Big Horn Basin Irrigation
Water Management Program

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GROWERS GUIDE

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BASIC CROP INFORMATION

Crops are like any other living thing, they need nutrients and water during the growing season to survive. Nutrients are furnished in several different ways: fertilizing or leaving the previous years stubble on the field for a mulch type nutrient.

Water is provided by precipitation and/or irrigation. Timely application and the consumptive use amount are important for the vitality of the crop.

The major concerns for management of irrigated cropland are the maintenance of soil structure, fertility and erosion control. Maintaining soil structure is necessary for good soil tilth, a desirable water intake rate, and adequate soil aeration. Organic matter promotes good soil structure.

Each seed species must absorb a fairly definite proportion of water before germination will start. The amount depends on the structure, size, and composition of the seed. The minimum seed moisture content as a percentage of dry weight required for germination is about 30 percent for most crops, but up to 50 percent for some. Some crops, such as corn, are less sensitive to high soil -water content and can germinate at levels just under saturation.

Each crop has a Critical Stress period that can be detrimental to crop yields. Generally this period is associated with some stage of growth. Water stress signs in most crops would be darkening color, curling leaves, and wilting.

Different crops use varying amounts of water during the growing season. Some crops send roots deep into the ground, searching for water while others have a shallow rooting system. Effective irrigation water management requires that you know something about the crops you are irrigating.

Plant root systems provide the linkage between the soil, water and nutrients and the aboveground parts of plants. Two general types of root systems are recognized: fibrous roots and taproots. Cereal grains and other grasses have fibrous root systems. Other crops have taproot systems. Both systems require proper irrigation management to develop to their potential.

SALINITY TOLERANT CROPS

Salinity Limit and Ranges that Crops can be Expected to Establish in Saline-Alkaline Soils

FIELD CROPS	
Barley	0 to 16
Sugar Beets	0 to 12
Wheat	0 to 8
Oats	0 to 8
Corn	0 to 6

FORAGES (WET)*	
Beardless Wildrye	0 to 26
Tall Wheatgrass	0 to 26
Slender Wheatgrass	0 to 22
Tall Fescue	0 to 18
Western Wheatgrass	0 to 16
Strawberry Clover	0 to 16
Creeping Foxtail	0 to 12
Meadow brome	0 to 10
Cicer milkvetch	0 to 10
Orchardgrass	0 to 8

FORAGES (DRY)*	
Russian Wildrye	0 to 24
Tall Wheatgrass	0 to 24
Altai Wildrye	0 to 22
Slender Wheatgrass	0 to 22
Crested Wheatgrass	0 to 16
Pubescent Wheatgrass	0 to 12
Intermediate Wheatgrass	0 to 12
Smooth Brome	0 to 10
Sweetclover	0 to 10
Birdsfoot trefoil	0 to 10
Alfalfa	0 to 8

SALINITY LEVELS

Low Salinity	*0 to 4*
Medium Salinity	*4 to 8*
High Salinity	*8 to 16*
Extreme Salinity	*16 to 28*

*** Wet areas are irrigated or have a water table at or within 3 feet of soil surface.**
***Dry areas have a water table deeper than 3 feet below the surface with 12" - 18" annual precipitation.**

Although salinity affects plants in many ways, visible symptoms, such as leaf burn or necrosis, seldom occur. During germination some plants don't germinate and some die shortly after. Salinity causes crop reduction with fewer and smaller leaves and thickening of leaf cuticles.

There are some salinity management alternatives that can be considered. They include more frequent irrigations, other crop selection, seed bed preparation and placement, changing water supply, subsurface drainage, nutrient and water management, tillage management, and improving water application distribution uniformity.

SALINITY-ALKALINE SOILS

Saline seeps and their associated saline-alkaline soils are increasing throughout the state of Wyoming. Crop yield reductions can result from plant stress caused by the salt concentration, toxicity and nutrient imbalances. As soil salinity increases, the cropland is no longer productive, supporting only salt-tolerant weeds. Planting salt-tolerant plant materials will help in the reclamation process, competing with weeds, utilizing excess soil moisture, and stabilizing the soil surface against wind and water erosion.

Salts contained in irrigation water accumulate in irrigated soils and may change the soil properties. It is sometimes necessary to over irrigate (leach) periodically to manage, reduce, or remove soluble salts from soil in the root zone area. The physical properties, as infiltration, of some sodiac soils can be improved by adding chemicals or soil amendments. Calcium sulfate, gypsum, is a comparatively economical and often used amendment to improve infiltration and aeration in order to enhance root development and plant growth.

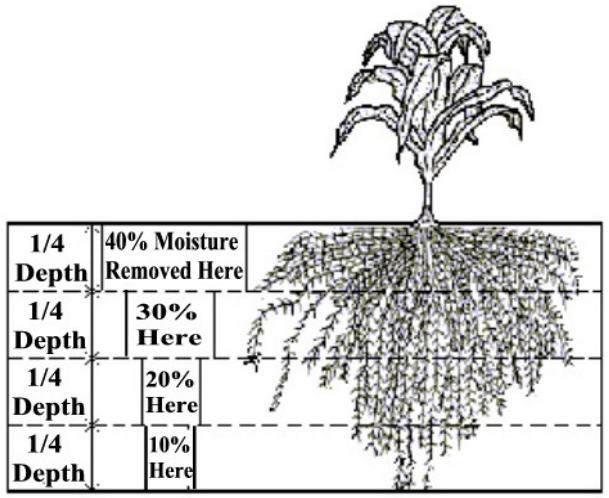
The irrigation method also has an influence on the way salts accumulate in the crop root zone. If the field is uniformly irrigated, has adequate leaching downward and has a good soil infiltration rate, you can use just about any type of irrigation method. With sprinkler system irrigation methods, the sprinklers can cause leaf burn when salts concentrate excessively on the surface of leaves. Sub irrigation or subsurface-trickle irrigation systems do not provide a means of leaching and can cause excessive salt accumulations with the use of poor quality water.

The list on the following page shows the most salt-tolerant forage species and field crops that are commercially available. It is impractical to recommend a universal mixture because of all the variables. Weed competition and heavy trash are the biggest obstacles in seeding and establishing plant materials on saline sites.

Seeding should be done in late fall or during a snow-free period in winter when the site is traversable. The seed should be in the ground, ready to utilize early spring precipitation (which dilutes surface salts), increasing the probability of germination and establishment. Planting depths should be between ¼ and ½ inch, seeded into a firm seedbed. Recommended seeding rates are twice that recommended for non-saline soils.

CROP WATER REQUIREMENTS

AVERAGE MOISTURE REMOVAL PATTERN OF MOST PLANTS



Root development tends to be dense near the soil surface, and most water is therefore taken up there, as illustrated in the above figure. About 70 percent of the crop's water requirement taken from the upper half of the root zone. The crop root depth changes in the early part of the growing season for annual crops.

TYPICAL PEAK WATER USE PERIODS

CROP	Peak Water Use Period (days)
Alfalfa	100—165 (depending on location)
Corn	45
Grass	155—200 (depending on location)
Wheat	30
Potatoes	45
Barley	30
Sugar Beets	65
Sorghum	45
Beans	50

GROWING SEASONS

Average growing seasons for Forages and Lawn Grass

Station	Season	#Days
Basin	3/27—10/16	204
Lovell	4/02—10/15	197
Ten Sleep	3/27—10/14	202
Thermopolis	3/28—10/11	198
Worland	4/02—10/15	196

These are the only stations in the Big Horn Basin that the UW Water Research Center keeps track of.

Average Planting and Harvest Dates

Crop	Planting Date	Harvest Date
Spring Grains*	April 28	August 14
Winter Wheat	September 7	August 1
Corn Silage	May 15	September 20
Corn Grain	May 15	November 1
Beans	June 1	September 15
Sugar beets	April 24	October 15
Alfalfa:		
1st Cutting:		June 15
2nd Cutting:		July 31
3rd Cutting:		Sept 20
Grass Hay:		
Usually 1 Cutting		July 25

Note: The dates shown above are statewide averages.
*Spring Grains include spring wheat, barley, & oats.

SEEDING DATES

Irrigated Pasture and Hayland Seeding dates for the Big Horn Basin area is from October 26th to August 9th. Dry land seeding dates depend on the Precipitation Zone:

PRECIPITATION	SEEDING DATE
5” to 9”	10/15 to 4/15
10” to 14”	10/1 to 5/15
15” to 19”	Anytime except 8/20 to 9/20

DROUGHT TOLERANT CROPS

To create a list of drought tolerant crops is very difficult. The crop may vary in its reaction to drought in many ways including the variety within a crop category, time of year the drought occurs and the stage of growth when the drought hits. A general consensus of drought tolerant crops listed from best to worst is:

1. Fall Rye, Spring Rye, Sunflower, Safflower
2. Winter Triticale, Spring Triticale
3. Hard Red Spring Wheat, Durum Wheat
4. Peas
5. Barley 2-row
6. Barley 6-row, Prairie Spring Wheat, Rapa-Napus Canola
7. Extra Strong Wheat
8. Oats
9. Soft White Spring Wheat

Tips to Remember:

- If irrigation water is less than normal, concentrate it on your best -producing hay meadows. Graze the rest, but rotate pastures frequently
- The Ability of perennial plants to recover after drought is closely related to their vigor before and during the drought.
- Nitrates can accumulate in crops during drought, and especially in the “green-up” following a rain. Nitrate toxicity and aflatoxins may be a problem in drought years.

Drought-stressed crops may often be salvaged for livestock feed, but testing for nutritional value and harmful substances is extremely important.

REDUCING THE RISK OF DROUGHT STRESS:

Early planting. By planting early, you increase the chance of having pollination completed before the driest part of the season.

Adequate weed control. Weeds compete with crop plants for water, so controlling weeds will provide more water for the crop.

Residue management. By maintaining a cover of residue through conservation tillage or no-till, you can reduce the amount of evaporation from the soil surface and conserve water for the crop's use.