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NEBRASKA

# Lawn Care

EXTENSION WORK IN "AGRICULTURE, HOME ECONOMICS AND SUBJECTS RELATING THERETO,"
THE COOPERATIVE EXTENSION SERVICE, INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES,
UNIVERSITY OF NEBRASKA-LINCOLN, COOPERATING WITH THE COUNTIES AND THE U.S. DEPARTMENT OF AGRICULTURE
LEO E. LUCAS, DIRECTOR

# NEBRASKA
# Lawn Care

R. C. Shearman, Extension Horticulturist (Turf)

The lawn is an important part of home landscaping. It contributes significantly to the beauty of the home, to its environment, and to its economic value.

A lawn can be a show-place, requiring considerable time, effort, and expense in maintenance. For the enthusiast lawn care can be a hobby, while the less enthusiastic view it as an essential chore. In either case, the lawn serves some essential functions around the home, including prevention of soil erosion, stabilization of mud and dust, elimination of visual pollution; and reduced heat, noise, and glare. A quality lawn also provides an attractive setting for business, institutional, and industrial buildings.

This circular is designed to help the person who prefers a lawn with minimal expense and upkeep, as well as the enthusiast who wishes to spend considerable time and effort in lawn maintenance. Table 1 lists turfgrass species used in Nebraska lawns and some aspects concerning their adaptation and culture.

Not all lawns need the same intensity of culture. The degree of culture required depends upon the turfgrass species or cultivars, quality of lawn desired, and time, effort, and money available for maintenance. A satisfactory lawn can be maintained by following these cultural practices:

1. Select turfgrass species or cultivars adapted to the site and suitable for the intended use of the turf (see Table 1).

2. Insure proper soil establishment conditions, including adequate surface and subsurface drainage.

3. Establish the turf using proper techniques.

4. Mow properly, using right mowing height, frequency, and equipment.

5. Fertilize properly to meet nutritional requirements of the turf.

6. Water the lawn to prevent drought stress.

Additional turfgrass cultural practices, such as weed, disease, and insect control, should be used when needed. Dethatching may be necessary when thatch accumulates, and soil should be cultivated with a coring device to relieve compaction and improve aeration.

## MOWING

Mowing height and frequency are important aspects in maintaining a quality turf. Proper selection, maintenance, and operation of mowing equipment are also essential practices.

### Mowing Height

Adjust mowing heights to suit the turfgrass species (see Table 2 for recommended mowing heights). Ranges in mowing heights account for variations in climatic factors, intensity of culture, intended use, and the quality of turf desired.

Place the mower on a hard, level surface and adjust the cutting edge (bedknife on a reel mower or blade edge on a rotary mower) to the desired height above the level surface. This is called the bench setting or bench height of cut. The effective height of cut will be the actual height that the grass is cut above the soil surface. Generally, this is slightly shorter than the bench height due to the mower settling into the turfgrass stand.

Raise mowing heights of cool season grasses such as Kentucky bluegrass and fine fescue during the summer months when turfs are exposed to high temperature stress. This will maintain more vegetation to insulate the crown or growing point of the turfgrass plant from high temperatures. For example, mowing at three inches (7.5 cm) as opposed to one inch (2.5 cm) during periods of high temperature stress can result in soil temperature reductions as great as 15 to 20$^{o}$F below that of the

**TABLE 1. CHART OF PRINCIPLE TURFGRASSES USED IN NEBRASKA LAWNS.**

| | ADAPTATION | | | | | | |
|---|---|---|---|---|---|---|---|
| *Turfgrass species* | *State wide* | *Soil* | *High temperature tolerance* | *Cold temperature tolerance* | *Drought tolerance* | *Shade tolerance* | *Wear tolerance* |
| Kentucky bluegrass | yes | well-drained soil, pH from 6.0 to 7.0 | fair | good | medium | poor | medium |
| Tall fescue | yes | wide range of soil, pH from 4.7 to 8.5 | good | poor | excellent | good | good |
| Perennial ryegrass | yes | medium to high fertility soil, pH from 6.5 to 7.0 | poor | very poor | fair | fair | good |
| Creeping red fescue | yes | dry-sandy, infertile soil, pH from 5.5 to 6.5 | fair | medium | good | excellent | poor |
| Chewings fescue | yes | sandy, infertile soil, pH from 5.5 to 6.5 | fair | medium | good | excellent | poor |
| Hard fescue | yes | sandy, infertile soil, pH from 5.5 to 6.5 | fair | medium | good | good | poor |
| Sheep fescue | yes | sandy, infertile soil, pH from 5.5 to 6.5 | fair | medium | good | fair | poor |
| Bentgrass | not recommended | fertile, fine textured soil, pH from 5.5 to 6.5 | fair | good | poor | good | fair |
| Zoysiagrass | South of Platte River | well-drained, fertile soil, pH from 6.0 to 7.0 | excellent | medium | excellent | good | excellent |
| Bermudagrass | Southeast only | well-drained, fertile soil, pH from 5.5 to 7.5 | excellent | very poor | excellent | poor | excellent |
| Buffalograss | yes | fine-texture soil, tolerates alkaline conditions | excellent | medium | excellent | very poor | fair |
| Blue grama | yes | wide range, sandy soil, tolerates alkaline conditions | excellent | good | excellent | poor | fair |
| Sideoats grama | yes | wide range, infertile soil | excellent | medium | good | poor | fair |

| | | | | CULTURAL PRACTICES | | | | |
|---|---|---|---|---|---|---|---|---|
| *Turfgrass species* | *Texture* | *Color* | *Nitrogen requirement* | *Preferred mowing height* | *Irrigation requirement* | *Disease problems* | *Insect problems* | *COMMENTS* |
| Kentucky bluegrass | medium | medium to dark green | medium to high | 1.5 to 2.5 | yes | some | some | Use a blend of three or more improved cultivars. |
| Tall fescue | coarse | light green | low to medium | 1.75 to 3.5 | seldom | seldom | seldom | Good low maintenance turfgrass. Direct low temperature kill is a problem. Do not plant in mixtures. |
| Perennial ryegrass | medium | medium to dark green | medium to high | 1.5 to 2.5 | yes | some | some | Some improved cultivars are available with improved mowing quality and improved high and low temperature tolerance. |
| Creeping red fescue | fine | medium to dark green | low | 1.0 to 2.5 | some | some | seldom | Mixes well with Kentucky bluegrass, should be included in mixes where shade is a problem. |
| Chewings fescue | fine | medium to dark green | low | 1.0 to 2.5 | some | some | seldom | Rapid establishment on sandy areas, bunch-type grass, shade tolerant. |
| Hard fescue | fine | light to dark green | low | 1.25 to 2.5 | some | some | seldom | Somewhat better disease resistance than creeping red fescue. Mixes well with Kentucky bluegrass. |
| Sheep fescue | fine | blue-green | low | 1.25 to 2.5 | no | some | seldom | Old stands become very tufted and bunch-like. |
| Bentgrass | fine | light to dark green | high | 0.2 to 0.5 | yes | severe | some | Very disease susceptible, for use on golf courses and bowling greens only. |
| Zoysiagrass | medium | medium to dark green | low to medium | 0.5 to 1.0 | seldom | seldom | seldom | Slow to establish but forms a dense, weed resistant turf. |
| Bermudagrass | medium to fine | light to dark green | medium to high | 0.5 to 1.0 | some | seldom | seldom | Common types most likely to persist in this region, but not recommended for widespread use. Midiron is an improved cultivar performing satisfactorily in S.E. portion of the state. |
| Buffalograss | medium | gray-green | low | 0.5 to 2.0 | no | seldom | seldom | Good low maintenance turfgrass, somewhat susceptible to phenoxy herbicide injury. |
| Blue grama | medium | gray-green | low | 1.5 to 3.0 | no | seldom | seldom | Mixes well with buffalograss. Not recommended in monostands. |
| Sideoats grama | medium | light green gray green | low | 2.0 to 3.5 | no | seldom | seldom | Mixes well with buffalograss and bluegrama. Not recommended in monostand. |

**Table 2. Recommended mowing heights for turfgrasses grown in Nebraska lawns.**

| | *Seasonal Mowing Heights in inches (cm)*[a/] | | |
|---|---|---|---|
| *Turfgrass* | *Spring* | *Summer* | *Fall* |
| Kentucky bluegrass | 1.5 (3.8) - 2.0 (5.0) | 2.0 (5.0) - 3.5 (8.8) | 1.5 (3.8) - 2.0 (5.0) |
| Perennial ryegrass | 1.5 (3.8) - 2.0 (5.0) | 2.5 (6.3) - 3.5 (8.8) | 1.5 (3.8) - 2.0 (5.0) |
| Tall fescue | 2.0 (5.0) - 3.5 (8.8) | 3.0 (7.5) - 4.0 (10.0) | 2.5 (6.3) - 3.5 (8.8) |
| Creeping red fescue | 1.0 (2.5) - 2.0 (5.0) | 1.5 (3.8) - 2.5 (6.3) | 1.0 (2.5) - 2.0 (5.0) |
| Chewings fescue | 1.0 (2.5) - 2.0 (5.0) | 1.5 (3.8) - 2.5 (6.3) | 1.0 (2.5) - 2.0 (5.0) |
| Hard fescue | 1.3 (3.3) - 2.5 (6.3) | 2.0 (5.0) - 3.0 (7.5) | 1.3 (3.3) - 2.5 (6.3) |
| Sheep fescue | 1.3 (3.3) - 2.5 (6.3) | 2.0 (5.0) - 3.0 (7.5 | 1.3 (3.3) - 2.5 (6.3) |
| Zoysiagrass | 0.8 (2.0) - 1.5 (3.8) | 0.8 (2.0) - 1.0 (2.5) | 0.8 (2.0) - 1.0 (2.5) |
| Buffalograss | 0.8 (2.0) - 2.0 (5.0) | 0.8 (2.0) - 2.0 (5.0) | 0.8 (2.0) - 2.0 (5.0) |
| Blue grama | 1.5 (3.8) - 3.0 (7.5) | 1.5 (3.8) - 3.0 (7.5) | 1.5 (3.8) - 3.0 (7.5) |
| Sideoats grama | 3.0 (7.5) - 4.0 (10.0) | 3.0 (7.5) - 4.0 (10.0) | 3.0 (7.5) - 4.0 (10.0) |

[a/] *Mowing heights are indicated as ranged based on climatic factors, intensity of culture, intended use, and quality of turf desired.*

[b/] *Summer mowing heights should be used when turfgrasses are grown in shaded conditions. Buffalograss, blue grama, and sideoats grama are not recommended for shaded areas.*

surrounding air. Generally, it is not necessary to raise the height of cut on warm season species such as zoysiagrass and buffalograss. Lower mowing heights in the fall. This should be done over the course of two or three mowings to avoid scalping the turf. Raise mowing heights when turfs are grown in the shade. Higher mowing heights allow the plant to retain more leaf surface area to catch the limited light energy in these areas.

## Mowing Frequency

Mowing frequency is dictated by turfgrass growth rate. Growth rates vary with species, season, intensity of culture, and intended use. Lawns grow rapidly during periods of adequate soil moisture, favorable growing temperatures, and adequate nitrogen nutrition. Lower mowing heights require more frequent mowing. Cool season turfgrasses, such as Kentucky bluegrass, need more frequent mowing in spring and fall than in the warm summer months. A mowing interval of five to eight days is common for normal growing conditions. During periods of high temperature stress this interval might be stretched to 10 to 14 days.

As a general rule, remove no more than 30 to 40% of the leaf area with any one mowing (Figure 1). For example, a Kentucky bluegrass lawn mowed at 2.0 inches (5.0 cm), should be cut before the leaf height exceeds 3.0 (7.5 cm) to 3.5 (8.8 cm) inches. Removing more than 30 to 40% of the top growth at one time shocks the turfgrass plant and causes it to lose roots. Removal of 60 to 80% of the leaf area with any one mowing results in root growth stoppage, reduction of the root system, and an overall weakened turf that is more susceptible to weed and disease problems.

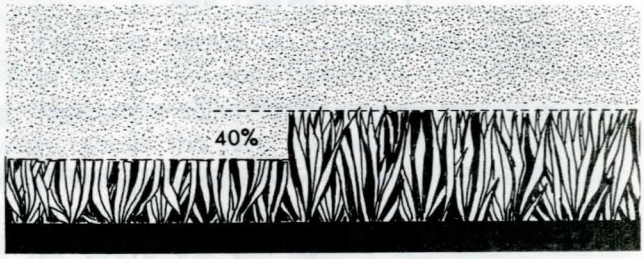


**Figure 1. Do not remove more than 30-40% of the leaf area with any mowing.**

If the lawn is growing more rapidly than it can be mowed, or if it has not been mowed during a vacation period, lower the height of cut in increments rather than trying to remove all growth at one time. Use height increments of 0.75 (1.9 cm) to 1.0 inch (2.5 cm) and a two to three day rest period between mowings until the desired cutting is obtained.

### Clippings

Clippings need not be removed from the lawn if proper mowing frequency is maintained. Short-leaf blade clippings filter down into the canopy and decay rapidly. They do not contribute significantly to thatch accumulation. In fact, by returning clippings to the lawn, nutrients such as nitrogen, phosphorus, and potassium can be recycled. Turfgrass clippings contain 2 to 6 percent nitrogen on a dry weight basis. If clippings are returned, nitrogen requirements for the lawn may be reduced 20 to 40%.

Remove clippings if an excessive amount accumulates due to infrequent mowing. Excess clipping debris can keep out light and enhance disease development. These clippings can be used for compost or air-dried and used as a mulch for trees, shrubs, gardens, or flower beds.

### Mowing Equipment

Keep mower blades sharp and properly adjusted. Continuous mowing with a dull blade results in weakened turf with reduced quality. A dull blade mutilates leaf blades, increasing disease susceptibility and water loss.

There are two types of mowers commonly used on lawns (reel and rotary). Reel-type mowers cut with a scissor-like action. The reel brings the leaf blades to the cutting edge (bed knife). Rotary mowers cut with a flailing action as a high-speed blade rotates in a horizontal plain. Rotary mowers are generally less expensive but less durable than reel-type mowers. The reel-type mower supplies the better mowing quality. The rotary mower is more effective cutting tall grass or grass with seedheads. No matter which kind of mower is used, the best quality of cut can only be obtained with a properly adjusted and sharpened mower.

### Mower Operations and Mowing Patterns

Safe mower operation is critical. Wear heavy shoes when mowing. Do not go barefoot. Do not permit anyone to stand or walk near the outlet of a rotary mower. Walk across the lawn and remove all debris such as sticks, stones, wire, and bones that might become projectiles if struck by the rotary mower blade.

Adjusting mowing patterns and mower operations are important in maintaining good turf. Vary mowing patterns to distribute the traffic wear uniformly over the lawn surface. This is especially important where riding mowers are used. A side-by-side pattern (Figure 2) can be used, particularly if turns are made on sidewalks or driveways rather than on the lawn. Circular patterns may be used to avoid making sharp, spinning turns on the lawn surface.

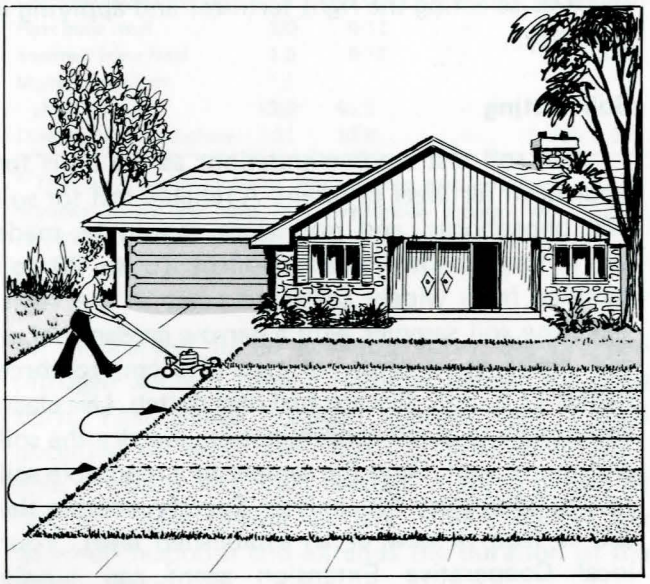

**Figure 2. Make turns on driveways or sidewalks to minimize wear injury. Avoid sharp, rapid, spinning turns that cause excessive crushing and tearing injury to the turf.**

Operate your mower according to the manufacturer's specifications. Excessive speed may cause mower bounce and result in an uneven or washboard cutting effect. Rapid turns, especially with riding mowers, cause injury to the turf. Make turns in a gradual sweeping manner rather than in a rapid spinning motion. Mow across slopes rather than up and down them. Steep slopes are difficult to maintain and should be avoided where possible. If a steep slope must be maintained, ground covers that do not require frequent mowing should be used.

Avoid mowing during wet periods. Wet clippings tend to mat together and leave unsightly debris on the lawn. In addition, soil compaction and disease spread are greater during wet conditions. Avoid mowing during high temperature periods. For your health and the health of the grass, mow in the morning or evening when temperatures are cooler.

## FERTILIZING

An adequate nutritional program is important for an attractive, healthy lawn. A well fertilized lawn is better able to resist weed, disease, and insect problems; and withstand heat, cold, drought and wear stress than a poorly fertilized lawn. It will also recuperate more readily from disease and insect injury. A proper lawn nutritional program involves selecting the right fertilizer and applying it properly.

### Soil Testing

Use soil test recommendations as the basis for your lawn fertilizer program. A reliable test for soil pH, phosphorus, and potassium should be made every four to five years. Collect 15 to 20 soil samples from widely scattered areas in the lawn. Take the soil samples with a narrow garden tool or soil probe to a depth of two (5.0 cm) to three inches (7.5 cm). Discard turf and thatch. Use clean equipment to avoid contamination. Air-dry the soil and mix it well. Send the sample to a reputable soil testing laboratory for analysis. Specify whether the soil is from a new or an established lawn. Your local Cooperative Extension agent can supply procedures for sampling and a soil sample box for mailing to the University of Nebraska Soil Testing Laboratory.

### Selecting a Fertilizer

Selecting the right fertilizer is important from the standpoint of supplying grass with proper types and quantities of nutrients. It is also economically important. Why pay for nutrients that are not needed or use a fertilizer that does not meet the needs of the grass? Soil test results will help in selecting the proper fertilizer.

Consider the following before selecting a fertilizer:

1. Soil test results.
2. Turfgrass species or cultivars.
3. Type of soil.
4. Intensity of culture.
5. Irrigation practices.
6. Clipping removal or return.
7. Type and cost of fertilizer.
8. Convenience of application.

It is important to know what is in the fertilizer bag. State laws dictate that each fertilizer bag must be labeled (Figure 3). Each fertilizer bag is labeled,

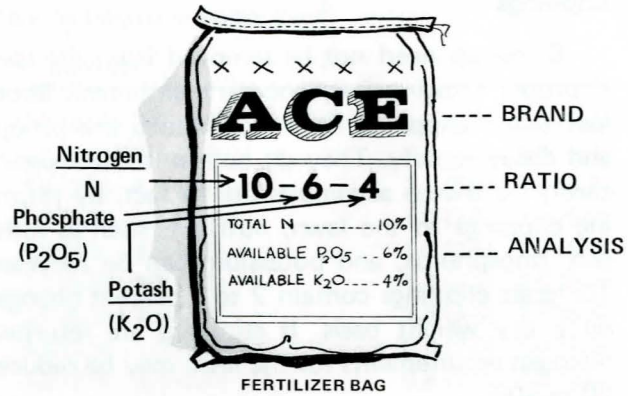


**Figure 3. Reading the fertilizer label.**

indicating the percentage of nitrogen (N), available phosphoric acid ($P_2O_5$), and water soluble potash ($K_2O$), respectively. Additional information such as the type of nitrogen (water-insoluble, urea, ammoniacal, etc.), other nutrients (iron, sulfur, micronutrients, etc.), and pesticides (fungicides, herbicides, and insecticides) may also be included.

Turfgrasses respond most to nitrogen, provided that adequate soil levels of the other nutrients are present. Most soil tests in Nebraska indicate adequate soil phosphorus and potassium levels. In such cases, applications of nitrogen alone may be sufficient. Annual nitrogen requirements for the turfgrass species grown in Nebraska are given in Table 3. A range for nitrogen recommendations is shown due to variations in climate, soils, and intensity of culture. Nitrogen recommendations are based on a six month growing season. Higher quality turfs can be obtained with the higher suggested nitrogen rates, but increased mowing, watering, and in certain cases, disease susceptibility may result.

Some nitrogen carriers available for lawn fertilizer programs in Nebraska are given in Table 4. As a general rule, apply no more than 1.0 to 1.5 lb actual nitrogen per 1,000 square feet (5 to 7.5 $g/m^2$) per application with fast-release nitrogen sources. Greater amounts can be applied with slow-release sources.

Slow-release nitrogen sources such as activated-sewage sludge, ureaformaldehyde, and processed tankage require microbial activity for their conversion to available forms for utilization by the turfgrass plant. This generally requires soil temper-

atures above 55°F. (12.7°C). Other slow-release nitrogen sources, such as IBDU, do not depend on soil temperature but require adequate soil moisture for hydrolysis to an available form. Slow-release nitrogen sources have a minimal danger for grass burn. Fast-release nitrogen sources have a high potential for grass burn. Many commercially available nitrogen fertilizers contain a combination of fast and slow release carriers. This enhances the green-up response and extends the duration of the green period.

When soil test results indicate that additional phosphorus and potassium are needed, thay can be supplied from carriers indicated in Tables 5 and 6. These deficiencies can also be corrected, using mixed fertilizers such as those listed in Table 7. Mixed fertilizers contain some nitrogen, phosphorus, and potassium and are often referred to as complete fertilizers. There are many types available. Mixed fertilizers with a 1:1:1 ratio (10-10-10 or 12-12-12) can be used when test results indicate low levels of phosphorus and potassium. When phosphorus and potassium are present at interme-

**Table 3. Annual nitrogen requirements for turfgrass species used in Nebraska lawns with clippings returned.**

| *Turfgrass species* | *Amount of N required each growing season* [a] | |
|---|---|---|
| | (lb/1000 ft$^2$) | (g/m$^2$) |
| Improved Kentucky bluegrass (i.e., Merion, Fylking, Pennstar, Baron, Victa, etc.) | 3 to 6 | 15-30 |
| Common Kentucky bluegrass (i.e., Park, Newport, Cougar, Delta, Kenblue, etc.) | 2 to 4 | 10-20 |
| Perennial ryegrass | 3 to 6 | 15-30 |
| Tall fescue | 1 to 4 | 5-20 |
| Fine-leaved fescues (i.e. Creeping red, Chewings, Hard, and Sheep fescues) | 1 to 3 | 5-15 |
| Zoysiagrass | 0 to 4 | 0-20 |
| Buffalograss | 0 to 2.5 | 0-12.5 |
| Blue grama | 0 to 2.5 | 0-12.5 |
| Sideoats grama | 0 to 2.5 | 0-12.5 |

[a] *Nitrogen recommendations are based on a six month growing season. A range for nitrogen is given because of variations in soil, climate, and cultural practices.*

**Table 4. Nitrogen carriers for turfgrass fertilization in Nebraska.**

| *Carrier* | *N* | *Percent* $P_2O_5$ | $K_2O$ | *Amount (lb) needed to apply 1 lb of N per per 1000 sq. ft. (g/m$^2$)* |
|---|---|---|---|---|
| *Fast Release:* | | | | |
| Ammonium nitrate | 33.0 | -- | -- | 3.0 (15.0) |
| Ammonium sulfate | 20.5 | -- | -- | 4.9 (24.5) |
| Urea | 45.0 | -- | -- | 2.2 (11.0) |
| *Slow Release:* | | | | |
| Activated sewage sludge (ex. Milorganite) | 4-7 | 4-6 | 0.4-0.7 | 16.7 (83.5) |
| IBDU (Par Ex) | 31.0 | -- | -- | 3.2 (16.0) |
| Processed tankage | 7-10 | 2.6 | 0.4-0.7 | 12.5 (62.5) |
| Ureaformaldehyde (UF) (ex. Nitroform, Ureaform, Vertanite, etc.) | 38.0 | -- | -- | 2.6 (13.0) |

[a] *This list is not all inclusive.*

**Table 5. Phosphorus carriers for turfgrass fertilization in Nebraska.**

| *Carrier* [a] | *N* | *Percent* $P_2O_5$ | $K_2O$ | *Amount (lb) needed to apply 1 lb $P_2O_5$ per 1000 sq ft (g/m$^2$)* |
|---|---|---|---|---|
| Superphosphate | -- | 16-22 | -- | 5.0 (25.0) |
| Treble superphosphate | -- | 44-52 | -- | 2.0 (10.0) |
| Calcium metaphosphate | -- | 62.0 | -- | 1.6 ( 8.0) |
| Raw bone meal | 5.0 | 6-11 | -- | 9.0 (45.0) |
| Steamed bone meal | 4.0 | 8-15 | -- | 6.7 (33.5) |
| Monoammonium phosphate | 12.0 | 61.0 | -- | 1.6 ( 8.0) |
| Diammonium phosphate | 21 | 53.0 | -- | 1.9 ( 9.5) |

[a] *This list is not all inclusive. When carriers that include a nitrogen source are used in a fertilization program in conjunction with a nitrogen carrier the total amount of nitrogen applied should be adjusted appropriately.*

**Table 6. Potassium carriers for turfgrass fertilization in Nebraska.**

| *Carrier* [a] | *N* | *Percent* $P_2O_5$ | $K_2O$ | *Amount (lb) needed to apply 1 lb of $K_2O$ per 1000 sq ft (g/m$^2$)* |
|---|---|---|---|---|
| Potassium chloride | -- | -- | 60 | 1.7 ( 8.5) |
| Potassium sulfate | -- | -- | 50 | 2.0 (10.0) |
| Potassium metaphosphate | -- | -- | 40 | 2.5 (12.5) |
| Potassium nitrate [b] | 13 | -- | 44 | 2.3 (11.5) |

[a] *This list is not all inclusive. When potassium carriers that include nitrogen are utilized in a fertilization program with other nitrogen sources the application rate should be adjusted appropriately.*

[b] *Can present a potential explosive and fire hazard.*

**Table 7. Examples of mixed fertilizers available for turfgrass fertilization in Nebraska.**

| *Fertilizer[a/] Analysis* | *Nutrient Ratio* | *N* | *Percent* $P_2O_5$ | $K_2O$ | *Amount (lb) needed to apply 1 lb. N per 1000 sq ft (g/m²)* |
|---|---|---|---|---|---|
| 10-10-10 | 1-1-1 | 10 | 10 | 10 | 10.0 (50.0) |
| 12-12-12 | 1-1-1 | 12 | 12 | 12 | 8.3 (41.5) |
| 16-16-16 | 1-1-1 | 16 | 16 | 16 | 6.3 (31.5) |
| 20-20-20 | 1-1-1 | 20 | 20 | 20 | 5.0 (25.0) |
| 10-6-4 | 2.5-1.5-1 | 10 | 6 | 6 | 10.0 (50.0) |
| 12-4-8 | 3-1-2 | 12 | 4 | 8 | 8.3 (41.5) |
| 61-8-8 | 2-1-1 | 16 | 8 | 8 | 6.3 (31.5) |
| 16-4-8 | 4-1-2 | 16 | 4 | 8 | 6.3 (31.5) |
| 24-4-8 | 6-1-2 | 24 | 4 | 8 | 4.2 (21.0) |
| 24-8-8 | 3-1-1 | 24 | 8 | 8 | 4.2 (21.0) |
| 25-5-10 | 5-1-2 | 25 | 5 | 10 | 4.0 (20.0) |
| 26-5-3 | 8.7-1.7-1 | 26 | 5 | 3 | 3.8 (19.0) |
| 27-7-7 | 3.9-1-1 | 27 | 7 | 7 | 3.7 (18.5) |
| 28-0-14 | 2-0-1 | 28 | ---- | 14 | 3.6 (18.0) |
| 30-3-10 | 10-1-3.3 | 20 | 2 | 10 | 3.3 (16.5) |
| 31-5-3 | 10.3-1.7-1 | 31 | 5 | 3 | 3.2 (16.0) |
| 32-5-3 | 10.7-1.7-1 | 32 | 5 | 3 | 3.1 (15.5) |
| 34-3-7 | 11.3-1-2.3 | 34 | 3 | 7 | 2.9 (14.5) |

*[a/] This list is not all inclusive.*

diate levels, a mixed fertilizer with 2:1:1 ratio could be used. If the soil phosphorus and potassium levels are high, use a 4:1:2, 5:1:2, 6:1:2, or a straight nitrogen fertilizer as described in Table 4.

**When to Fertilize**

The number of fertilizer applications and when they should be applied depends upon turfgrass species or cultivar, quality of lawn desired, release pattern of selected fertilizer, nutrient holding capacity of the soil, and intensity of use.

Lawns should receive at least one fertilizer application each year. A minimum of two applications per season is preferred. If one application is made, it best be done in late-fall (mid to late-October) with a slow release carrier. If two applications are made, they should be done in late-fall and again in mid-spring (May). Avoid early spring (March and early-April) fertilizer applications whenever feasible. Early-spring applications, especially with fast-release carriers, tend to encourage increased disease susceptibility and proneness to high temperature and drought stress. Tall fescue (Kentucky 31) lawns are best fertilized in the spring, preferably in early to mid-May.

Better quality lawns will require three or more fertilizer applications per season. This is especially true when lawns are frequently watered, clippings are removed, or when soils are sandy or coarse and nutrients can be easily leached.

Fertilize warm season turfgrasses, such as zoysia, buffalograss, and blue grama differently than cool season species such as Kentucky bluegrass, tall fescue, perennial ryegrass, and fine-leaved fescues. Do not fertilize cool season turfgrasses heavily during warm summer months. Heavy nitrogen applications are detrimental. Light applications of 0.5 lb (2.5 g/m$^2$) of nitrogen per 1000 sq. ft. can be utilized to enhance turfgrass color. Fertilize warm season grasses during this period. Avoid fall fertilization on warm season grasses. Fall fertilization of these grasses encourages weed competition and increases winter injury. Avoid fertilizing warm season turfgrasses after August 15.

Late-fall fertilizer applications should be timed with the last mowing in the fall. Turfgrasses are still taking in nutrients at this time but they are not vertically elongating. Nutrients taken up at this time will be retained over winter and utilized to start growth next spring. This should be referred to as a dormant fertilizer application. Late-fall or winter fertilizer applications on browned or frozen turf are not recommended in Nebraska. Significant amounts of nutrients can be lost due to surface

runoff or leaching out of the root zone. Therefore, it is not an efficient use of plant nutrients or resources.

### How to Apply Fertilizers

Apply fertilizers uniformly and with care. They can be applied in dry form or as a liquid. Lawns are commonly fertilized with dry or granular type fertilizers. These materials can be spread uniformly with centrifugal (broadcast-type) or gravity (drop-type) spreaders (Figure 4).

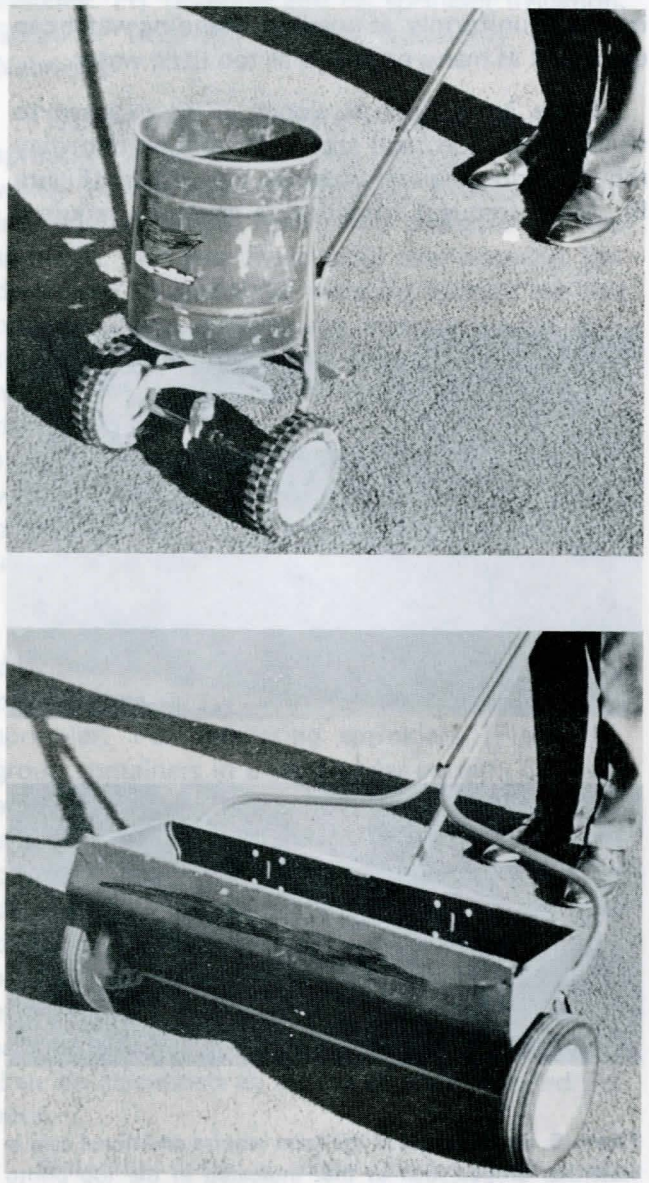

**Figure 4. Types of fertilizer spreaders commonly used in lawn fertilization: top centrifugal type and bottom gravity type.**

Centrifugal-type spreaders usually distribute material more rapidly with a minimum overlapping problem when compared to gravity spreaders. Gravity spreaders can be used to spread herbicide-fertilizer mixtures with greater safety around trees, shrubs, and other susceptible plants. In addition, gravity or drop-type spreaders spread more evenly than centrifugal-type spreaders when wind is a problem. Avoid hand fertilizer application since it is difficult to obtain uniform coverage.

Use the recommendations on the fertilizer bag or the chart supplied with the spreader to determine proper spreader setting for the desired application rate. To insure uniform distribution of the fertilizer divide the application rate into two equal parts. Apply half of this amount in a back and forth fashion and the other half over the same area in a cross-wise direction.

Water the lawn immediately after applying the fertilizer, especially when fast-release nitrogen sour es are used. This will minimize the potential for foliar burn. Wash the fertilizer spreader before putting it away. This will reduce corrosion and keep the equipment in good operating condition. Never leave fertilizer in the bin of the spreader during storage.

Combinations of fertilizers with pesticides such as herbicides, fungicides, or insecticides are available. They can be used efficiently and effectively for pest control and fertilization when applied at the proper time and rate. Apply these materials only when needed for control of a particular pest, and do not apply on a continuous basis throughout the growing season. Follow label directions closely for the rate, timing, and preferred method of application. Do not use these materials on vegetable or ornamental plants unless recommended by the label.

## WATERING

Watering is necessary in most areas of Nebraska to maintain a healthy, dense turf with adequate color. Table 1 indicates that some of the major Nebraska turfgrass species are more drought tolerant than others. These species require less supplemental irrigation than those susceptible to drought stress. Zoysiagrass, buffalograss, blue grama, and tall fescue are quite drought tolerant. However, if the drought period is extended (more than 1.5 months), even these grasses will need watering to avoid thinning the stand. All turfgrasses require

some watering during their establishment phase.

**How Much Water Is Needed?**

The amount of water needed will vary according to the turfgrass species or cultivar, season of the year, location, climate, intensity of culture, and its intended use. About 1.5 to 2.0 inches (3.8 to 5.0 cm) of water per week are required to maintain a desirable turf during hot summer months in Nebraska. This may be supplied in the form of natural rainfall or supplemental irrigation. If the lawn does not receive adequate moisture, it will become stressed, cease growth, and become dormant. A dormant turf turns light-brown to straw colored. Dormant turfs should not be subjected to heavy use because they lack the ability to recuperate from injury.

To decide whether or not you wish to water your lawn consider:

1. The turfgrass species in the lawn (zoysia, buffalograss, blue grama, and tall fescue require less frequent watering).

2. The quality of turf desired (a highly maintained lawn will require more irrigation).

3. The intensity of use of the lawn ( lawns used for recreation and play will require more irrigation).

4. The length and severity of drought periods (even a dormant lawn must have enough moisture to keep crown tissues alive).

5. The cost, quality, and availability of water (if costs are prohibitive, select a more drought tolerant grass).

**How and When to Water?**

Water lawns thoroughly and infrequently. Wet the soil six to eight inches (15-20 cm) deep, whenever possible. This may require watering one area for several hours, but avoid watering so long that run-off occurs. A deep rooted turf can draw moisture and nutrients from a larger volume of soil and requires less frequent watering. Light, frequent watering encourages a shallow root system and a weakened turf less capable of withstanding heat, cold, drought, and disease stress. Watering frequency should be dictated by the demands of the grass plant. Water the lawn when signs of wilt appear. Watch for a dark blue-green appearance and foot printing effect on the lawn.

The preferred time to water to minimize disease problems is between sunrise and midday. Diseases develop more rapidly when the grass remains wet for a long period of time. It was once thought that midday watering caused scald injury. This is not the case. Scald injury occurs when the turfgrass plant is standing in water during periods of high temperature and high light intensity.

There are certain drawbacks to midday watering. Strong winds are more likely during this time of day. Wind can disrupt the uniformity and distribution of water and cause an increased evaporative water loss. Early morning watering is preferred.

Apply water only as fast as the soil can absorb it and as uniformly as possible. Standing water can cause just as many problems as too little water.

Some areas such as slopes, areas exposed to wind, direct sun, and tree root competition may require more frequent watering than others (Figure 5). More frequent irrigation is generally required

**Figure 5. Special areas in the lawn require additional care in watering. Slopes such as that indicated in the top photo will require more frequent watering than level areas; and tree root-grass competition will require additional care in watering (bottom photo).**

on soils with low moisture holding capacity, such as sandy sites. Lawns with excess thatch accumulation require more frequent irrigation. Newly established lawns require daily, light watering to keep the soil surface moist and prevent desiccation (drying out) of newly established seedlings. Lawns may also be syringed (a light watering practice) at midday to help cool plants during heat stress periods. This will also lower outside temperatures around the home. Syringing is particularly beneficial if *Fusarium* blight or billbugs have been a problem in the lawn. The light water application cools the plants as energy is utilized to evaporate the water.

Water can be applied to lawns basically by two systems: (1) flooding, and (2) sprinkler irrigation. Sprinkler irrigation is most commonly used in Nebraska.

The simplest and most common method of sprinkler irrigation involves portable hoses to which the sprinklers are attached. Effective watering requires proper timing and movement of the sprinkler. The user must avoid over-watering. Underground or automatic watering systems are also popular. These systems are more expensive than the portable types, but if properly installed and maintained, they give efficient, uniform water distribution. A common problem with automatic systems is setting them with an application interval which results in light, frequent irrigations that promote a shallow root system and a weakened, less vigorous turf.

It is important to know the rate and the distribution of water applied. This can be done by placing cans or containers at intervals around the sprinkler. For oscillating sprinklers (Figure 6), group containers in a rectangular pattern. Containers should have straight sides. Place these containers no more than five feet apart. The closer containers are placed together the more precise and detailed will be the determination of the rate and distribution of water. Operate sprinklers under normal conditions for about one hour. At the end of this period determine the amount of water in each container. The rate of water application can then be calculated as inches of water applied per hour.

Watering twice a week during heat stress periods is not uncommon in southeastern Nebraska. During cooler periods, watering interval can be increased to 7 to 14 days. Lawns maintained under

**Figure 6. Water deeply and infrequently to promote a deep root system. Light, frequent waterings result in shallow root systems and a weakened turf.**

a high intensity of culture, high cutting heights, and on coarse-textured soils will require more frequent watering than those maintained to a lesser degree on heavy soils. High temperatures, low relative humidity, and wind movement also will increase the water needs of a lawn.

## SOIL CULTIVATION (AERIFICATION)

Many soils in Nebraska have a high clay and silt content. These soils become severely compacted when exposed to traffic. This compaction can impede the growth of the turfgrass plant by limiting air, water, and nutrient movement in the soil. Soil cultivation through coring or aerification is essential to alleviate this compaction problem. On turfgrass areas particularly prone to soil compaction, traffic should be manipulated to minimize the associated wear and compaction problems. In addition, soils on sites that are prone to compaction should be aerified a minimum of once and preferably twice each season (Spring, Fall, or both).

Aerify with a device that removes soil cores. These cores can be removed or they can be chopped with a rotary mower and distributed across the lawn area. Figure 7 indicates the benefits of aerification for improving water, air, and nutrient penetration into the soil, as well as increasing the extent and depth of rooting of the turfgrass plant.

Most soils in Nebraska would benefit from an annual soil aerification process. The aerification process will improve the infiltration of water into

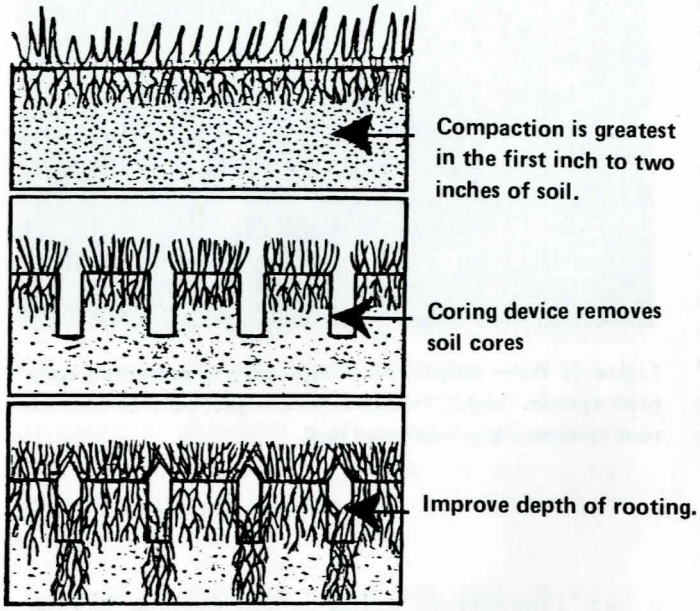


**Figure 7. Soil cultivation with a coring device enhances water, air, and nutrient penetration, as well as increases root depth on heavy, clay soils.**

the soil and enhance the plant's ability to utilize this water. Therefore, the improved utilization of water and increased depth of rooting will make the plant better suited to withstand high temperature and drought stress during the warm summer months.

## CONTROL OF THATCH ACCUMULATION

Practices that promote an actively growing, vigorous turf will also contribute to the accumulation of thatch. Thatch is seldom a problem on low maintenance turfs. It is a common problem on turfs that receive frequent irrigation and high nitrogen nutritional programs. Actively growing lawns may require annual dethatching. However, before deciding to dethatch as an annual maintenance practice the lawn should be sampled to determine the level of thatch accumulation. When the thatch accumulation exceeds one-half inch (1.25 cm), the lawn should be dethatched.

Thatch accumulation is generally greater on compacted soils and soils with poor drainage. These soils should be cultivated or aerated to promote better moisture and air penetration. Aeration will help promote a deeper and healthier root system. Soil aeration or core removal will not eliminate thatch accumulation but will help slow its development. If too much thatch has accumulated on a soil that is compacted or poorly drained, use power raking and aeration to reduce the accumulated thatch. A light power raking is better than trying to remove too much debris at one time.

Thatch accumulation also tends to be greater on acid soils. Lime can be used on acid soils to help inhibit this accumulation. However, lime should not be applied in Nebraska without a soil test to determine the soil pH.

Avoid excessive fertilizing. Fertilize only enough to maintain the desired color, growth, and recuperative potential of the grass. Avoid frequent, light irrigations. Use pesticides for controlling lawn pests only when necessary and only at rates indicated on the labels. Proper cultural practices such as these will minimize the accumulation of thatch and reduce the need for mechanical thatch removal. When thatch accumulates to an excessive degree, it may be necessary to completely renovate or reestablish the turf.

## OTHER CULTURAL PRACTICES

In addition to mowing, fertilizing, and watering, lawns may require additional maintenance. Some of these additional maintenance practices are weed, disease, and insect control; thatch removal; soil cultivating; care of shaded areas; and lawn renovation. These are essential aspects of any lawn care program and require more extensive treatment than space in this bulletin will allow. For more information concerning these lawn maintenance aspects, ask your local Extension office for:

1. Lawn Diseases in the Midwest, E.C. 73-1833.
2. Turf Disease Control Guide, G74-107.
3. Sod Webworm, G75-231.
4. Bluegrass Billbugs, G75-236.
5. Insect Control Recommendations for Ornamentals and Lawns, E.C. 75-1502.
6. Lawn Weeds and Their Control, North Central Regional Extension Publication No. 26.
7. Cool Season Turfgrasses for Nebraska, G76-273.
8. Warm Season Turfgrasses for Nebraska, G76-285.
9. Thatch Removal, G76-300.
10. Fertilizing Nebraska Turfgrasses, G77-369.

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