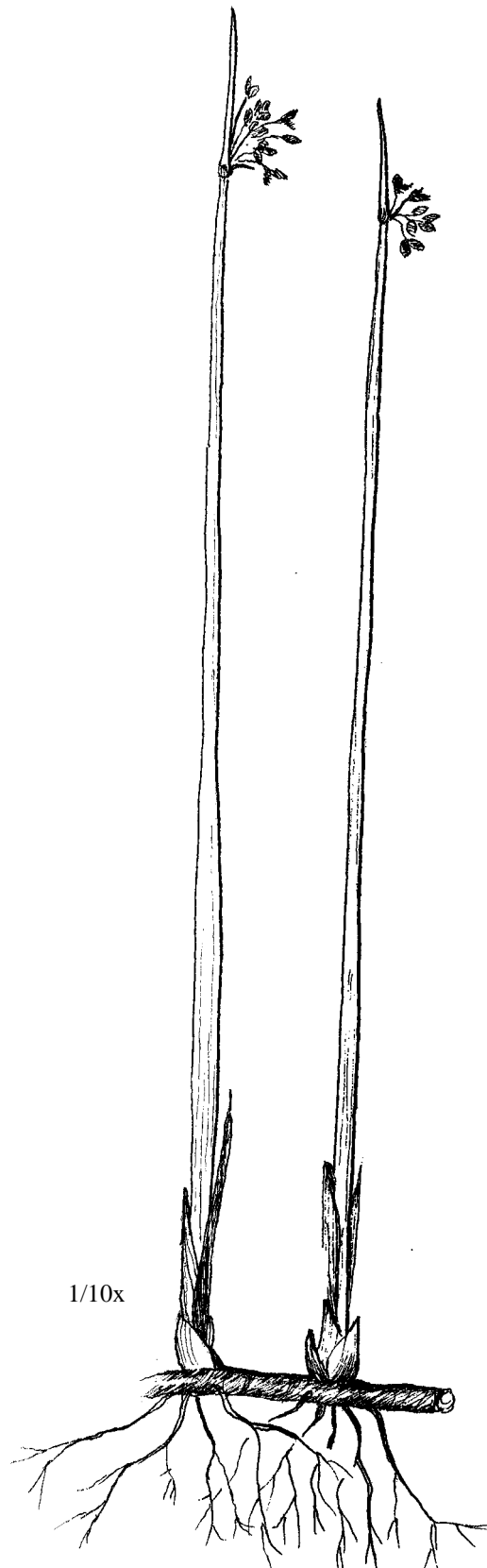
| <u>For uniform ground cover</u> | <u>Plant at:</u> |
|---------------------------------|------------------|
| in 1 yr.                        | 1 ft. o.c.       |
| in 2 yrs.                       | 2 ft. o.c.       |
| in 3 yrs.                       | 3 ft. o.c.       |



seed  
12x



1x



1/10x



# Alkali Bulrush - *Scirpus maritimus*

**Synonym:** *Bolboschoenus maritimus*

## Characteristics

### Habit:

A medium-sized, stout perennial, 8 to 60 inches in height. Rhizomatous, usually occurring in large stands with few other species.

### Stems:

Sharply triangular often with concave sides.

### Leaves:

Usually several well developed leaves that are borne below the midpoint of the stem.

### Spikelets:

Terminal spikelets that are quite compact with 1-3 involucre bracts. Flowering period: July to September.

## Habitat

### Distribution:

A common species that can be found at elevations from 3,000 to 8,000 feet. Widespread in the Northern Hemisphere.

### Community:

Marshes, wet meadows, and pond edges. Often occurs with inland saltgrass. Grows on moist soils from fine clays to silty loams to sands.

### Hydrology:

Generally found in areas with season-long saturated soils or standing water up to 3 ft deep. Can survive where the water table drops to 3 ft below the surface.

## Wildlife Benefits

### Food (seeds, rhizomes):

Waterfowl, upland game birds, and songbirds.

### Food (plants):

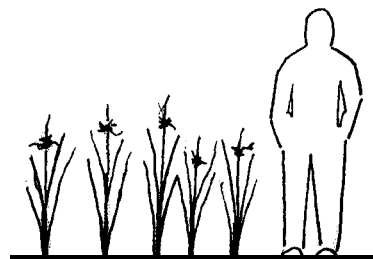
Musk rats and beaver. Grazers rarely use this species.

### Cover:

Waterfowl, deer, and small mammal cover. Can provide fish spawning and rearing areas.

## Comments

High tolerance for alkaline and saline soils. Small bracts in the seedheads will cause severe irritation to hands and eyes when handling. A pioneering species that will be replaced by other species under good soil and water conditions.





# Alkali Bulrush - *Scirpus maritimus*

## Propagation and Planting

### Fruits:

Achenes are tan to greenish brown and approximately 1/8 inch long. Collect by cutting the seedheads with a clipper, although care should be taken because of the sharp edges on the leaves and stems. A grocery bag of bulk material will yield about 2 cups of seed.

### Propagation:

Wet prechill seed for 30 days in a mixture of distilled water and sphagnum moss in a cooler (34 to 38<sup>o</sup> F). Sprinkle seed on top of soils and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 months.

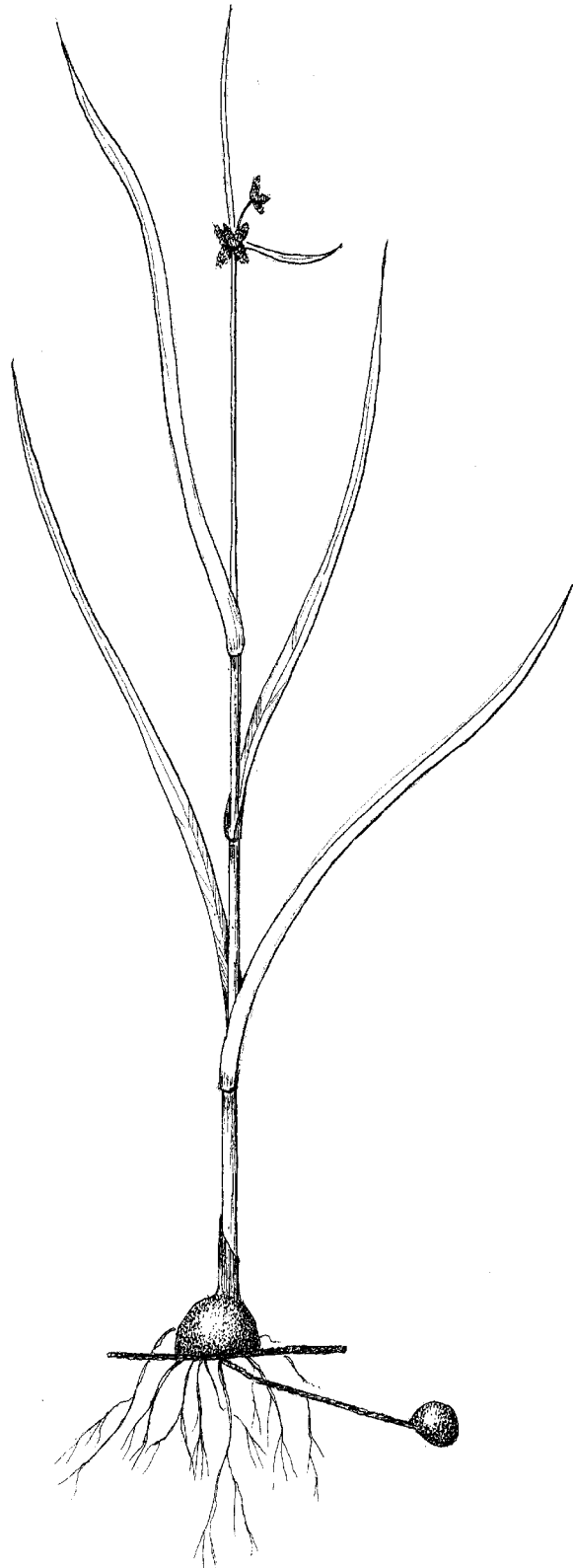
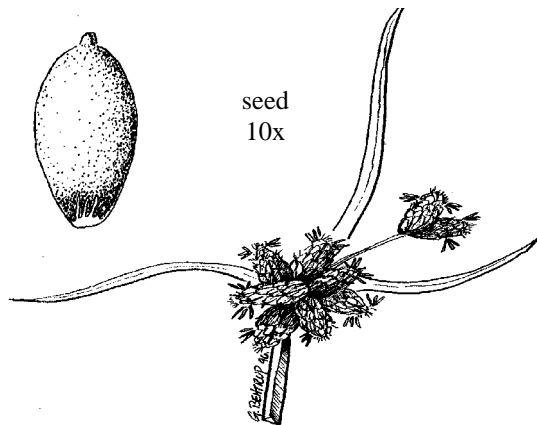
### Transplanting:

This species has a medium rate of spread.

### Suggested spacing:

For uniform ground cover      Plant at:

|           |              |
|-----------|--------------|
| in 1 yr.  | 0.5 ft. o.c. |
| in 2 yrs. | 1 ft. o.c.   |
| in 3 yrs. | 2 ft. o.c.   |



# Threesquare Bulrush - *Scirpus pungens*

**Synonym:** *Schoenoplectus pungens*

## Characteristics

### Habit:

A medium-sized, erect perennial, 6 to 40 inches in height. Rhizomatous, usually occurring in large, monotypic stands.

### Stems:

Upright, triangular with flat sides, rarely concave.

### Leaves:

Borne near the base.

### Spikelets:

Lateral cluster of 1-6 sessile spikelets. Subtended by an involucre bract that appears to be a continuation of the stem. Flowering period: June to September.

## Habitat

### Distribution:

Very common species that can be found at elevations from 3,000 to 6,500 feet. Common throughout the US.

### Community:

Pond and stream edges, marshes, and lake fringes. Prefers fine silty clay loams, but grows on sandy-loam, uncommon on gravel/sand.

### Hydrology:

Generally found in areas with season-long saturated soils or standing water up to 6 inches deep. It will tolerate long periods of drought.

## Wildlife Benefits

### Food (seeds, rhizomes):

Muskrats, geese, and other waterfowl.

### Food (plants):

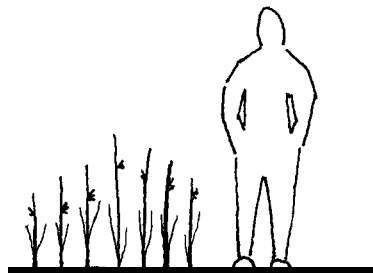
Grazers will use early growth. Palatability and production is low.

### Cover:

Waterfowl, muskrats, and small mammal cover.

## Comments

Excellent tolerance for saline and alkaline soils. Germination is primarily by seed. Will spread readily by rhizomes.



# Threesquare Bulrush - *Scirpus pungens*

## Propagation and Planting

### Fruits:

Achenes are dark green to brown and approximately 1/16-1/8 inch long with slender beaks. Collect by cutting the seedheads with a clipper. A grocery bag of bulk material will yield about 1/2 to 2/3 cup of seed.

### Propagation:

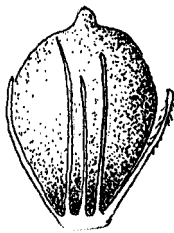
This is a difficult species to propagate from seed, thus transplanting may be the best option.

### Transplanting:

This species has a medium to rapid rate of spread.

### Suggested spacing:

| <u>For uniform ground cover</u> | <u>Plant at:</u> |
|---------------------------------|------------------|
| in 1 yr.                        | 1 ft. o.c.       |
| in 2 yrs.                       | 2 ft. o.c.       |



seed  
10x



2x



1/2x



# Common Cattail - *Typha latifolia*

## Characteristics

### Habit:

A tall, stout perennial, up to 6 feet in height. Rhizomatous, usually occurring in large, monotypic stands.

### Stems:

Round and pithy, covered for much of the length by overlapping leaf sheaths.

### Leaves:

Flat, ascending, and alternate.

### Flowers:

Small on large, dense, brown terminal spikelets, male spike above and separate from the female spike.

Flowering period: June to August.

## Habitat

### Distribution:

Very common species that can be found at elevations from 3,000 to 7,000 feet.

### Community:

Marshes and pond edges. Often found with hardstem bulrush. Grows on a range of moist soils from gravel to clay, uncommon on heavy clay soils.

### Hydrology:

Generally found in areas with season-long saturated soils or in standing or slow moving water up to 12 inches deep. It will tolerate long periods of flooding or drought.

## Wildlife Benefits

### Food (seeds, rhizomes):

Waterfowl and muskrats.

### Food (plants):

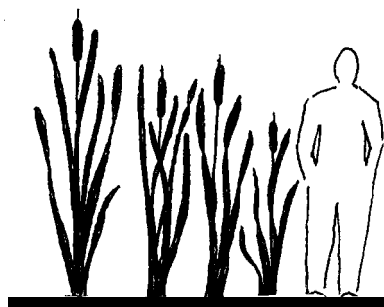
Muskrats

### Cover:

Waterfowl and small mammal cover.

## Comments

High tolerance for saline soils. Excellent uptake capabilities of nutrients and heavy metals. Can be very invasive.



# Common Cattail - *Typha latifolia*

## Propagation and Planting

### Seeds:

Nutlets are approximately 1/32-1/16 inch long with many long slender hairs that arise from the base. Collect by cutting the spikes with a clipper.

### Propagation:

Wet prechill seed for 30 days in a mixture of distilled water and sphagnum moss in a cooler (34 to 38<sup>o</sup> F). Sprinkle seed on top of soil and press in to ensure seed to soil contact. Keep moist during germination. Plants should be ready for outplanting in 2 months.

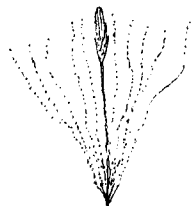
### Transplanting:

This is a good species for transplanting methods due to it's dense rhizomes and high growth rate.

### Suggested spacing:

For uniform ground cover

|           | <u>Plant at:</u> |
|-----------|------------------|
| in 1 yr.  | 1 ft. o.c.       |
| in 2 yrs. | 2 ft. o.c.       |
| in 3 yrs. | 3 ft. o.c.       |



seed



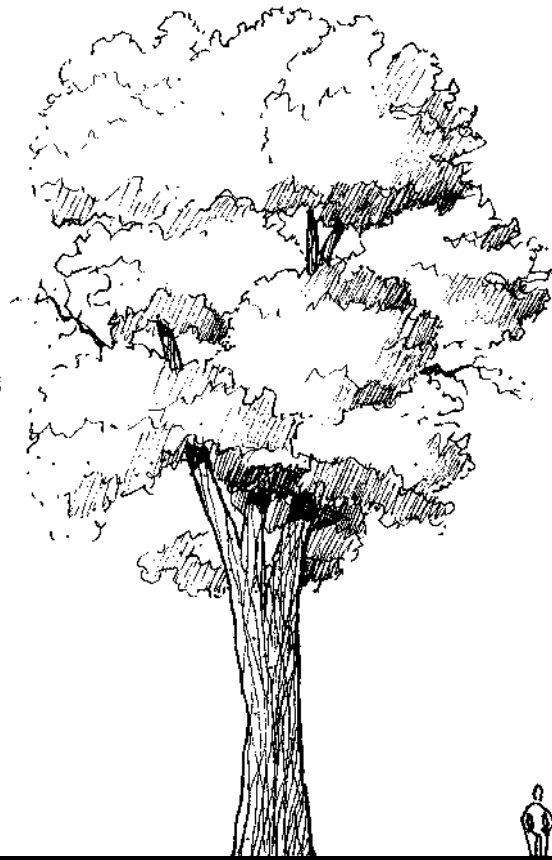
# Woody Species Plant Data Sheets



Planeleaf Willow  
*Salix planifolia*



## Narrowleaf Cottonwood - *Populus angustifolia*



### Characteristics

**Habit:**

Medium-sized tree with narrow, rounded crown, up to 60 feet in height with trunk diameters from 1 to 2 feet.

**Twigs/Bark:**

Bark is shallowly fissured with broad, flat ridges. Bark on upper branches is whitish, becoming slightly darker with age.

**Leaves:**

Leaves are eglandular, lance shaped, broadest near the middle, tapering to a pointed tip with finely toothed margins, and bright yellowish green with a flattened leaf stalk.

### Habitat

**Distribution:**

Throughout the region - 4,000 to 7,000 ft.

**Community:**

Usually occurs with redosier dogwood and alder. Occupies coarse, cobbly soils that flood frequently. Generally prefers wetter sites.

**Growth:**

Has good growth rate.

### Propagation

Roots easily from hardwood cuttings. Use smooth bark sections.

## Fremont Cottonwood - *Populus fremontii*



### Characteristics

**Habit:**

Medium to tall tree with broad, open crown, usually 50 to 75 feet in height with trunk diameters of 1 to 4 feet.

**Twigs/Bark:**

Bark is thick, rough, dark gray-brown and splitting with age.

**Leaves:**

Triangular shaped leaf with broad base. Very irregularly and coarsely toothed. Thick, shiny, green, without glands. The leaf stalk is flattened.

### Habitat

**Distribution:**

From 2,000 to 6,500 feet, mostly in the southern portion of the region.

**Community:**

Usually occurs with coyote willow. Prefers gravel to sandy soils that flood periodically.

**Growth:**

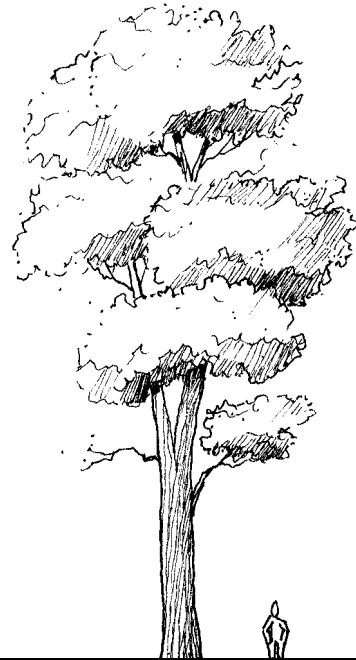
Good growth rate. Seems to do well in slightly saline areas.

### Propagation

Will root from hardwood cuttings with medium ease.



## Black Cottonwood - *Populus trichocarpa*



### Characteristics

#### Habit:

Very tall tree with narrow, rounded, open to pointed crown, up to 160 feet in height. Trunk diameters from 2 to 5 feet.

#### Twigs/Bark:

Twigs are yellow-gray. Old bark is thick, grayish-brown, and deeply furrowed.

#### Leaves:

Alternate, smooth, thick, hairless, wedge shaped, and finely round-toothed. Dark green above and silvery with rust colored spots beneath. Leaf stalks are round; a pair of glands are at the base of the leaf.

### Habitat

#### Distribution:

Common from 3,000 to 5,000 feet, more common in the northern part of the region.

#### Community:

Occurs with whiplash and yellow willow, grows well on coarse soils that are flooded, i.e. floodplains.

#### Growth:

Good growth rate.

### Propagation

Roots easily along entire stem. Use smooth bark sections rather than older,

## Peachleaf Willow - *Salix amygdaloides*



### Characteristics

#### Habit:

Tree sometimes up to 90 feet in height with trunks 3 feet in diameter. Often smaller, occurring in clumps and having 1 1/2 to 2 feet diameter trunks.

#### Twigs/Bark:

Twigs are smooth, shiny gray to red-brown to orange. Bark is grayish brown, shallowly furrowed, and shaggy.

#### Leaves:

Alternate, simple, lanceolate, finely toothed, somewhat leathery, yellowish green above and pale beneath without any glands or hairs on the petiole.

### Habitat

#### Distribution:

Throughout the region, primarily at low elevations from 2,000 to 6,000 feet.

#### Community:

Associated with cottonwoods and coyote willow. Often on loamy soils that are saturated seasonally.

#### Growth:

Tends to have a low growth rate.

### Propagation

Good rooting ability, roots up and down the entire stem. Use smooth bark sections rather than deep furrowed sections.



## Bebb Willow - *Salix bebbiana*



### Characteristics

**Habit:**

Shrub to small tree, 10 to 30 feet in height with main stems up to 8 inches in diameter.

**Twigs/Bark:**

Short, reddish brown branches with long hairs.

**Leaves:**

Leaves narrower at the base and slightly wider at the tip, generally tapering at both ends, dull green above and pale with a waxy bloom beneath, and sparsely hairy. Margin is either entire or coarsely toothed.

### Habitat

**Distribution:**

Common from 3,300 to 7,900 feet, rarely dominant.

**Community:**

Usually found with aspen and black cottonwood. At low elevations, it grows in moist soils while at higher elevations it will grow in coarser, well drained soils.

**Growth:**

Tends to have a low growth rate.

### Propagation

Difficult to propagate.



## Booth Willow - *Salix boothii*



### Characteristics

**Habit:**

Many branched shrub with a rounded top. Generally reaches 6 to 10 (20) feet in height

**Twigs/Bark:**

Numerous basal stems less than 2 inches in diameter, usually with bright yellow bark.

**Leaves:**

Green on both sides and slightly toothed. Distinctive feature: Leaves lack a waxy bloom and have few if any hairs.

### Habitat

**Distribution:**

Most common willow from 4,500 to 8,000 feet.

**Community:**

Usually found with geyer and drummond willow. Most common on wet, coarse soil. Does grow on fine-textured soils.

**Growth:**

Good growth rate.

### Propagation

Roots well from hardwood cuttings, easy to propagate.



## Barrenground Willow - *Salix brachycarpa*



### Characteristics

**Habit:**

Small rounded, compact shrub up to 3 feet in height.

**Twigs/Bark:**

Reddish under a dense covering of hairs.

**Leaves:**

Small, oval-shaped with entire margins. Older leaves with fine wooly hairs on both sides.

### Habitat

**Distribution:**

Throughout the region from 4,500 to sometimes as high as 9,000 ft.

**Community:**

Occurs on a wide range of sites and soils. Needs wetter sites at lower elevations than at higher elevations. Can tolerate saline conditions.

**Growth:**

Slow to moderate growth.

### Propagation

Roots along entire stem, moderate to good rooting.



## Drummond Willow - *Salix drummondiana*



### Characteristics

**Habit:**

Shrub with open growth form, up to 6 to 12 feet in height.

**Twigs/Bark:**

Green to reddish purple twigs that are covered with a whitish waxy bloom.

**Leaves:**

Leaves narrow at the base, widening out at the middle and rounded at the apex. Dark green on top. Underside has a pubescence that appears to be a waxy bloom, but won't rub off. Edges of the leaves are rolled under.

### Habitat

**Distribution:**

Throughout region from 4,500 to 9,000 ft, abundant at higher elevations.

**Community:**

Usually associated with Engelmann spruce and subalpine fir on coarse textured soils that are moist and well aerated.

**Growth:**

Moderate growth rate.

### Propagation

Roots along entire stem with good to excellent rooting.

## Coyote Willow - *Salix exigua*



### Characteristics

**Habit:**

Shrub 3 to 15 (27) feet in height, thicket forming with numerous slender stems.

**Twigs/Bark:**

New twigs are reddish brown turning to ashy gray when older.

**Leaves:**

Long and narrow with short petioles, generally green above and pale below. The silvery pubescence on young leaves wears off becoming dull, grayish green.

### Habitat

**Distribution:**

Very common species from 2,000 to 7,000 ft.

**Community:**

Associated with cottonwood, whiplash and yellow willow. Grows on moist soils, from gravel to silt.

**Growth:**

Grows rapidly.

### Propagation

Roots freely from cuttings, easiest species to propagate.

**Synonymy:** Sometimes referred to as sandbar or dusky willow. Two major subspecies are recognized, *Salix exigua* ssp. *exigua* and *Salix exigua* ssp. *melanopsis*. *Salix exigua* ssp. *exigua* is often referred to as gray sandbar willow. *S. exigua* ssp. *melanopsis* is a smaller shrub with wider, darker, greener leaves. Within the ssp. *melanopsis*, a variety *tenerrima* is recognized by its extremely narrow, predominantly toothed leaves. All of the recognized subspecies and varieties are rhizomatous, thicket-forming willows. For more information refer to Brunfeldt and Johnson (1985).

## Geyer Willow - *Salix geyeriana*



### Characteristics

**Habit:**

Shrub with numerous straight branches, up to 10 to 15 (20) feet in height arising from a tight basal cluster.

**Twigs/Bark:**

Green and covered with a white waxy coating.

**Leaves:**

Leaves are dark green and hairy above, with a waxy bloom underneath that can be rubbed off.

*Note: Closely related to Lemmon willow and may be synonymous.*

### Habitat

**Distribution:**

Throughout this region from 4,000 to 8,000 feet. Often found on side drainages.

**Community:**

Usually found with booth willow which will occupy wetter zones while geyer willow will occupy drier sites. Most common on deep, fine textured soils.

**Growth:**

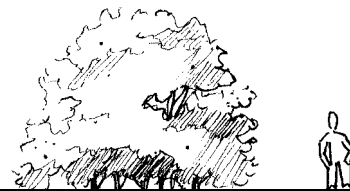
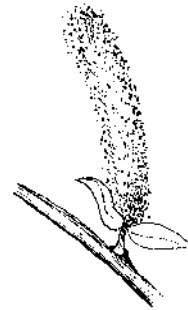
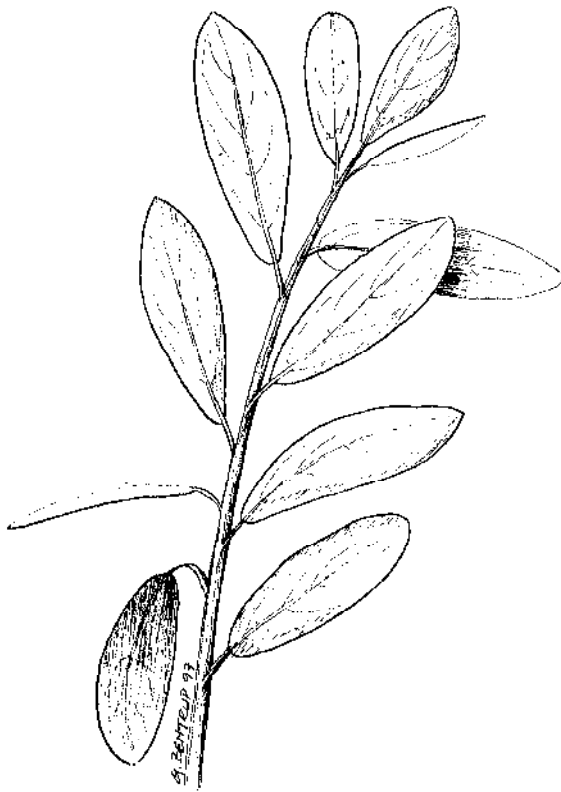
Good growth rate.

**Propagation**

Roots along entire stem and has good rooting abilities.



## Arroyo Willow - *Salix lasiolepis*



### Characteristics

**Habit:**

Shrub or tree from 12 to 30 feet in height.

**Twigs/Bark:**

Yellow to reddish dark brown; softly hairy when young.

**Leaves:**

Seldom more than 3 times longer than wide, margins entire. Lower surface hairy with a waxy bloom.

### Habitat

**Distribution:**

Found at low elevations. Most common in the southern portion of our region, uncommon elsewhere.

**Community:**

Sometimes with Fremont cottonwood. Grows in coarse, rocky soils.

**Growth:**

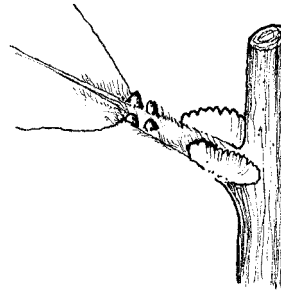
Moderate growth rate.

### Propagation

Roots erratically and is difficult to propagate successfully.



## Pacific Willow - *Salix lasiandra*



### Characteristics

#### Habit:

Tree with several main stems and a dense green crown, up to 50 feet in height. Stems often 4 to 12 inches in diameter.

#### Twigs/Bark:

Twigs covered with a fine pubescence, Bark is rough and brown.

#### Leaves:

Long, lanceolate with finely toothed margins, green on both sides, lacking a waxy bloom. Apex of leaf has a curving point, hence the name whiplash. Distinctive glands are found on the petioles at the base of the leaf.

### Habitat

#### Distribution:

Common in the region from 2,000 to 6,000 ft (below 6,500).

#### Community:

Often occurs with black cottonwood and yellow willow. Likes moist sandy to gravelly soils.

#### Growth:

Medium growth rate.

### Propagation

Easy to propagate from 2- to 4-year old stems, older stems root more slowly.



## Yellow Willow - *Salix lutea*



### Characteristics

**Habit:**

Rounded shrub, occasionally becoming a multi-stemmed tree, up to 20 feet in height.

**Twigs/Bark:**

Twigs yellowish white to gray, not hairy.

**Leaves:**

Green above and pale with a waxy bloom beneath, margins are finely toothed especially near the apex. Older leaves lack hairs. The stipules are somewhat persistent.

### Habitat

**Distribution:**

Very common from 2,000 to 4,500 feet.

**Community:**

Commonly found with coyote and pacific willow. In a variety of sites from coarse cobble along streams to moist terraces with deep, fine textured soils.

**Growth:**

Grows at good rate.

### Propagation

Roots easily along the entire stem from hardwood cuttings.



## Planeleaf Willow - *Salix planifolia*



### Characteristics

**Habit:**

Low, compact and rounded shrub, up to 3 to 4 feet in height.

**Twigs/Bark:**

Older twigs are dark red without hairs.

**Leaves:**

Dark, shiny green above with a waxy bloom underneath; margins are entire or slightly toothed; lateral veins are prominent.

### Habitat

**Distribution:**

Throughout area at upper mid elevations to 7,000 ft.

**Community:**

Occurs with wolf willow at higher elevations and booth willow at lower elevations. Grows in continually saturated, high organic soils.

**Growth:**

Slow growth.

### Propagation

Roots along the entire stem; fair rooting



## Scouler Willow - *Salix scouleriana*



### Characteristics

#### Habit:

Large shrub to small multi-stemmed tree 20 to 35 feet in height. Stems often 4 to 8 inches in diameter.

#### Twigs/Bark:

Reddish orange to dull yellow and dotted with corky spots. Bark stripped from second year twigs smells skunky.

#### Leaves:

Wider at the top than at the base. Dark, shiny green above, covered with dense reddish hairs below.

### Habitat

#### Distribution:

Throughout the region from 3,000 to 8,000 ft.

#### Community:

Often grows with Bebb willow. Small tree height at low elevations. At higher elevations, it occupies drier slopes. Only "upland willow" in this region.

#### Growth:

Very slow growth rate.

### Propagation

Roots from cuts with a rooting hormone. Difficult to propagate; low success rate.

## Wolf Willow - *Salix wolfii*



### Characteristics

**Habit:**

Low rounded shrub, rarely over 2 feet in height.

**Twigs/Bark:**

Covered with a pubescence.

**Leaves:**

Gray-green, covered with densely silvery pubescence and hairy at maturity.

### Habitat

**Distribution:**

Found from 6,500 to 9,000 ft.

**Community:**

Occurs with Geyer and lemmon willow on wetter sites at mid elevations. Occupies drier sites at higher elevations. Occurs on sandy, well-drained and aerated soils.

**Growth:**

Very slow growth rate.

### Propagation

Roots along entire stem, though rooting is erratic. Definitely treat with a rooting hormone.



# **The Practical Streambank Bioengineering Guide**

## **Appendix C Sample Monitoring Sheet**



