YIELD AND QUALITY OF TIMOTHY IN SOUTHCENTRAL ALASKA

by

William W. Mitchell
Professor of Agronomy, Emeritus
Palmer Research Center
533 E. Fireweed
Palmer, Alaska 99645

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INTRODUCTION

Timothy (*Phleum pratense*) is the major perennial forage seeded on strongly acidic soils in southcentral Alaska. It is an important forage grass on the Kenai Peninsula and in the Susitna Valley. Bromegrass (*Bromus inermis*) is more commonly used on the moderately acidic soils of the Matanuska Valley. Timothy is also used to some extent in the Tanana Valley of interior Alaska. Recently it has assumed an increasingly important role in forage programs of dairy farms and hay growers in the Pt. MacKenzie Agricultural Project northwest of Anchorage.

This bulletin summarizes information on yield and quality of timothy as it relates to management practices. Most of the data were obtained in research trials conducted by the author at locations in southcentral Alaska, in particular at Pt. MacKenzie. Additional information is supplied from other research efforts.

METHODS

Yield trials were conducted on plots measuring 4 ft by 15 ft, replicated four times, in a randomized complete block design. Harvests were taken with a sickle-bar mower from the center 2 ft x 12 ft section of each plot, leaving about three inches of stubble. Samples were oven dried at about 140 degrees F for determination of yield. Quality analyses were conducted by the Alaska Agricultural and Forestry Experiment Station analytical laboratory. Most trials were fertilized each spring at rates of 90 to 100 lbs of nitrogen, 70 to 90 lbs of phosphate (P_2O_5), and 70 to 90 lbs of potash (K_2O) per acre. If a second harvest was taken, an additional application of 90 lbs N/acre was made after the first harvest. Yields are reported on an oven dry-weight basis. Approximate hay weights (12% moisture) can be obtained by multiplying oven dry-weights by 1.14.

Yield trials were conducted on the following soil types at the different locations: Palmer, Bodenburg silt loam, pH ≈ 6.2; Pt. MacKenzie, Kashwitna silt loam, pH ≈ 5.6;

Talkeetna, Rabideux silt loam, pH ≈ 5.0; Soldotna, Tustumena silt loam, pH ≈ 5.6; Homer, Lookout Mt.—Kachemak silt loam, pH ≈ 5.0; Homer, Fritz Creek—Mutnala silt loam, pH ≈ 4.8; and Delta Junction, Volkmar silt loam, pH ≈ 5.9.

TIMOTHY VARIETIES

Alaska has relied mainly on the Scandinavian countries, with their long history of research with timothy, for its source of timothy varieties. The variety Engmo, introduced to Alaska in the 1950s, was developed in Norway, where it is used principally in the northern part of the country. Because of its superior winter hardiness Engmo has become the most frequently used variety in Alaska. The Canadian variety Climax also has been used in Alaska to some extent but it is inferior to Engmo in hardiness (Klebesadel 1970; Klebesadel and Helm 1986). Two varieties of Icelandic origin, Korpa and Adda, have been tested and found adaptable for use in Alaska. Mixed results have been obtained with varieties Tiiti (Finland) and Bottnia II (Sweden); they performed relatively poorly in some trials near Palmer (Klebesadel and Helm 1986). The Scandinavian variety Kampe was found inferior in hardiness. Both Kampe and Climax were winterkilled in a trial near Delta Junction and were severely reduced in stand in a trial near Soldotna (Tables 1 and 2).

The above varieties demonstrate a range of forms based on the positioning of their leaves. The most winterhardy types such as Engmo, Korpa, and Adda have their leaves more basally oriented on the stem than the least winterhardy types such as Climax and Kampe. Leaf positioning may have a bearing on hardiness; the basal orientation of the leaves of the winterhardy types conserves more photosynthetic tissue after cutting, thus may promote greater accumulation of food reserves in the stem bases for overwintering purposes.

YIELD POTENTIAL

Researchers have found that timothy generally produces high first-harvest yields but relatively low second-harvest yields under the two-harvest system. First-harvest yields can vary a great deal, depending upon particular growing conditions. In trials conducted at different locations in southcentral Alaska, healthy stands of Engmo timothy generally have produced about 1.50 to 2.50 tons per acre of oven-dried matter (or about 1.71 to 2.85 tons of air-dry hay) under normal growing conditions when cut in the head-emergence to early-headed stage. Under optimal conditions per acre yields of about 3.50 oven-dried tons (about four tons of hay) have been obtained when cut in the early-headed stage. This has been accomplished both at Pt. MacKenzie and on the lower Kenai Peninsula, but these are exceptionally high yields. Second growth of Engmo timothy, after a cutting taken in the emergent to early heading stage, generally has produced yields of about one ton or less of oven-dry matter per acre. Second-harvest yields have ranged from negligible amounts under dry conditions to about 1.25 tons per acre under favorable conditions. Regrowth harvests generally were taken about two months after the first harvest. Timothy often produced lower second-harvest yields than some other grasses with which it was compared, but its higher first-harvest yields generally accounted for a total yield equal to, or exceeding that of, most other grasses (Mitchell 1987; Mitchell et al. 1987). However, the high regrowth capabilities of reed canarygrass (*Phalaris arundinacea*) and some hairgrasses (*Deschampsia* sp.) at times resulted in their producing more total yield. In areas with shorter growing seasons, as in the upper Susitna Valley and parts of the Kenai Peninsula, the native species polargrass (*Arctagrostis latifolia*) and bluejoint reedgrass (*Calamagrostis canadensis*) become more competitive with timothy and merit consideration as forage options.

The yielding ability of timothy depends a great deal on the health of the plants coming out of the winter. When healthy, the less winterhardy varieties Kampe and Climax are capable of yielding as much as the hardier varieties, and both show the potential for producing higher second-harvest yields. Table 2 compares Engmo and Climax in trials conducted at Pt. MacKenzie and near Soldotna. In each case Climax exceeded Engmo in second-harvest yields but was less reliable for the first harvest because of greater susceptibility to winter injury. If growth is severely retarded because of winter injury, thus producing much reduced yields when cut at the normal first-harvest time, timothy may recover, form heads like first-growth material, and produce a bountiful second harvest. In a study conducted near Delta Junction (Table 1) all timothy varieties in the study experienced varying degrees of winter injury, particularly in the second winter. Climax and Kampe were eliminated by winterkill; all others recovered sufficiently to produce higher second-harvest than first-harvest yields. The winter injury at Delta Junction resulted from low air temperatures. In the Soldotna trial (Table 2), reduction in first-harvest yields from winter injury in 1985 and 1986 was due to ice encasement.

Timothy is less tolerant of dryness than some other grasses, such as bromegrass. Rainfall in May and June typically is relatively low in southcentral Alaska, thus high soil moisture content coming out of the winter generally is critical for a good first harvest. Initial growth may deplete residual soil moisture, however, and without adequate replenishment through irrigation or rainfall, regrowth is severely retarded. This set of circumstances produced negligible second growth in 1988 at Pt. MacKenzie. Rains that came in August were too late to compensate for the droughty late June through July period.

MANAGEMENT CHARACTERISTICS

Some workers have found time-of-cutting to be critical in the management of timothy. Studies in the northeastern states have shown that cutting in the stem-elongation to early-heading stage can be detrimental to stand persistence, particularly when accompanied by high nitrogen (N) fertilization (Brown et al. 1968; Jung and Kocher 1974). In the northeastern states studies, stands persisted better when first cuttings were taken either prior to stem elongation or when the grass was in bloom (advanced-heading stage). Cutting prior to stem elongation permits more frequent cuts, but studies have shown that total yields are greater under the two-harvest system than under a three- or four-harvest system (Pulli 1980; Kunelius et al. 1976). Over a three-year period at Pt. MacKenzie a single seasonal harvest equalled or exceeded the total yields obtained for the two-harvest system if the single harvest was taken three to four weeks after the first cutting of two harvests (Table 3). Delaying the harvest three to four weeks produced an additional 1.0 to 1.5 tons of dry matter per acre. Higher quality forage is obtained, however, by taking earlier and more frequent cuts.

Plantings of a perennial such as timothy are often expected to form long lasting forage fields, but there are reports of loss of stand and vigor under intense management employing high N rates (Brown et al. 1968; Pulli 1980; Kunelius et al. 1976). Cuttings in the early-heading stage with high N fertilization produced stand deterioration. No definitive results were obtained on this matter in the Alaskan studies.

In a review of research results with timothy in the northeastern states (Brown et al. 1968) a number of reports were cited showing timothy to be "relatively intolerant of close, and/or frequent defoliation." However, in an observational study at Palmer (W.W. Mitchell, unpublished data), Engmo timothy was subjected to mowings about every two to three weeks over two summers. No yield estimates were obtained, but when moisture was adequate, Engmo afforded good growth through both summers, and at the end of the second summer (1988) it was maintaining a good stand. More study is needed of this potential and the effects of timing of harvest under Alaskan conditions.

FORAGE QUALITY

Such factors as plant maturity, nutrition, soil properties, yield, kind of growing season, and species or varietal differences can influence plant quality. In a Palmer trial, at the initiation of growth in early May, crude protein of Engmo timothy herbage was 28.5%, and its digestibility (in vitro digestible dry matter) was 88.3% (Mitchell 1987). By the post-bloom stage in late July, crude protein had declined to 9.6% and digestibility to 46.3%, i.e., to about one-third and one-half, respectively, of their initial values. Table 4 provides crude protein and digestible dry matter percentages with such relative information as yield, date of harvest, and stage of plant development for a number of Engmo timothy harvests at various locations in southcentral Alaska. It is evident that these values can vary considerably from year to year, particularly in crude protein, for harvests taken at the same location and at similar developmental stages and times of growing season. This may be related to yield differences and/or growing-season differences. Specific soil differences also enter in when different sites are involved. (Fertilization was similar for most of the Table 4 trials) Considerable data for a given site and soil type are necessary to establish a reliable norm. Forage testing is essential for ration formulation even after the norm has been defined.

For Pt. MacKenzie the data indicate that with yields of 2.0 to 2.5 tons per acre obtained in the emergence to early-heading stage, crude protein varies in value from about 12% to 15% and digestibility from about 62% to 70%, with medians of 14% and 66%, respectively. These figures were obtained with spring applications of 90 to 100 lbs N/acre. In 1983 at Pt. MacKenzie, growing conditions promoted a rapid growth rate, providing almost 3.5 tons per acre yield by early heading stage for two trials (Table 4), which lowered crude protein to 8% to 9% as a result of dilution (Jarrell and Beverly 1981). Digestibility at 60% also was lower with the high yield. In 1986 and 1987, obtaining over three tons per acre yield by taking a late harvest (at bloom stage, about three weeks after head emergence) provided crude protein and digestibility figures equal to, or in excess of, those for the earlier, high-yielding harvests described above. However, in 1988 the bloom-stage harvest yielding over three tons per acre, produced a low crude protein value of 6.3%. The lower figure for 1988 probably resulted from the abnormally warm, dry conditions of that year.

There are some indications that under soil and growing conditions of the lower Kenai Peninsula, higher protein values may be obtained than at Pt. MacKenzie. The 1979 harvest at Fritz Creek and the 1984 harvest at Funny River produced over three tons per acre yield in the early-headed stage but maintained crude protein values of about 11% to 13.5% (Table 4). In succeeding years with lower yields at Funny River crude protein was about 18% to 20%. Except for the 1974 harvest, the Palmer values also appear higher than those at Pt. MacKenzie for comparable yields and stage of harvest.

Timothy maintains good digestibility for a grass forage, often exceeding that of other grasses contained in the same trial. Digestibility figures do not vary as much, percentage-wise, as those for crude protein.

Crude protein content of second-harvest timothy herbage with about one ton per acre yield has varied from about 10% to 16%. Digestibility has varied from about 60% to nearly 70%.

Nitrogen Nutrition

Engmo timothy has been an efficient user of nitrogen in its primary growth. With 90 to 100 lbs of N applied per acre, nitrogen removal in the first harvest, taken in the emergence to bloom stage, generally has equalled 85% to 100% or more of that applied. With additional nitrogen applied after the first harvest, nitrogen removal in the second harvest is much less. This is due to second-harvest yields often equalling only half or less than that of the first harvest.

Phosphorus Nutrition

In a trial at Pt. MacKenzie, timothy was compared with bromegrass and reed canarygrass for responses to phosphorus (P) fertilizer. In the establishment year all three grasses showed responses to increasing levels of P fertilizer (Table 5; Mitchell and Mitchell, 1986). In the ensuing three harvest years timothy showed little or no response to increasing levels of P and substantially exceeded the other two grasses in first-harvest yields, particularly at the lowest P level of 40 lbs P_2O_5/acre (Table 5; Mitchell et al. 1987). Most of the response for the other two grasses was to the first, 40-lb/acre increment of phosphate. Timothy generally did poorer than the other two grasses in second-harvest yields (Table 6). Reed canarygrass, in particular, substantially outproduced timothy in this harvest. Timothy growth was severely influenced by dryness in 1988.

When cut in the emergence to early-heading stage, timothy herbage generally contained 0.2% to more than 0.3% concentration of elemental phosphorus in the southcentral Alaskan trials. At 0.25% concentration, five lbs of elemental P are removed for each ton of forage dry matter. An application of 11.4 lbs of P_2O_5 is required to furnish five lbs of P. Thus 40 lbs P_2O_5/acre would supply enough P for 3.5 tons forage dry matter (at 0.25% herbage P concentration), assuming the plant is capable of extracting it from the soil.

Potassium Nutrition

Studies in eastern Canada and on the lower Kenai Peninsula of Alaska have shown definite responses by timothy to potassium (K) fertilization. Nitrogen fertilization had little effect without the addition of K in New Brunswick, Canada, but provided substantial increases with the application of 50 and 100 lbs K_2O/acre (Grant and MacLean 1966). Application of 40 to 80 lbs K_2O/acre increased yields and decreased leaf spot infection of timothy grown on Mutnala silt loam on the lower Kenai Peninsula (Laughlin 1965; Laughlin et al. 1981). Both studies indicated a critical concentration of about 1.2% of K in the plant tissue at harvest time with K definitely becoming limiting at levels below that. There was some indication of a need for higher levels to maintain optimum growth for a second harvest on the lower Kenai Peninsula.

Concentrations of potassium in timothy herbage often equalled 2.0% to over 3.0% in the southcentral Alaskan trials. At 2.5% concentration, 50 lbs of elemental K are removed in each ton of forage dry matter. An application of 60 lbs of potash (K_2O) is needed to supply 50 lbs of K. Grasses can be "luxury feeders" of K, thus large amounts can be removed in a crop. Soil deficiencies may arise as a consequence.

SUMMARY

Timothy is adapted for use on many of southcentral Alaska's strongly acidic soils but it has certain limitations. The cultivar Engmo, of Norwegian origin, has demonstrated superior winterhardiness and is the most used timothy variety in Alaska. Other Scandinavian and Finnish varieties that have shown promise include Korpa, Adda, Tiiti, and Bottnia II. All timothy varieties are subject to injury or winterkill, however, when exposed to severe winter cold or when encased in ice as a result of thawing and freezing.

In trials on strongly acidic soils, timothy generally has provided greater first-harvest yields than other grasses tested. With adequate fertilization and moisture, healthy stands of Engmo timothy cut in the emergence to early-heading stage generally have yielded about two tons per acre. Permitting stands to grow three to four weeks longer to the bloom stage may provide an additional one ton/acre yield. Yields will vary, of course, according to growing conditions.

When cut in the stem-elongation stage, regrowth of timothy does not equal initial growth, thus second-harvest yields on these strongly acidic soils generally have equalled about one ton/acre or less. Among those varieties tested, the leaves of the winterhardy timothy varieties are more basally oriented on the stem than those of the less winterhardy varieties. When cut in the stem-elongation stage, the regrowth of the winterhardy types consists of basal leaf growth without stem elongation, thus accounting for their relatively low second-harvest yield.

Timothy can be cut in an early growth stage, prior to stem elongation, and recover to provide vigorous regrowth. Engmo timothy demonstrated the ability to tolerate frequent cuttings in a study at Palmer. Various studies have shown, however, that two harvests in a season provide more yield than a management system with three or four harvests. At Pt. MacKenzie, a single harvest taken at bloom stage has equalled the total yield of two harvests with the first harvest being taken three to four weeks prior to bloom.

Often, with about two tons/acre yield obtained in the early heading stage, timothy has provided about 12% to 16% crude protein content. However, these values vary considerably from year to year owing to a complex of factors such as yield, harvest timing, particular growing conditions, and plant nutrition. Delaying the time of harvest is an important

factor that reduces quality. Increased growth rate, producing higher yields at early harvest, also reduces herbage quality. There was an indication that crude protein concentrations varied according to geographic area, which was probably related to differences in soil and particular growing conditions. Abnormally warm, droughty growing conditions appeared to reduce forage quality.

Digestibility of timothy herbages generally exceeded 60% and did not vary as much as crude protein. When compared with other grasses, timothy often was among the highest in digestibility (as determined by the in vitro method).

Engmo timothy demonstrated the ability to produce well with relatively low phosphorus fertilization on a soil type with strong phosphorus-bonding properties. Allophanes (strongly acidic soils containing relatively high amounts of volcanic ash), prevalent in southcentral Alaska, have strong chemical affinities for phosphorus, making it more difficult for plants to obtain this critical nutrient. Engmo performed well on an allophane with 40 lbs P_2O_5 applied per acre.

Timothy has shown yield reductions as a result of potassium deficiencies. Plant tissue analyses suggest that a tissue K concentration of about 1.0 to 1.2% is indicative of a potassium deficiency.

In managing timothy, producers must give careful consideration to their forage objectives. Most operators take one or two harvests during a season, but some may take more frequent cuts for green-chop purposes or for the purpose of maximizing the quality of stored forage. When cut after stem elongation in the two-harvest system timothy can be expected to provide the most yield in the first harvest. The timing of the first harvest is critical to yield and quality. Almost as much yield can be obtained in a single harvest as in two harvests by taking the lone harvest at bloom stage, about three to four weeks after the onset of heading. But there is a compensatory loss in quality. Under favorable conditions, timothy appears to lend itself to early harvesting by tolerating defoliation prior to stem elongation and still support good growth for subsequent harvests. The highest quality forage can be obtained in this manner, though yields generally will not equal those of the post stem-elongation, two-harvest or late one-harvest systems. However, because of the higher quality of the early-cut, frequent-harvest herbage, a proportionately higher amount of protein and digestible dry matter will be harvested by this system than by the delayed-cut, double- or single-harvest systems. More research is needed in Alaska on the effects of harvest timing on yield, quality, and stand maintenance.

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Table 1. Yields of timothy varieties grown in trial near Delta Junction.

Variety	1984			1985		
	1st Harvest 17 Jun	2nd Harvest 4 Aug	Total	1st Harvest 25 Jun	2nd Harvest 21 Aug	Total
	tons per acre					
Engmo	1.19	1.71	2.90	0.25	1.95	2.20
Tiiti	0.55	2.39	2.94	0.14	2.17	2.31
Bottnia II	0.14	2.31	2.45	0	1.62	1.62
Korpa	0.86	1.87	2.73	0.10	1.86	1.96
Adda	0.89	1.82	2.71	0.11	2.10	2.21
Kampe	0.06	2.20	2.26	0	0	0
Climax	0	0	0	0	0	0

Table 2. Yields of Engmo and Climax timothy in Pt. MacKenzie and Soldotna areas.

Variety	Harvest	1986	1987	1988
Pt. MacKenzie		tons per acre		
Engmo	1st	2.40	1.50	2.38
	2nd	0.95	1.35	0.10
	TOTAL	3.35	2.85	2.48
Climax	1st	1.28	1.57	2.43
	2nd	1.47	2.09	0.37
	TOTAL	2.75	3.66	2.80
Soldotna (Funny River)				
Engmo	1st	3.13	1.50	1.53
	2nd	0.93	0.39	0.19
	TOTAL	4.06	1.89	1.72
Climax	1st	2.35	1.41	0.11
	2nd	1.36	1.53	0.73
	TOTAL	3.71	2.94	0.84

Table 3. Yields of Engmo timothy under two- and single-harvest systems in neighboring trials at Pt. MacKenzie over a three-year period.

Year		Two-harvest trials Trial A	 Trial B	Single-harvest trial Trial C
		tons per acre		
1986		2.40 (6/26)†	2.48 (6/25)	
		0.95 (9/11)	1.05 (8/20)	
	TOTAL	3.35	3.53	3.59 (7/17)
1987		1.50 (6/16)	2.04 (6/23)	
		1.35 (8/19)	0.94 (8/18)	
	TOTAL	2.85	2.98	3.02 (7/16)
1988		2.38 (6/23)	2.53 (6/22)	
		0.10 (9/1)	0.20 (8/30)	
TOTAL	2.48	2.73	3.47	(7/14)

†Date of Harvest

Table 4. Yield, crude protein (CP), and digestible dry matter (DDM) data for Engmo timothy herbage grown in southcentral Alaska trials.

Location	Harvest date	Harvest stage#	Yield tons/ac.	% CP	% DDM
Fritz Creek (Homer)	7/10/79	e. hd.	3.66	11.1	61.7
	7/8/80	em.	2.14	15.1	60.4
Lookout Mt. (Homer)	7/12/76	em.	1.96	14.8	63.4
	7/9/79	b.-em.	1.45	17.3	67.5
Funny River (Soldotna)	7/9/84	e. hd.	3.13	13.4	59.4
	7/9/85	b.-em.	1.59	18.4	64.5
	7/14/86	e. hd.	1.53	20.2	68.2
Palmer	6/25/74	e. hd.	1.49	13.8	NA
	6/26/75	em.	1.93	17.2	70.8
	6/17/77	boot	2.94	16.5	63.4
	6/22/83	em.	3.21	10.4	60.7
Pt. MacKenzie	6/27/83	e. hd.	3.44	8.8	60.3
	6/28/83	e. hd.	3.48	7.9	55.1
	6/28/85	em.-hd.	1.77	13.7	66.2
	7/2/85	em.-hd.	1.84	11.4	63.1
	6/24/86	em.	1.98	12.5	67.5
	6/24/87	em.	1.98	14.8	68.8
	6/25/86	em.	2.48	13.8	63.8
	6/23/87	em.	2.04	16.1	67.6
	6/22/88	em.	2.53	13.1	61.1
	6/17/87	boot	1.50	17.4	71.8
	6/26/86	e. hd.	2.40	13.5	70.9
	7/17/86	bloom	3.59	10.6	57.4
	7/16/87	bloom	3.02	9.6	62.0
	7/14/88	bloom	3.47	6.3	60.8
Bartlett Hills (Talkeetna)	7/8/85	b.-em.	1.54	18.3	69.5

#e.hd.=early heading stage; em.=head emergence stage; b.-em.=boot to head emergence stage.

Table 5. First-harvest yields of three perennial grasses in response to four phosphorus treatments at Pt. MacKenzie.

Fertilizer	Harvest year		Engmo timothy	Manchar bromegrass	Reed canarygrass
lbs/acre $N-P_2O_5-K_2O$†			tons per acre		
90-40-80	85		0.58	0.15	1.29
	86		2.42	1.06	0.59
	87		1.99	1.22	1.53
	88		2.35	1.85	1.89
		Avg.††	2.25	1.38	1.34
90-80-80	85		0.81	0.51	1.90
	86		2.48	1.78	0.76
	87		2.04	1.43	1.86
	88		2.53	2.04	2.03
		Avg.	2.35	1.75	1.55
90-120-80	85		1.08	1.03	2.24
	86		2.36	1.97	1.02
	87		2.05	1.47	1.81
	88		2.48	1.95	2.06
		Avg.	2.30	1.80	1.63
90-160-80	85		1.20	1.04	2.18
	86		2.41	2.10	1.17
	87		2.12	1.29	1.79
	88		2.52	2.09	1.98
		Avg.	2.35	1.83	1.65

†spring application each year.

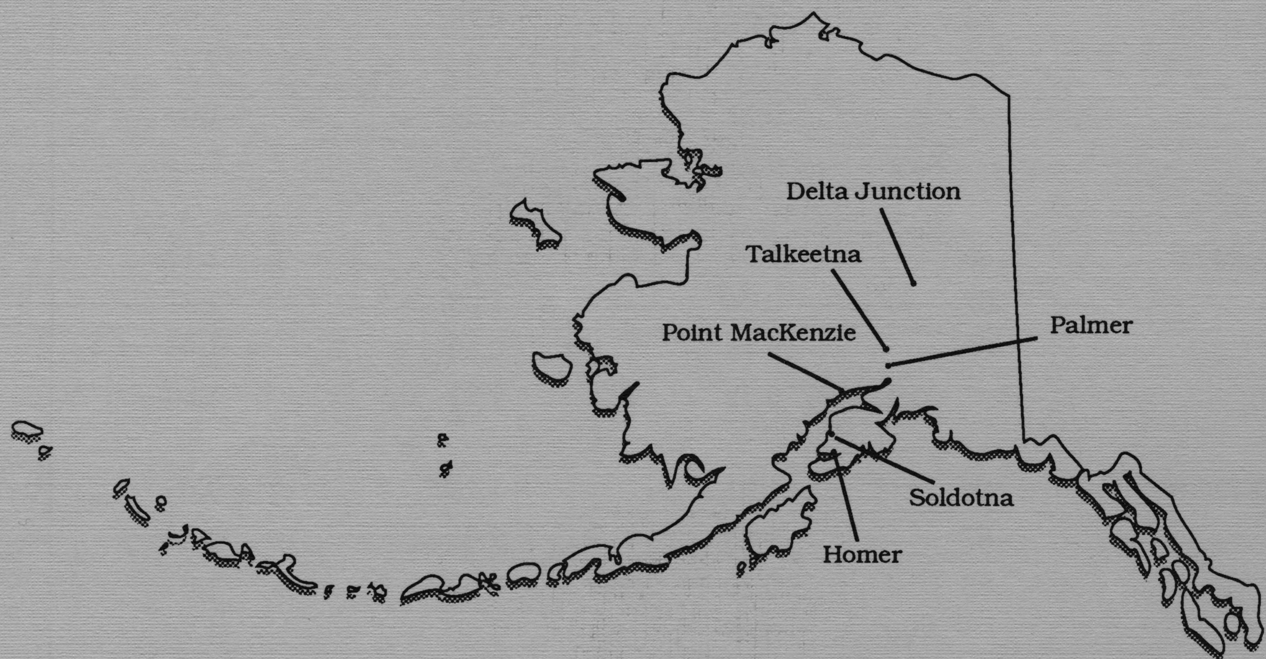
††Figures for 1985 (seeding year) not included in calculation of averages.

Table 6. Second-harvest yields of three perennial grasses in response to four phosphorus treatments at Pt. MacKenzie.

Fertilizer	Harvest year	Engmo timothy	Manchar bromegrass	Reed canarygrass
$N-P_2O_5-K_2O$† lbs/acre		tons per acre		
90-40-80	86	1.01	0.78	1.87
	87	1.03	1.54	2.16
	88	0.22	0.64	1.09
	Avg.	0.75	0.99	1.71
90-80-80	86	1.05	1.27	2.13
	87	0.94	1.68	2.31
	88	0.15	0.69	1.05
	Avg.	0.71	1.21	1.83
90-120-80	86	1.21	1.26	2.05
	87	1.08	2.03	2.29
	88	0.20	0.60	1.01
	Avg.	0.83	1.30	1.78
90-160-80	86	1.22	1.40	2.08
	87	1.00	1.81	2.33
	88	0.21	0.62	1.05
	Avg.	0.81	1.28	1.82

† All plots received 90 lbs N/acre after the first harvest of each year in addition to the indicated spring treatment.

Alaska



Agricultural and Forestry Experiment Station
School of Agriculture and Land Resources Management
University of Alaska Fairbanks
James V. Drew, Dean and Director