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G96-1362 Soil Temperatures and Spring Planting Dates

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Soil Temperatures and Spring Planting Dates

Dates on which soil temperatures reach a threshold value are presented as a spring planting guide for agronomic and horticultural producers.

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For a seed to germinate it must have good contact with the soil and be placed in a favorable soil environment. A good soil environment is one that has suitable soil temperature, adequate soil moisture, good aeration, and for certain seeds, light. Conditions necessary for germination depend on the species and variety of seed being planted. Alone, none of these factors guarantee germination; rather it is the interaction of these factors that affects seed germination.

In Nebraska, soil moisture is usually adequate at planting; good aeration is normally achieved through normal tillage; and few of the state's agronomic and horticultural crops require light for germination. When it comes to germination of spring-planted crops, soil temperature becomes an important factor since it affects both the capacity for and rate of germination.

Table I lists the recommended minimum soil temperatures at which selected agronomic and horticultural crops will germinate. Various sources will list different germination temperatures; therefore the temperatures specified in *Table I* are not intended to be definitive but rather a guide for planting.

Table I. Minimum soil temperatures (°F) needed for germination of selected spring-planted agronomic and horticultural crops.				
Agronomic Crop	*Minimum Soil Temperature at Planting (°F)*		*Horticultural Crop*	*Minimum Soil Temperature Planting (°F)*
Spring Wheat	37		Spinach	38
Barley	40		Radish	40
Rye	41		Lettuce	41
Oats	43		Onion	41
Alfalfa	45		Pea	42
Canola	50		Potato	45
Sugar Beet	50		Cabbage (*)	45
Field Corn	55		Carrot	46
Soybean	59		Sweet Corn	55
Sunflower	60		Pepper (*)	57
Millet	60		Snap Beans	57
Sorghum	65		Tomato (*)	57
Dry Bean	70		Cucumber	58
			Pumpkin	60
(*) Temperature at which seedling can be transplanted				

The dates on which soil temperatures average 40°F, 45°F, 50°F, 55°F 60°F, 65°F, and 70°F throughout the state (*Figures 1-7*) were determined using 10 years of data (1987-1996) from 22 weather stations in the High Plains Climate Center's Automated Weather Data Network.

The dates on which soil temperatures average a specific temperature in different regions of the state, and which agronomic and horticultural crops can then be planted are discussed below:

NOTE: To provide the best image possible, the soil temperature maps (*Figures 1-7*) are provided as links. Click on the figure references to view the maps.

40°F Soil Temperature (*Figure 1*): A soil temperature of 40°F will allow germination of spring wheat and barley as well as spinach and radish. Soils in southwest Nebraska will normally warm to 40°F around mid-March, while soils in the Sandhills will typically reach 40°F by the third week of March. In the northeastern part of the state, soils will typically warm to 40°F by the end of the first week of April.

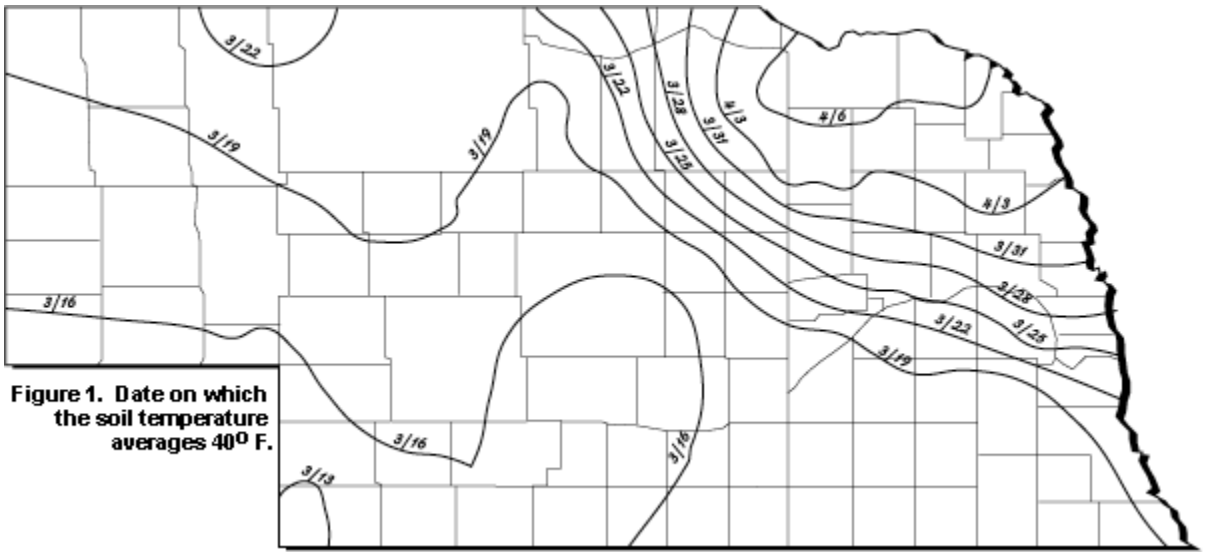

Figure 1. Date on which the soil temperature averages 40° F.

45°F Soil Temperature (*Figure 2*): Alfalfa, oats and rye will germinate at a soil temperature of 45°F, as will potato, pea, onion and lettuce. In addition, cabbage seedlings can be transplanted when soils reach 45°F. Dates on which Nebraska soils normally reach 45°F fall into a south-to-north gradient, with soils in the south attaining 45°F during the last week of March, central Nebraska soils typically reaching that temperature by the end of the first week of April, and northern Nebraska by mid-April.

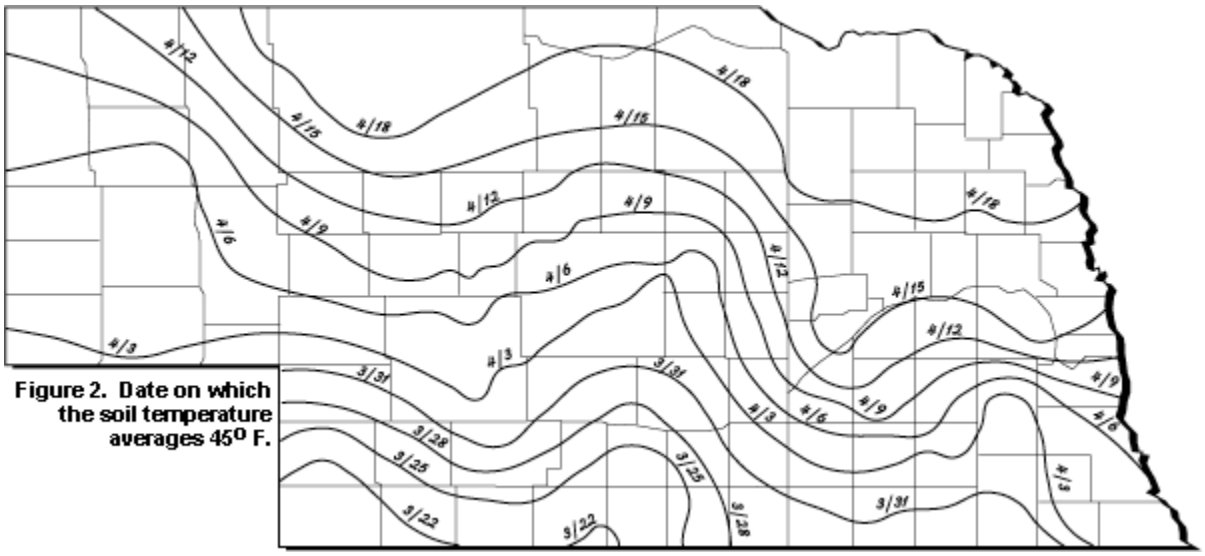

Figure 2. Date on which the soil temperature averages 45° F.

50°F Soil Temperature (*Figure 3*): At a soil temperature of 50°F, sugar beet, canola and carrot will germinate. Typically, soils in the southern half of Nebraska will reach 50°F by April 21. Soils in north central Nebraska and northeast Nebraska will normally warm to 50°F by the beginning of May.

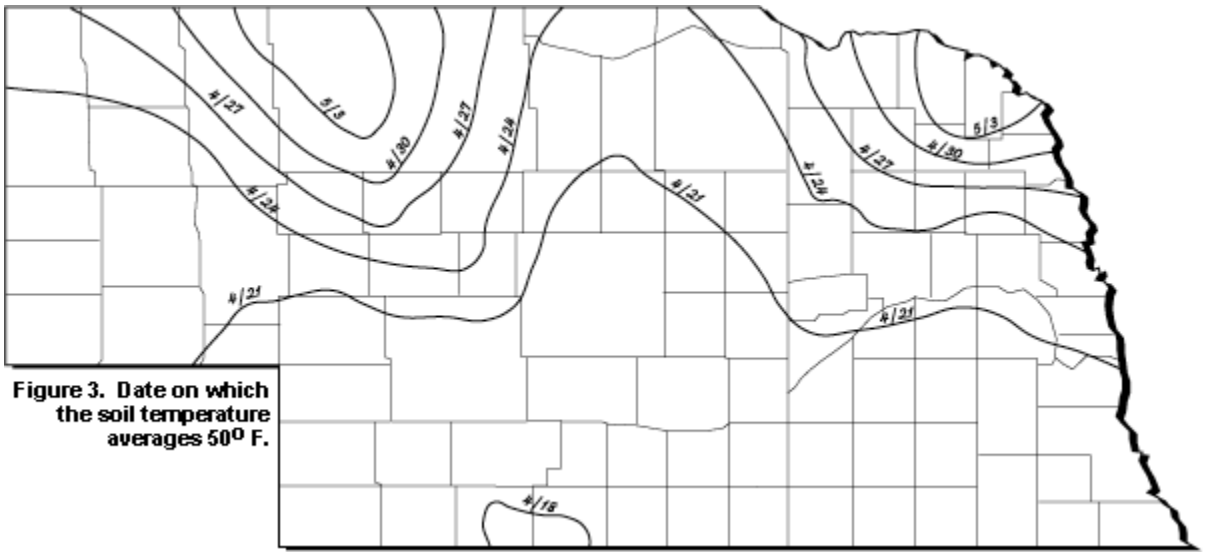

Figure 3. Date on which the soil temperature averages 50° F.

55°F Soil Temperature (*Figure 4*): When soils reach 55°F, both field corn and sweet corn will germinate. Soils in southwestern and southeastern Nebraska will typically reach 55°F around the beginning of May, while soils in the Panhandle and central Nebraska will generally warm to that temperature by the end of the first week of May. Northeastern Nebraska soils will typically reach 55°F around May 10.

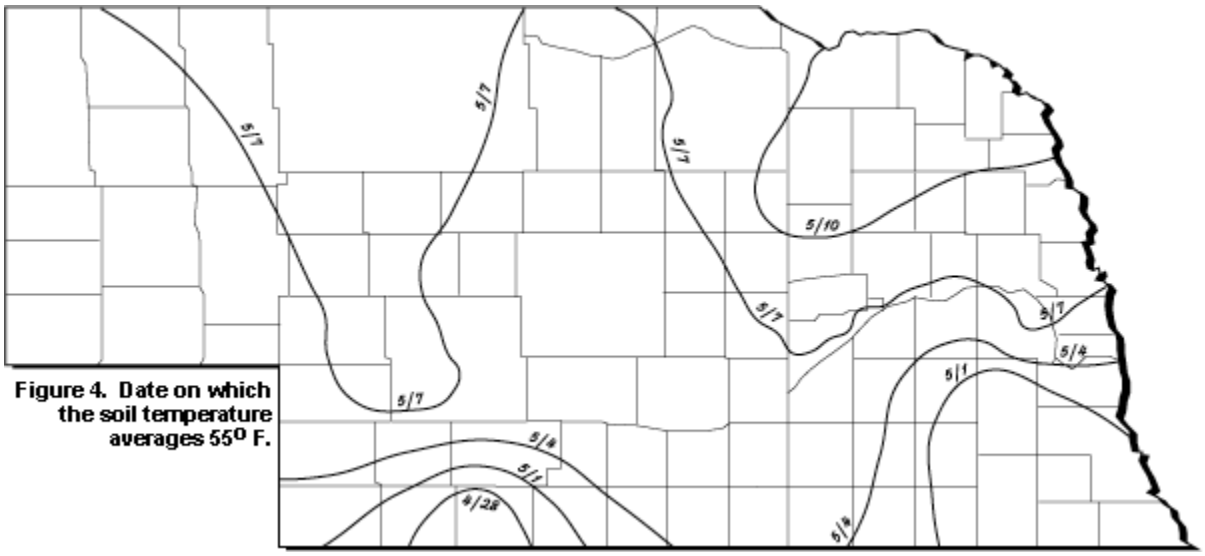

Figure 4. Date on which the soil temperature averages 55° F.

60°F Soil Temperature (*Figure 5*): When soil temperatures reach 60°F, soybean, sunflower and millet will germinate, as will pumpkin, cucumber, watermelon and snap beans. In addition, tomato and pepper seedlings can be transplanted when soils reach this temperature. The bulk of Nebraska's soils will reach 60°F in mid-May. Southwestern Nebraska soils will usually warm to 60°F by May 11, while northeastern Nebraska soils will typically reach that temperature by May 17.

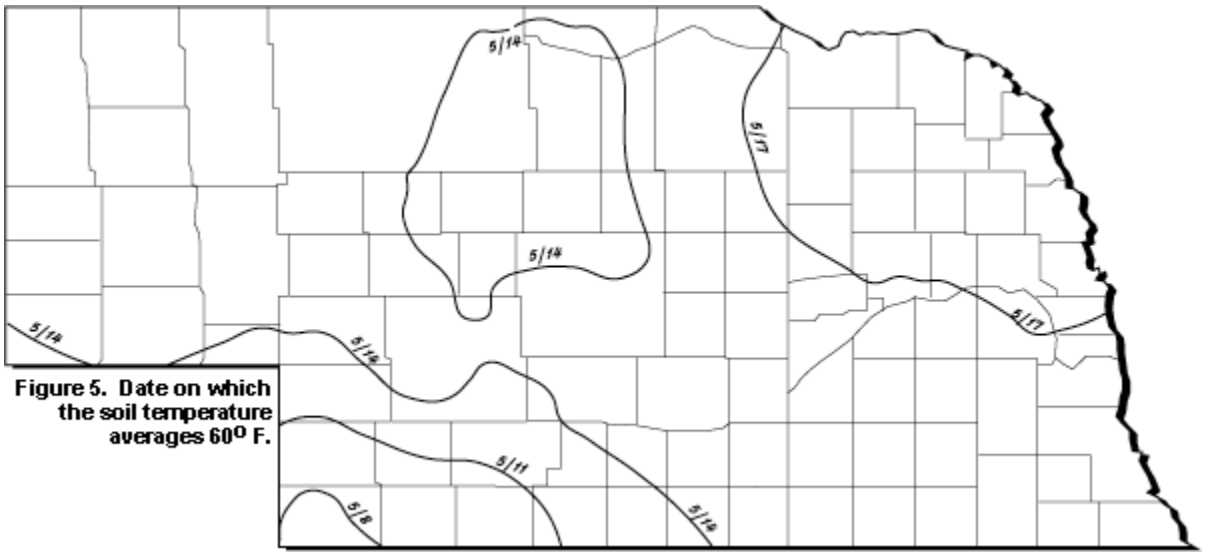

Figure 5. Date on which the soil temperature averages 60° F.

65°F Soil Temperature (*Figure 6*): A soil temperature of 65°F is needed for sorghum germination. Again, we find a south-to-north gradient of dates in which soils reach 65°F. Typically, southern Nebraska soils will reach 65°F by May 21. Soils in the Panhandle and northeast will reach 65°F at the beginning of June, while north central soils usually attain that temperature by June 8.

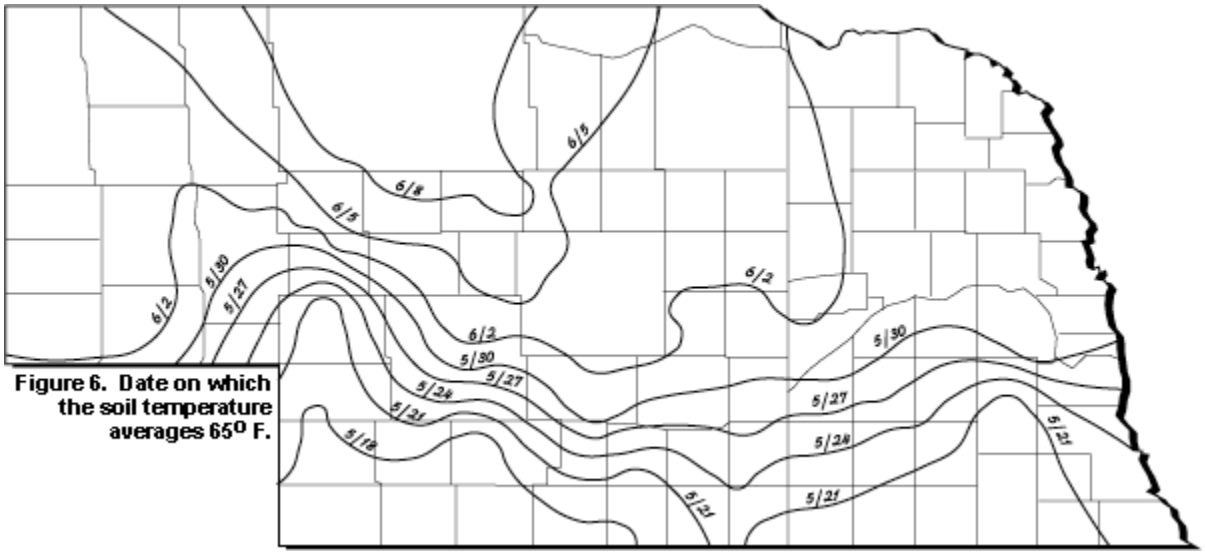

Figure 6. Date on which the soil temperature averages 65° F.

70°F Soil Temperature (*Figure 7*): Dry beans require a soil temperature of 70°F for germination. For most of Nebraska, 70°F is reached between June 11 and June 14. In the Panhandle, where most of the state's dry beans are grown, 70°F is typically reached near mid-June.

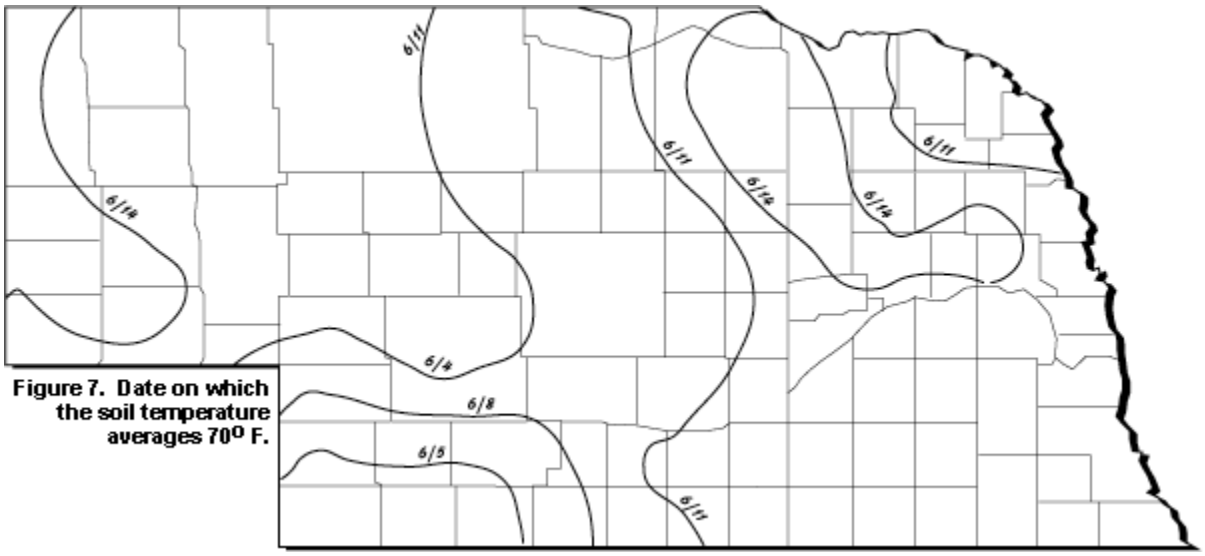

Figure 7. Date on which the soil temperature averages 70° F.

Actual dates on which soil temperatures reach these threshold temperatures will vary. Much of this variation is due to:

- Soil type. The sands and loams in western Nebraska generally warm much more quickly than the clay soils in northeastern Nebraska
- Soil water content. Those soils that have the capacity to hold more water (a function of soil type) will not warm as quickly; and
- Spring snow cover. When spring blizzards occur, much of the sun's energy that would go into warming the soil is used to melt snow cover.

Finally, it should be emphasized that the soil temperatures illustrated in *Figures 1-7* are measured at a depth of 4 inches under bare, undisturbed soil. Although beneficial from the standpoint of aerating the soil, tillage operations at, or immediately prior to planting can reduce soil temperatures in the planting zone by 5°F. During spring, soil temperatures in a one-foot profile can vary more than 10°F and tillage will bring colder soil from deeper in the profile to the surface. Thus, producers who till the soil prior to planting should take this into consideration as they are planting their crop.

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