



Perennial Forages for Saline Seeps

Planting perennial forages into saline seep areas is one of several recommended practices for salinity control (see the factsheet *Dryland Saline Seeps: Types and Causes*, Agdex 518-12, published by Alberta Agriculture and Food).

Saline seeps result when salt-laden groundwater rises to within a few metres of the soil surface. Once the water is in the soil's capillary zone, evaporation as well as cohesive and adhesive forces act like the wick in a kerosene lamp to draw saline water into the root zone or topsoil. Water then evaporates and the salts remain, gradually accumulating over time.

Forage establishment is especially tough in saline environments because of the harsh soil conditions for germination and emergence, along with heavy competition from salt-tolerant species like kochia or foxtail barley. Forages differ in their salinity and flood tolerance, with several appropriate species available depending on the specific farm situation.

How these controls work

Perennial forages help control salinity by lowering the existing groundwater, which allows salts to flush downward in the soil profile, depending on the dynamics associated with groundwater recharge (see *Dryland Saline Seeps: Types and Causes*, Agdex 518-12).

The forages also provide soil cover and shading to help reduce evaporation, thereby reducing the capillary rise of salty water compared with bare soil areas. These controls are only possible when the salt concentration in the seep is not so high as to completely prevent all plant growth.

Perennial forages are an effective way to help control seep expansion, but they cannot reclaim the area for annual crop production unless the groundwater source is controlled first.

Plant species

The choice of which salt tolerant forage or forage mixes to grow will depend on the desired land use for the affected area. For example, species like tall wheatgrass or Nuttall's salt grass may be suitable for reclamation or wildlife habitat, but if livestock production is the goal, then forage mixes should include productive, long lived and relatively palatable species more suitable for grazing or hay production.

Forage mixes are often recommended because of the extreme variability and dynamic nature encountered within typical saline seeps. Some forage species can establish in strongly saline zones while others are more suitable as livestock forage with moderate salinity tolerance. Soil testing will give a good indication of the range of salinity in terms of electrical conductivity (EC). Table 1 shows the relationship between the salinity rating and EC values.

Table 1. Salinity rating and electrical conductivity value for upper soil layers

Soil depth (cm)	Non-saline	Weakly saline	Moderately saline	Strongly saline	Very strongly saline
0 - 60	<2 dS/m*	2 - 4 dS/m	4 - 8 dS/m	8 - 16 dS/m	>16 dS/m
60 - 120	<4 dS/m	4 - 8 dS/m	8 - 16 dS/m	16 - 24 dS/m	>24 dS/m

* dS/m = decSiemens per metre, a unit of measure for electrical conductivity within a saturated soil paste extract from the soil.

Table 2 lists the characteristics of various salt-tolerant grass species recommended for seeding into saline seeps. A degree of flood tolerance is usually a requirement because saline areas are often temporarily saturated in the spring.

Some of the sod-forming species like green wheatgrass and creeping foxtail, once established, have the ability to creep into adjacent areas and can also choke out salt tolerant weeds like kochia or foxtail barley. Note that creeping foxtail is only moderately salt-tolerant in the seedling stage and, thus, may be difficult to establish. It also has poor drought tolerance.

Slender wheatgrass is recommended only when mixed with another grass species. It is quick to establish, so it provides good cover while the main grass species becomes

established. However, slender wheatgrass will die out within two or three years, once the main grass is established. If possible, plant slender wheatgrass and the main species in separate rows.

If the area is severely saline, very salt-tolerant forages like Nuttall's alkali grass can be established for reclamation purposes. However, this species is not suitable for livestock forage production.

Note that alfalfa seedlings are only slightly to moderately salt-tolerant, even though mature alfalfa can be moderately to strongly salt-tolerant. Thus, alfalfa is not suitable for planting into saline seep areas. Many of the common seed industry mixes include some alfalfa, but it will usually only establish on the slightly saline seep edges.

Table 2. Grass species recommended for seeding into saline seeps

Species	Salinity tolerance*	Sod or bunch	Rate of establishment	Longevity	Winter hardiness	Flood tolerance	Drought tolerance	Livestock palatability
creeping foxtail	high	sod	average	long	good	high	poor	good
meadow foxtail	medium	sod	average	long	good	high	poor	fair
smooth bromegrass	medium	sod	slow	long	excellent	medium	good	good
meadow bromegrass	medium	sod	slow	long	excellent	medium	good	good
slender wheatgrass	high	bunch	very fast	short	good	medium	good	fair
intermediate wheatgrass	medium	sod	fast	short	excellent	medium	good	good
pubescent wheatgrass	medium	sod	fast	short	excellent	medium	good	good
tall wheatgrass	high	bunch	fast	long	excellent	high	poor	poor
western wheatgrass	high	sod	fast	long	excellent	high	good	good
NewHy wheatgrass	high	sod	average	long	excellent	medium	good	good
green wheatgrass	high	sod	average	long	excellent	medium	good	good
Russian wildrye	high	bunch	very slow	long	good	poor	good	good
altaï wildrye	high	bunch	very slow	long	excellent	medium	good	fair
beardless wildrye	very high	sod	very slow	long	good	medium	good	fair
Nuttall's alkali grass	very high	sod	average	long	good	medium	good	very poor

* Salinity tolerance: medium - tolerates up to 6 to 8 dS/m, high - tolerates up to 8 to 12 dS/m, very high - tolerates greater than 12dS/m.
Source: Adapted from original by Henry Najda, Alberta Agriculture and Food.

Forage nutritional issues

Care should be taken when feeding crops grown in saline seeps to livestock. Research by Agriculture and Agri-Food Canada has shown that high levels of sulphate and trace metals are common in plants grown in saline seeps. If there is any concern about forage quality, the feed should be tested and reviewed by a livestock nutritional specialist.

Hay mixes

When selecting a mix for hay production, choose grasses that can be harvested easily. Low growing or basal growth grasses are difficult to swath and bale.

Grazing mixes

Select forage species that are suited to the conditions in the seep and to your grazing needs. Wheatgrasses are good choices for spring pasture due to their lush spring growth, but become coarse and rank in the late summer and fall. Wildrye grasses are good choices for fall pasture because they usually start slowly in the spring, but produce good forage and cure well on the stem.

Stand establishment

Establishing vegetation on a saline seep can be very difficult. One option is to seed in the fall when the seeps are dry and accessible. Seeding rates for saline seeps should be double those for non-saline areas. Several salt-tolerant forage mixtures are available from different seed suppliers, each with suggested planting rates.

For all types of saline seeps, plant salt-tolerant grasses in an area larger than the visibly saline area to ensure good control. For saline sloughs and depression bottom seeps, plant salt-tolerant grasses in a band around the saline wetlands. This band should cover the visibly saline area and extend an additional 20 to 60 metres further. *Perennial Forage Establishment in Alberta* (Agdex 120/22-3) is a good information source related to forage stand establishment.

More Information

For more information on salinity control, contact the Alberta Ag-Info Centre at 310-FARM (3276), or refer to the factsheet *Dryland Saline Seeps, Types and Causes* (Agdex 518-12).

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