



# Forages for Periodically Flooded Areas

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Forage crops differ in their tolerance to flooding in early spring before growth begins. Grasses are more tolerant to flooding than legumes. Individual forages generally are more tolerant of flooding when soil, water and air temperatures are cool. Under cool temperatures, plants remain dormant longer in the spring. Their need for oxygen is less than during active growth. Most grasses and legumes are easily killed by flooding in mid-summer during active growth when soil, water and air temperatures are high.

Several studies have been conducted on the flooding tolerance of grasses and legumes in early spring. These studies show (Table 1) how many days of spring flooding can be tolerated by established stands of grasses and legumes, by fall established grass seedlings, and by seed planted in late fall as a dormant-season seeding. These data indicate the range of days beginning when little or no

flooding injury occurs to the upper limit where the stand is killed or will likely suffer extensive plant loss or poor seed germination. Flooding tolerance of grasses and legumes may vary from year to year due to temperature, depth of water, age of stand, etc. However, the flooding tolerance guidelines provide a basis for selecting grasses and legumes for planting on periodically flooded soil areas.

Grasses exhibiting high flooding tolerance include creeping foxtail, meadow fescue, reed canarygrass, tall wheatgrass, slender wheatgrass and western wheatgrass. Grasses moderately tolerant to flooding include creeping red fescue, Russian wildrye, smooth bromegrass and intermediate wheatgrass. Crested wheatgrass, orchardgrass, alfalfa and sweetclover will only tolerate relatively short periods of early spring flooding. The flooding tolerance data in Table 1 also show the influence of spring flooding on early fall established forages and tolerance of grass and legume seed when planted in very late fall when soil temperatures are cool enough to prevent seed germination until the following spring. Generally, those forages with high flooding tolerance as mature plants ranked high as seedlings and seed.

**Table 1. Estimated tolerance of grasses and legumes to early spring flooding in days.**

Species	Tolerance to flooding in days <sup>1</sup>		
	Mature Plant	Seedling	Seed
<b>LEGUMES</b>			
Alfalfa	14-21	—	7-14
Sweetclover	10-14	—	7-14
<b>GRASSES</b>			
Beardless wildrye	—	—	35-42
Creeping foxtail	30-50 +	—	—
Creeping red fescue	21-35	21-35	—
Meadow fescue	35-63	49-63	21-42
Orchardgrass	14-21	—	—
Reed canarygrass	49-63	35-49	35-63
Russian wildrye	21-35	21-35	21-35
Smooth bromegrass	24-28	49-63	35-56
Wheatgrasses:			
Crested	10-17	21-35	—
Intermediate	21-35	14-21	21-28
Tall	35-49	21-35	35-56
Slender	49-63	21-35	35-56
Western	49-63	—	—

<sup>1</sup> Lower limit - generally no injury; upper limit - severe injury possible.

Although several grasses possess a high degree of flooding tolerance, creeping foxtail and reed canarygrass are better adapted to very wet, poorly drained soils. The wheatgrasses (tall, slender and western) possess high salt tolerance and will be desirable species for planting around the upper slopes of pothole areas or on high water table, salt affected flats (see circular R-584 entitled 'Forages for Salt Affected Soils').

## CREEPING FOXTAIL

Creeping foxtail (*Alopecurus arundinaceus* Poir.) is an early maturing, cool-season, perennial, sod-forming grass introduced into the United States from Eurasia during the early 1900s. It is sometimes referred to as creeping meadow foxtail, reed foxtail, Scotch foxtail and German timothy.

Creeping foxtail is adapted to sites where soil moisture is readily available. It performs well along the margins of sloughs, periodically flooded pothole areas in cropland fields and on high water table areas. In dry upland areas it

44.3  
19  
8  
.876

performs best on sites receiving more than 25 inches of moisture annually. It also is moderately tolerant to saline-alkali soil conditions but has difficulty in becoming established if the salinity level of the soil is 5 to 6 millimhos (mmhos) or higher based on the NDSU salinity test.

Successful establishment is dependent on a moist soil, at or above 50 percent field capacity during seed germination and seedling emergence. A dormant-season seeding in late fall generally is required on wet sites. Seeding is done late enough in the fall so that seed germination does not take place.

Creeping foxtail contains approximately 750,000 seeds per pound. Therefore, for every pound of seed planted there are about 17 seeds per square foot in the field. If seed can be uniformly distributed during seeding, 2 pounds of pure live seed (PLS) should be adequate. The minimum seeding rate suggested is 3 to 4 pounds PLS per acre to obtain improved seed distribution in the field. This rate of seeding provides from 50 to 70 live seeds per square foot in the field.

Currently two varieties of creeping foxtail are recognized for use in North Dakota - Garrison and Retain. The variety Garrison originated from a collection made in 1950 from plants growing in a pothole area near Max, ND. The variety Retain was developed by South Dakota State University and released in 1979. The only difference between the two varieties is that Retain tends to not shed its seed as readily as it matures.

Creeping foxtail forage is high in quality, similar to other commonly grown hay and pasture grasses when harvested at the same growth stage. In North Dakota it does not produce as much forage per acre as reed canarygrass.

## REED CANARYGRASS

Reed canarygrass (*Phalaris arundinacea* L.) is a coarse, tall growing, leafy, cool-season, native, perennial sod-forming grass. The short, scaly rhizomes of reed canarygrass form a very dense sod that will support the weight of livestock and heavy farm equipment when the soil is saturated with water.

Reed canarygrass is adapted primarily to very wet, periodically flooded areas in North Dakota. It possesses considerable drought tolerance, but it has not performed as well as crested wheatgrass and smooth bromegrass on dry upland soils outside of the Red River Valley area of North Dakota. It is the highest yielding grass under irrigation in North Dakota. Reed canarygrass possesses a low tolerance to saline-alkali soil conditions. Therefore, if saline-alkali conditions are a problem on wet areas, select grasses which will tolerate existing soil conditions.

Reed canarygrass seedlings grow quite slow following emergence, are very sensitive to frost and cannot tolerate low light conditions. If a cereal crop such as oats is used

as a companion crop during establishment, it should be removed early for hay or silage to improve seedling establishment. Fall seedings on a well-prepared seedbed should be made early or by about August 15 to 20 if moisture is adequate for immediate seed germination. Early planting in the fall is important because the leaves of reed canarygrass, both seedling and mature plant leaves, are killed by temperatures not low enough to stop growth of Kentucky bluegrass. Seedlings should develop a minimum of two leaves and preferably three or more before a killing fall frost. If reed canarygrass cannot be planted early enough to make adequate growth before frost, delay seeding until very late fall. Using a dormant-season seeding will place the seed in the soil ready to germinate the following spring. If the area floods in the spring, the seed will not germinate until the flood waters recede.

Reed canarygrass has approximately 530,000 seeds per pound. For every pound of seed planted there are about 12 seeds per square foot in the field. The suggested seeding rate is 4 to 5 pounds PLS per acre to obtain uniform seed distribution. This rate of seeding will provide about 50 to 60 live seeds per square in the field.

Several reed canarygrass varieties are available. However, the older varieties contain alkaloids which cause diarrhea and poor animal performance when grazed. Two new low alkaloid varieties are available - Palaton and Venture. If seed of these varieties is not available use the variety Vantage for grazing. Any of the named varieties may be used for hay since the alkaloid level in dry hay is rarely high enough to cause poor animal performance.

Reed canarygrass produces an abundance of quality hay provided it is harvested early. The yield of digestible dry matter per acre increases to the heading growth stage, then declines. In contrast, crude protein content of the forage increases until the boot stage of growth, then holds constant until flowering when it begins to decline. The later the first cutting is delayed, the less regrowth forage available for harvest on good moisture sites.

## FERTILIZATION

Stands of creeping foxtail and reed canary grass will become 'sod-bound' within two or three years if not fertilized. The primary nutrient required is nitrogen, but phosphorus may be needed if the soil 'P' level is very low. Since these grasses are planted on the better moisture sites statewide and/or on cropland soils in higher rainfall areas, growth response to nitrogen fertilizer application should be above average for the area. The suggested rate of actual nitrogen to apply per acre is 40 to 50 pounds in western North Dakota, 50 to 70 pounds in west central areas, 70-90 pounds in east central areas and 90 to 100 pounds in the Red River Valley area. The ideal time to fertilize periodically flooded areas is in late summer. Fall growth from autumn rains accumulates nutrients in plant roots promoting early spring growth and increased forage production. Another good time to fertilize is immediately following the first hay harvest.