



Managing Saline Soils With Forages



Saltlander
Forage Grass Mix



Managing saline soils with forages

by Bruce Barker

Salinity is white death for many crops, but forages can help manage the problem.

Many areas of the Prairies are at risk for developing salinity or already have salinity issues. Whether the salinity developed naturally or was induced by human activities, salinity will just keep getting worse unless mitigation efforts are initiated

Glenn Friesen, forage specialist with Manitoba Agriculture, Food and Rural Initiatives at Carman, Manitoba, says the challenge for many crop producers is that the best option usually includes taking land out of crop production and establishing perennial forages. "Headland salinity is becoming more of a problem for many farmers, especially in wetter areas and often it has to be addressed with forage establishment," says Friesen. "That's a difficult thing to talk about because how can you make money out of growing cattle or hay on this land?"

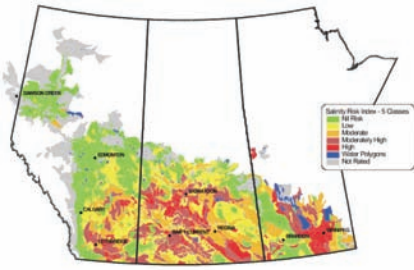
Headland salinity occurs when water in ditches moves down in the soil, picks up soluble salts, and then moves laterally into the field where it moves upward, evaporating and leaving the salts in the rooting zone. "To put things into perspective, if you look at the land use map from the 1996 Census, there is fairly significant risk of salinity, and we know that more than a decade later there is still fairly significant risk in areas like the Red River valley," says Friesen.

Saline soils are often found where the water table is within two metres of the soil surface. If excess groundwater builds up in a recharge zone, the excess water moves laterally, and on the way it picks up and transports soluble salts, eventually depositing them just beneath the discharge area where the water evaporates and leaves the salt deposits.



AC Saltlander establishes well and spreads by a creeping root system.

PHOTOS COURTESY OF MILLER SEEDS.



Salinity Risk Map

Friesen explains that there are two ways to deal with salinity: biologically or mechanically. From a mechanical perspective, surface drainage can be used in the recharge area to keep water from moving downward in the soil. Tile drainage can be used to move the excess water away from the discharge area to prevent salts from accumulating.

Forages provide a biological solution

Barley is one of the most salt-tolerant grain crops but when salinity levels get too high for barley production, perennial forages often become the only biological solution.

The advice for growers is to pick forages that are adapted to their environment and determine the purpose of the forage. “Is it for yield or just for land cover?” asks Friesen. He says growers cannot have both and if they try to do both, stand establishment and

<i>Relative tolerance of crops and weeds to salt</i>			
Salt tolerance level (dS/m)	Forages	Speed of forage establishment	Common weed and crop seen
Very High (>16)	Tall wheatgrass Beardless wild-rye	Slow Medium	Red samphire Sea blight
High (16)	Slender wheatgrass Altai wild-rye Russian wild-rye Western wheatgrass Tall fescue	Fast Slow Slow Slow Fast	Kochia Foxtail barley Russian thistle
Moderate (8)	Alfalfa Sweetclover Birdsfoot trefoil Bromegrass Meadow fescue Crested wheatgrass Intermediate wheatgrass	Fast Medium Slow Slow Medium Fast Fast	Barley Wheat Fall rye Oats
Low Tolerance (4)	Timothy Alsike clover Red clover White clover Sainfoin	Fast Fast Fast Fast Slow	Canola Soybeans Beans Corn Flax Pea Sunflower

dS/M = DECISIEMENS/METRE

SOURCE: FRIESEN, MAFRI

longevity will be compromised.

MAFRI has a forage adaptability chart that provides a good cross-reference of forage features, including characteristics like longevity, flooding tolerance, salinity tolerance, winter hardiness and preferred climate and growing conditions. Friesen says that a good strategy is to plant a mixture of four grasses to achieve the best stand establishment and longevity. “When you boil it down, you

end up with about seven species with high or very high tolerance to salinity,” says Friesen. “We tend to focus on tall wheatgrass but its problem is that it is slow to establish. When it does get going though, it is probably the best performer we have right now.”

A new option is green wheatgrass, a cross between Eurasian bluebunch wheatgrass and quackgrass that originated in Turkey. The difference between





AC Saltlander is a green wheatgrass with good palatability that remains green longer in the fall.

green wheatgrass, tall wheatgrass and the others is that green wheatgrass has good palatability. It also remains green longer in the fall, and has aggressive rhizomes, similar to those of smooth brome grass, or about half that of quackgrass. This allows the plant to spread out to compete with weeds and increase the groundcover. Wheatgrasses are typically bunch grasses that do not spread out.

Plant breeders at Agriculture and Agri-Food Canada at Swift Current, Saskatchewan, have bred a Canadian variety called AC Saltlander using

Turkish germplasm. AC Saltlander is based on Turkish selections of a natural cross between bluebunch wheatgrass and quackgrass.

NewHy, developed at the Agricultural Research Service Laboratory in Utah, is a similar concept but is based on North American germplasm, so is not a green wheatgrass. NewHy is based on American selections of the American bluebunch grass and quackgrass-cross. Although it could be assumed that AC Saltlander and NewHy are the same, they are actually not because the Turkish strains of bluebunch wheatgrass and

What is the difference between saline and sodic soils?

Saline soils have normal pH and high concentrations of soluble salts like NaCl and CaSO₄. These soils have a combination of sodium, potassium, calcium or magnesium that combine with another ions to create a soluble salt that will precipitate out.

Sodic soils, often called alkali, or gumbo, soils, typically have a high pH above 8.5 and high proportions of sodium but not necessarily salt. The high portion of sodium relative to calcium and magnesium causes the clay particles to disperse. This causes soil structural breakdown, soil pore blockage, and hard, dense subsoil that inhibits root growth and water infiltration. Be cautious when looking at soil tests to determine whether you have a sodic soil or a saline soil.

quack are different than American versions.

Friesen points out that AC Saltlander is a fairly aggressive species and caution should be used if it is grown



near natural Prairie habitat as it could become invasive on native pastures. There were also some early issues with downy brome contamination in the seedlots, so farmers should ensure their seed source is free of weeds.

Research from the Canada Salt Tolerance Lab at Swift Current found that AC Saltlander survived very well on both pasture and hay land. NewHy also survived well on pasture and hay land, but was not quite as salt tolerant as AC Saltlander. Tall wheatgrass, which is the predominant saline grass grown on the Prairies, survived quite well as a hay crop, but not as pasture. "So if you are looking for a pasture option, tall wheatgrass is not an option. On the other hand, tall wheatgrass could tolerate two to five weeks of flooding, but AC Saltlander and NewHy could not," cautions Friesen.

AC Saltlander is available from Miller Seeds at Milk River, Alberta.

Tips for forage establishment

Seed as early as possible. Plant tolerance to saline soils tends to drop off as temperatures warm up in the summer, so Friesen says early stand establishment when the soil is cool and moist is preferred. However, saline soils are usually wet, so early seeding can be difficult. He says that frost seeding in late March or early April, where seed is broadcast on frozen

Basic grass mixtures for saline problem areas (seeding rate lb./acre)	
Pasture	Hay
4 lb. creeping foxtail; 2 lb. slender wheatgrass.	5 lb. tall wheatgrass; 5 lb. slender wheatgrass; 3 lb. alfalfa; 3 lb. sweet clover.
2 lb. alfalfa; 2 lb. sweet clover; 2 lb. birdsfoot trefoil.	5 lb. tall fescue; 3 lb. alfalfa; 3 lb. sweet clover.
4 lb. tall fescue; 2 lb. slender wheat grass; 2 lb. creeping foxtail.	
1 lb. alfalfa; 2 lb. sweet clover; 1 lb. birdsfoot trefoil.	

SOURCE: FRIESEN, MAFRI.

ground has worked well. "It is a pretty well-established technique used in the cattle industry, and we have seen really good results," Friesen says.

Seeding rates should be doubled and seed should be placed shallow. Perennial weeds should be controlled before seeding.

Friesen cautions that a forage mix should be chosen for salinity control, and not for yield. Some forage companies market mixes aimed at producing maximum yield on good soils, but they do not have the best adaptation on saline soils. "Stick to the standards like tall fescue, slender wheatgrass and tall wheatgrass and then add in others based on availability and pricing. Alfalfa is a really good option. It

won't establish well in the saline area, but it will establish on the fringes where the salinity isn't as high and with deep roots alfalfa will help to contain the salinity in the area by drawing down moisture," explains Friesen.

Native grasses are also a good choice when their seed price is low, says Friesen. Green needle grass, big blue stem and little blue stem are moderately tolerant of saline soils and longer lived than some of the commercial grasses.

"I can't stress enough that when you plant forages in saline areas the production is always reduced because of the inhospitable soil," says Friesen. "And you have to keep in mind, with saline soils, there are no quick fixes." ■

Difference you can see



Stratego® fungicide keeps your cereal crops greener and healthier by protecting them from early disease pressure, ultimately producing higher yields.

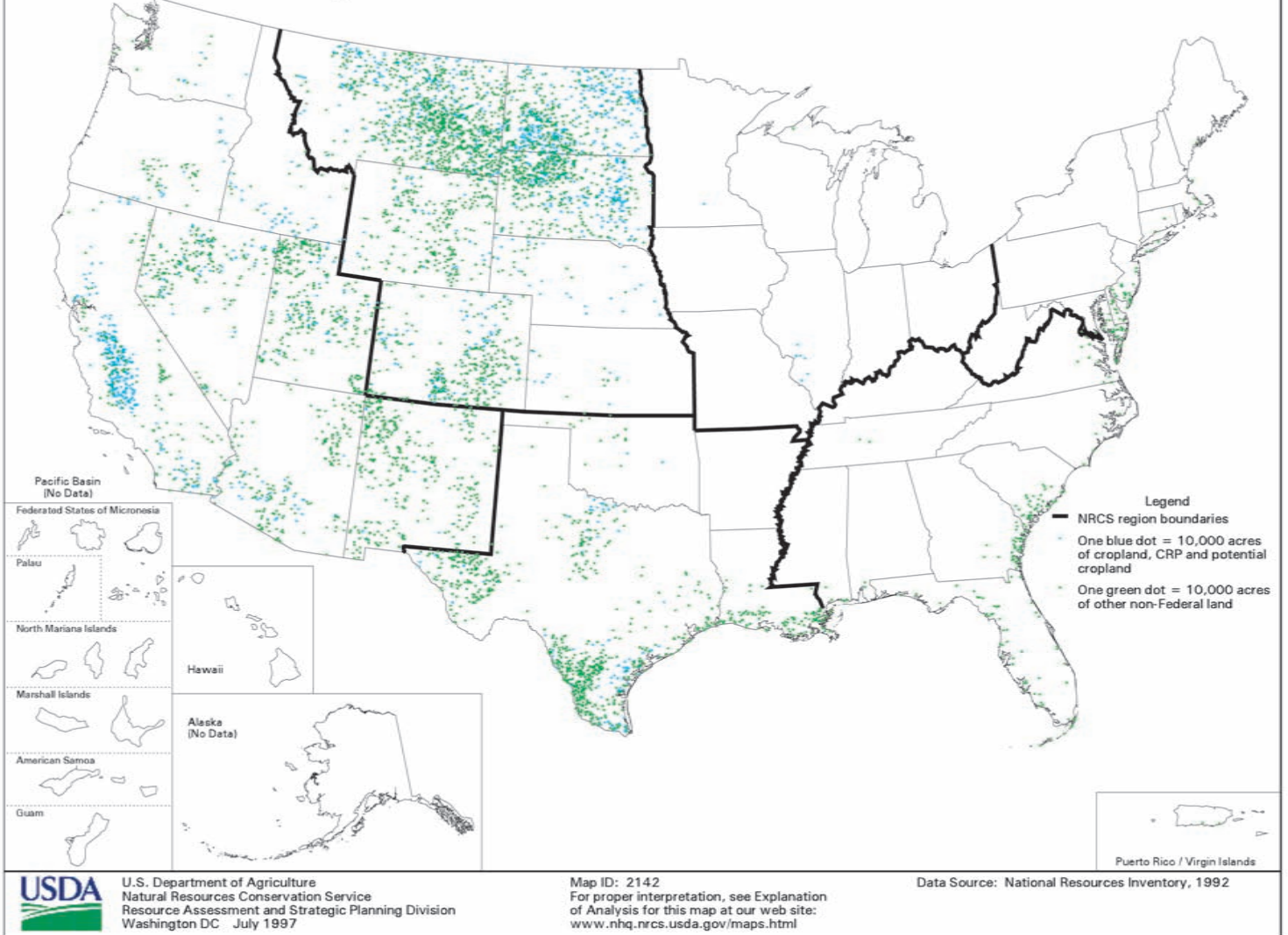
Its wide window of application from 3-4 leaf to flag leaf on wheat, barley and

oats provides long lasting control. A great partner in your herbicide tank mix, Stratego delivers flexibility in the field no


matter what conditions you face. The benefits won't go unnoticed.



Salinity-Influenced Soils on Non-Federal Land, 1992



Salinity Tolerance Index *

AC Saltlander	12.51	Most Salt Tolerant  Least Salt Tolerant
Tall Wheatgrass (Orbit)	11.73	
Orchardgrass	10.07	
Lovegrass (Eragrostis sp)	8.58	
Intermediate Wheatgrass	8.49	
Barley (Dryland)	8.29	
Slender Wheatgrass	7.84	
Alfalfa	6.79	
Durum Wheat (Dryland)	6.66	

*Index data (higher numerical value= higher salt tolerance); Information from: H. Steppuhn, M. Th van Genuchten, and C.M. Grieve. 2005. Root-Zone Salinity:II. Indices for Tolerance in Agricultural Crops. Crop Sci. 45:221-232

AC Saltlander

Average Daily Gain

Saltlander 2.9 LBS/Day

Smooth Brome 2.2 LBS/Day



Saltlander Forage Grass Mix

Proven Genetic Innovation

Perennial Grasses with Salt Tolerance for More Farmable and Productive Acres

A New Forage Alternative for Saline Soils

As much as 20% of the crop land in the Northern Great Plains and Intermountain West are affected by some degree of salinity. The effects of salinity range from undetectable yield loss to severe seeps prohibiting plant growth.

Saltlander Forage Grass Mix offers producers a new alternative for hay or pasture. The mix is designed to push forage production further into the tough spots while maximizing yield on the field's most productive acres. The result is *More Farmable and Productive Acres*.

Saltlander is a specific mix containing:

- 50% AC Saltlander Green Wheatgrass
- 25% Revenue Slender Wheatgrass
- 25% Courtenay Tall Forage Fescue

The slender wheatgrass and tall forage fescue act as nurse crop for the AC Saltlander during establishment by providing weed and erosion control. By the end of the second growing season, the stand will be predominantly AC Saltlander.

Green Wheatgrass is a new forage species

AC Saltlander Green Wheatgrass is a long-lived, perennial, cool season grass developed specifically for semi-arid production areas. AC Saltlander was mass selected by breeders for overall salinity tolerance, winter hardiness, productivity on saline and nonsaline soils and a desirable plant form. The variety has better saline tolerance than intermediate and NewHy RS Wheatgrass and equal to tall wheatgrass. Drought tolerance is similar to intermediate wheatgrass.

AC Saltlander produces aggressive spreading rhizomes which allow the stand to fill in as the less competitive forage species and weeds lose out. The variety can displace foxtail barley from the field or pasture.

Adaptation and Forage Use

Saltlander Forage Grass Mix is suitable for the semi-arid Northern Plains and Intermountain West regions that receive 10-18 inches of annual precipitation. The Saltlander Mix performs best in geographies receiving 13 or more inches of annual precipitation or with limited irrigation.

Forage uses include season-long pasture, dry hay, dual purpose hay/pasture, soil conservation, reclamation or wildlife habitat.

The forage quality is equal to brome grass or orchardgrass; however the yields are superior.



A stand of AC Saltlander planted in the saline area of a pasture.



A dryland field with severe salinity areas being dormant seeded.

Saltlander Forage Grass Mix

Planting Management

- Prepare a firm seed bed and avoid areas with large surface concentrations of weed seed, especially foxtail barley. Best stands are obtained when seed is placed 1/2" to 3/4" deep. Deeper placement will lead to partial or complete stand failure. Be careful with seeding depth on sandy soils. Use seeders that leave shallow seed furrows and when no-tilling, remove as much residue as possible before planting.
- Spring seedings are preferred for best weed control, however dormant seedings can be done. When dormant seeding, plant late enough in the fall to ensure germination does not take place until spring. Mid-summer seedings on soils prone to crusting or with high sodium content should be avoided.
- The recommended seeding rate is 6 to 10 pounds per acre. Use a seeding rate that fits the annual precipitation, seeding method and nurse crop. To lessen wind and water erosion, 5 to 8 pounds of a cereal may be used. Seedlings are vigorous and establish quickly, even under adverse conditions.
- After the second or third leaf has emerged, broadleaf herbicides may be applied for weed control. Generally, the same herbicides recommended for wheat can be applied but always follow the label.
- Limited fertilizer is required during establishment. Starting the fall of the establishment year, apply 40-60 pounds of nitrogen per acre to encourage aggressive rhizome and tiller development. The rhizomes fill in the stand and the tillers are next season's yield potential.



AC Saltlander produces aggressively spreading rhizomes allowing the stand to thicken and remain productive.

- AC SALTLANDER demonstrates salinity tolerance equal to tall wheatgrass, better than intermediate wheatgrass and exceeds NewHy RS Wheatgrass in performance.
- AC SALTLANDER is a long-lived perennial grass that is adapted to semi-arid rangeland with 13" of precipitation or more, with drought tolerance similar to intermediate wheatgrass.
- AC SALTLANDER's extensive root system allows it to be a useful tool for farmers and ranchers in dewatering saline seep discharge areas.
- AC SALTLANDER can be a useful tool for farmers and ranchers in controlling problem weeds such as foxtail barley, on saline soils.
- AC SALTLANDER is palatable and has a low growth point which allows for flexible grazing and hay management.
- AC SALTLANDER has increased grazing tolerance and persistence on range sites and in pasture. If properly managed, it produces comparable quality yield of forage as brome and orchard grass in non-saline conditions. Beef cattle weight gains have been reported in the range of 2 plus pounds per day.

- Salt tolerant alfalfa varieties can be sown with Saltlander at the rate of 2-3 pounds per acre. The legume contributes nitrogen credits for the grass and to forage quality. However, the alfalfa will eventually be choked out.

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