University of Idaho
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Northern Idaho Fertilizer Guide

Grass Pastures

by Robert L. Mahler

These fertilizer guidelines have been developed by the University of Idaho and Washington State University based on relationships obtained from soil tests and crop yield responses. The suggested fertilizer rates are designed to produce above-average yields if other factors are not limiting production. Thus, these fertilizer guidelines assume good management.

The suggested fertilizer rates will be accurate for your field provided that (1) the soil samples are properly taken and are representative of the field to be fertilized and (2) the crop and fertilizer history supplied is complete and accurate. For help in obtaining a soil sample, see University of Idaho Bulletin 704, *Soil Sampling*, or consult your county extension educator.

Harvested grasses remove large quantities of nutrients from the soil. Incorporate fertilizer into the soil as you prepare the seedbed; apply additional amounts periodically over the life of the stand to maintain optimum nutrient levels.

Established grass pastures

Nitrogen (N), phosphorus (P), potassium (K), and sulfur (S) are nutrients essential for plant growth but are often deficient in northern Idaho grass pastures. Conversely, calcium (Ca), boron (B), copper (Cu), chlorine (Cl), iron (Fe), manganese (Mn), molybdenum (Mo), and zinc (Zn) deficiencies are rare in northern Idaho grass pastures.

Animals foraging for grass in the spring may suffer grass tetany, caused by low levels of soil magnesium (Mg).

Nitrogen—Soil sampling for N fertilizer recommendations is generally not practical; available N is mobile in soils and can be leached beyond the root zone with spring precipitation or irrigation.

Grass pastures will usually respond to N applications in northern Idaho. Table 1 lists suggested N application rates based on annual precipitation. Highest recommended N application rates are on irrigated grass pastures. These suggested rates are yearly requirements and should be split into at least two applications for nonirrigated and three to five applications for irrigated grass pastures.

Table 1. Nitrogen fertilizer rates for grass pastures based on annual precipitation.

Annual precipitation	N application
(inches)	(lb/acre)
less than 20	80 to 110
20 to 22	100 to 130
22 to 25	120 to 145
more than 25	135 to 160
irrigated pastures	140 to 170

On nonirrigated land, make one of the two recommended applications as early in the spring as possible (February to April) and the second application in early June. On irrigated grass pastures, apply the first of the three to five applications as early in spring as possible and make subsequent applications every 5 to 7 weeks.

Phosphorus—Conduct a soil test to assess the P status of grass pastures. Table 2 lists P application rates required for optimal forage production, as determined by a soil test. On established stands, fall broadcast applications of P fertilizers are more effective than spring applications. On established stands, you may apply enough P to last for 2 or 3 years. The P fertilizer application rates suggested in Table 2 should be increased by 25 percent if your soil contains large amounts of volcanic ash.

Table 2. Phosphorus fertilizer rates for grass pastures based on a soil test.

Soil test P (0 to 12 inches)[1]			P_2O_5 application rate[2]		
NaOAc	Bray	$NaHCO_3$	1-year supply	2-year supply	3-year supply
(ppm)	(ppm)	(ppm)	(lb/acre)	(lb/acre)	(lb/acre)
0 to 2	0 to 20	0 to 8	50	90	110
2 to 4	20 to 40	8 to 14	35	45 to 55	70 to 80
4 to 8	40 to 80	14 to 20	0	10 to 20	20 to 40
over 8	over 80	over 20	0	0	0

[1] Soil test P can be determined by three different procedures: sodium acetate (NaOAc), Bray I method, or sodium bicarbonate ($NaHCO_3$). Sodium bicarbonate should not be used on soils with pH values less than 6.2. Use the column indicated by your soil test report.

[2] P_2O_5 x 0.44 = P, or P x 2.29 = P_2O_5.

Potassium —Grass pastures remove large quantities of K from the soil. On established stands, applying K as a fall topdress application is most beneficial. Most northern Idaho soils contain enough K for optimal forage production, but deficiencies can occur in localized areas. Use a soil test to determine K needs (Table 3).

Table 3. Potassium fertilizer rates based on a soil test.

Soil test K[1]	K_2O[2]
(ppm)	(lb/acre)
0 to 35	80
35 to 75	55
75 to 100	35
more than 100	0

[1]Sodium acetate-extractable K in the 0- to 12-inch depth.

[2]K_2O x 0.83 = K, or K x 1.20 = K_2O.

Sulfur—Northern Idaho soils are often S deficient, causing yield and quality reductions. When an S deficiency occurs, the entire plant yellows early in the growing season. This symptom is indistinguishable from an N deficiency.

Sulfur can be applied as gypsum or with liquid or dry fertilizer materials containing S. Use materials containing sulfate (SO_4). Since S is mobile and subject to leaching in soils, apply S early in the spring. Do not apply S in fall. Sulfur needs of grass pastures based on a soil test are shown in Table 4. The S fertilizer application rates suggested in Table 4 should be increased to 30 from 20 pounds per acre if your soil contains large amounts of volcanic ash.

Table 4. Sulfur fertilizer needs of grass pastures based on a soil test.

Soil test S (0 to 12 inches)		S application rate
(ppm SO_4-S)	(ppm S)	(lb/acre)
0 to 10	0 to 4	20
over 10	over 4	0

Magnesium—Grass tetany is a cattle and sheep disorder caused by low levels of Mg often resulting from low Mg in their forage. Grass tetany occurs when lush grass pastures grow rapidly in areas with cool, wet springs.

Low Mg levels are found in cool-season grasses, such as bluegrass, brome, fescue, orchardgrass, and timothy. Under cool, wet spring conditions, these grasses contain such low Mg levels that grazing animals may not obtain enough Mg to meet their nutritional requirements.

Supplement improved grass pastures that are prone to developing low Mg levels in the spring by using one or more of the following practices:

- Add legumes, such as ladino and alsike clovers or alfalfa.
- Fertilize pastures with Mg (e.g., dolomitic limestone or potassium-magnesium sulfate).
- Avoid heavy N and K applications.
- Supplement animal rations or water with Mg.

Micronutrients—Grass pastures have never been observed to respond to micronutrient applications in northern Idaho. If you are in doubt, test the soil and consult the extension educator in your county.

Lime—Test lime applications on highly acid soils (soil pH less than 5.1) to determine if there's an economical response. When needed, apply lime at a rate of 1 to 2 tons per acre, and where possible, mix it thoroughly into the soil. Surface applications will work but will be slow to react. Fewer than 5 percent of the grass pastures in northern Idaho have soil pH values less than 5.1.

New grass seedings

Consider soil fertility needs before establishing new pastures. Both P and K are particularly important as these nutrients are immobile in the soil and are more available when worked into the seedbed before seeding.

At establishment, work 60 pounds of P_2O_5 per acre and appropriate amounts of K (see Table 3) into the seedbed. Add S when a soil test indicates a need (Table 4). Sulfur does not need to be incorporated into the seedbed because it is mobile in soils and will reach plant root zones with normal precipitation or irrigation.

Adding 20 to 30 pounds of N per acre at seeding will help establish a pasture. Add 50 percent of the recommended N rate listed in Table 1 during the first season.

Agronomy/Water quality considerations

- Weeds, insects, diseases, and environmental stress can influence the effectiveness of a fertilizer program and reduce yields.
- Nitrogen, phosphorus, and sulfur are the elements most often needed for grass pasture production in northern Idaho. In some situations applying potassium and lime will also improve plant growth.
- Since nitrate nitrogen and sulfate sulfur are mobile in soils, make fertilizer applications of these two nutrients in the spring. Never apply N or S in the fall.
- Since phosphorus and potassium are relatively immobile in soils, work these nutrients into the seedbed before seeding.
- Grass tetany can occur in pure grass pastures during cool, wet springs in northern Idaho counties because of low magnesium levels in the forage.
- Grasses grow poorly in soils with pH values less than 5.1. In such situations, you may need to apply lime to correct soil acidity. Apply and incorporate lime into the soil before the pasture is established.

- When seeding, select the best-adapted grass varieties for your area.
- Sulfur and nitrogen fertilization increases forage protein content, greatly improving its quality.

Further reading

BUL 704, *Soil Sampling*, $2.00

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Northern Idaho fertilizer guides are available online and may be downloaded from http://info.ag.uidaho.edu/catalog/catalog.html. Look under Fertilizers and Soils:

CIS 447, *Alfalfa*
CIS 453, *Winter Wheat*
CIS 785, *Winter Rapeseed*
CIS 788, *Bluegrass Seed*
CIS 815, *Blueberries, Raspberries, and Strawberries*
CIS 820, *Grass Seedings for Conservation Programs*
CIS 826, *Chickpeas*
CIS 851, *Legume and Legume-Grass Pastures*
CIS 853, *Grass Pastures*
CIS 911, *Northern Idaho Lawns*, also available in print for $1.00
CIS 920, *Spring Barley*
CIS 954, *Winter Barley*
CIS 1012, *Spring Canola*
CIS 1083, *Lentils*
CIS 1084, *Spring Peas*
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