NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE SPECIFICATION

NUTRIENT MANAGEMENT

(Acre)

CODE 590

The following tables contain the accepted values to be used in nutrient management planning for Alaska. Use of other values requires approval by the State Resource Conservationist or the State Agronomist.

Crop Removal of N, P, and K

To calculate the amount of N, P, and K removed by a specific crop at a specific yield level use the NRCS plants database Crop Nutrient Tool identified below. An online version is available at the following web site.

http://npk.nrcs.usda.gov

USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Table 1. PLANT NUTRIENT UPTAKE (lbs/unit of prod.)

CROP	Unit	N	P_20_5	K_20
Alfalfa	tons	56.6	13.3	60.0
Alfalfa Haylage	tons	33.48	9.11	33.41
Apples	tons	8	3.67	14.3
Barley	bu	1.45	0.55	1.45
Bromegrass	tons	37.4	9.66	61.2
Corn Grain	bu	0.9	0.37	0.87
Corn Silage	tons	9.0	3.1	9.0
Grass Hay	tons	40	12.86	58.8
Grass Pasture	tons	31.6	12.7	58.8
Hybrid Poplar	tons	7.55	3.76	5.88
Oats	bu	1.15	0.4	1.45
Onions	cwt	0.3	0.13	0.27
Potatoes	cwt	0.5	0.18	0.7
Reed Canarygrass	tons	40.0	14	16.0
Safflower	lbs	0.05	0.03	0.05
Small Grain Haylage	tons	11.2	5.15	9.02
Sorghum/Sudangrass	tons	13.6	3.68	17.4
Sweet Corn	tons	17.8	11.04	13.92
Tall Fescue	tons	39.4	9.2	48
Wheat (Fall Dry)	bu	2	0.75	2
Wheat (Irr)	bu	1.7	0.7	2

From: AWM Ut-2.22.2, Dec 1997, Page 40

Table 2. **Optimum Crop Soil pH Ranges**

	Optimum pH range[1]		Optimum pH range[1]
alfalfa	6.5 - 8.0	lettuce	5.8 - 7.0
apples	4.8 - 6.5	lupine	5.5 - 7.0
apricots	4.8 - 6.5	oats	5.5 - 7.0
barley	6.5 - 8.0	parsnips	5.3 - 6.8
beets	5.8 - 8.0	peas	5.8 - 6.8
blackberries	5.7 - 6.5	peppers	5.3 - 6.8
blueberries	4.0 - 4.8	potatoes	4.9 - 6.2[2]
broccoli	6.0 - 7.5	pumpkins	5.3 - 7.5
brussels sprouts	6.0 - 7.5	quackgrass	5.5 - 6.5
cabbage	5.8 - 8.0	radishes	5.8 - 7.0
carrots	5.3 - 6.8	rape	6.0 - 7.5
cauliflower	5.8 - 7.0	raspberries	5.7 - 6.5
celery	5.8 - 7.0	red fescue	5.5 - 6.5
cherries	4.8 - 6.5	reed canary grass	6.0 - 7.0
chinese cabbage	6.9 - 7.5	rhubarb	5.8 - 7.0
chives	5.8 - 7.0	rutabagas	5.3 - 6.8
clover,		rye	5.0 - 7.0
alsike	5.5 - 7.5	snap beans	5.3 - 6.8
red	6.0 - 7.5	spinach	5.8 - 7.5
white	6.0 - 7.5	strawberries	4.8 - 6.5
cucumbers	5.3 - 6.8	squash	5.3 - 7.5
currants	5.8 - 8.0	timothy	5.5 - 7.5
gooseberries	5.8 - 8.0	tomatoes	5.3 - 7.5
horseradish	5.8 - 7.0	turnips	6.0 - 7.0
kentucky bluegrass	5.5 - 8.0	wheat	6.0 - 8.0
		vetch	5.5 - 7.0

[1] These ranges are estimates only; they are for mineral soils (not mucks or peats).

[2] Potatoes grown at the upper end of this range may be more susceptible to potato scab than those grown at lower pHs.

Source: Walworth, J. L. 1992. *Soil Fertility Basics*. University of Alaska, Cooperative Extension Service Publication100G-00242A.

Table 3. **Lime Requirements to Adjust Soil pH**

Suggested agricultural lime additions for SMP buffer pH for Alaskan soils. Values are expressed as tons of agricultural grade lime[1] required to adjust soil pH to the indicated pH based on an acre 6-inch volume of soil.

	Final pH		
Buffer pH	6.0	6.5	7.0
6.9	0	0	0
6.8	0.3	0.5	0.6
6.7	0.7	1.0	1.2
6.6	1.1	1.4	1.7
6.5	1.5	1.9	2.3
6.4	1.9	2.4	2.9
6.3	2.3	2.9	3.5
6.2	2.7	3.3	4.0
6.1	3.1	3.8	4.5
6.0	3.5	4.3	5.2
5.9	3.9	4.8	5.8
5.8	4.2	5.2	6.3
5.7	4.6	5.8	6.9
5.6	5.0	6.2	7.4
5.5	5.5	6.8	8.0
5.4	5.9	7.2	8.6
5.3	6.2	7.6	9.2
5.2	6.6	8.2	9.8
5.1	7.0	8.6	10.4
5.0	7.4	9.2	11.0
4.9	7.8	9.6	11.6
4.8	8.2	10.2	12.1

[1]Amounts of lime are based on agricultural-grade limestone (95% through 8-mesh and 40% through 100-mesh sieve, and 90% $CaCO_3$ equivalent).

Source: Loynachan, T.E. 1979. *Lime Requirement Indices of Alaskan Soils.* University of Alaska Agricultural Experiment Station Bulletin 52.

Atmospheric Deposition of Nutrients

The National Atmospheric Deposition Program (NADP) maintains two sites in AK. Both sites are in the Interior, one at Poker Creek north of Fairbanks and the second in Denali National Park. You can access data from these sites at:

http://nadp.sws.uiuc.edu/nadpdata/state.asp?state=AK

Based on the historical record from these two NADP sites the average annual deposition of N and K is less than 1 lb./acre therefore, atmospheric deposition of nutrients can be assumed to be insignificant and need not be accounted for in the nutrient budget.

Table 4. Commercial Fertilizer Sources

Fertilizer	Total N%	Available Phosphoric acid %	Soluble Potash %	Equivalent Acidity	Salt Index	Comments
Urea (NH_2-CO-NH_2)	46	0	0	84	75	A dry material in dry or prilled form. Urea-N rapidly hydrolyzes to NH4+. Used for direct application, in mixed fertilizers, and in liquid nitrogen. N at application is present as urea-N. Within 1 day about 66% of urea-N is hydrolyzed to ammonia-N, all within 1 week. When not incorporated, significant N loss by volatilization can occur until approximately 0.5 inch of rain has fallen. Not recommended for starter use. Broadcast (incorporated) or sidedress
Ammonium Nitrate NH_4NO_3	33-34	0	0	63	105	A dry material in dry or prilled form. Half of the N is Nitrate and half ammonium. Used in direct application and in the production of nitrogen solutions. Broadcast or sidedress. Can be left on the surface or incorporated into the soil
Ammonium Sulfate $(NH_4)_2SO_4$	21	0	0	112	69	A dry crystalline material in which the nitrogen is all in the Ammonium form. Produced by 2 methods, by product and synthetic. Used for direct application and blended complete fertilizers. Broadcast or sidedress. Can be left on surface or incorporated into soil. Contains 24% sulfur.
Diammonium Phosphate (DAP)$(NH_4)_2HPO_4$	18-21	46-53	0	74	34	A dry granular or crystalline material. Common analysis 18-46-0. Used for direct application and in blended fertilizers. Starter fertilizers containing DAP should be used with caution. Be sure to band at least 2 inches below seed.
Monoammonium Phosphate (MAP) $NH_4H_2PO_4$	11-13	48-52	0	65?	30	A dry granular material. Common analyses are18-46-0 and 13-52-0. Used for direct application and in blended fertilizers. Makes an excellent starter fertilizer either alone or with a small amount of potash.
Ammonium Phosphate	10	34	0	53	-	A liquid solution (10-34-0). The agronomic effectiveness of APP is similar to that of MAP. Sequesters some micronutrients and impurities in fluid fertilizers keeping them in solution. Also produced as solid material (11-55-0) similar to MAP
Triple Superphosphate $Ca(H_2PO_4)_2$	0	46	0	0	10	A dry granular material. Used for direct application and in blended fertilizers.
Muriate of Potash KCl	0	0	60-62	0	116	A dry crystalline material. Used for direct application and in blended fertilizers.
Potassium Sulfate K_2SO_4	0	0	50	0	46	A dry crystalline material. A specialty fertilizer used for direct application and in blended fertilizers.
Potassium Nitrate KNO_3	13	0	45	-26	74	A dry crystalline material. A specialty fertilizer used for direct application and in blended fertilizers.
Potassium Hydroxide	0	0	70	-89	-	Crystalline material usually used in liquid fertilizers. Basic nature of this material allows production of neutral liquid fertilizers. Primarily used as a liquid starter fertilizer.

Table 5. Approximate Nutrient Content of Various Manures

Type of Animal	Dry Manure Production Values-As Excreted per AU (1000#)					
	N lb/day	P_2O_5 lb/day	K_2O lb/day	Volume cu ft/d	Weight lb/day	Moisture %
Beef (Cow)	0.33	0.27	0.31	1.02	63	88
Beef (Feedlot)	0.21	0.32	0.04	0.29	18	45
Beef (Yrlng)	0.30	0.23	0.24	0.89	55	87
Dairy (Dry)	0.36	0.11	0.28	1.32	82	88
Dairy (Lact)	0.45	0.16	0.31	1.29	80	88
Ducks	0.70	0.69	0.60	0.73	46	75
Goats	0.45	0.11	0.31	0.63	40	75
Heifers	0.31	0.09	0.29	1.37	85	89
Horses	0.28	0.11	0.23	0.81	50	78
Poultry (Layr)	0.83	0.71	0.41	0.96	61	75
Poultry (Pull)	0.62	0.55	0.31	0.73	46	75
Sheep	0.45	0.16	0.36	0.63	40	75
Swine (Boar)	0.15	0.11	0.12	0.34	21	91
Swine (Gest)	0.19	0.14	0.15	0.44	27	91
Swine (Grow)	0.42	0.37	0.27	1.02	63	90
Swine (Lact)	0.47	0.34	0.36	0.96	60	90
Swine (Nurs)	0.60	0.57	0.42	1.70	106	90
Turkey (w/litter)	0.88	0.92	0.54	0.38	24	34
Turkeys	0.74	0.64	0.34	0.69	44	75

From: AWMFH, Chapter 4, p 8-17

References to be used to determine Nutrient Application Rates in Absence of a Soil Test and Recommendation from AK Cooperative Extension Service

Field Crop Fertilizer Recommendations For Alaska - CEREAL GRAINS

G. A. Mitchell, 1992. University of Alaska Cooperative Extension Service Publication 100G-00442

Field Crop Fertilizer Recommendations For Alaska - FORAGE CROPS

M. T. Panciera and R. G. Gavlak, 1993. University of Alaska Cooperative Extension Service Publication 100G-00149A

Field Crop Fertilizer Recommendations For Alaska - POTATOES

J. L. Walworth, 1993. University of Alaska Cooperative Extension Service Publication 100G-00246A

Field Crop Fertilizer Recommendations For Alaska - VEGETABLES

J. L. Walworth, 1995. University of Alaska Cooperative Extension Service Publication 100G-00643A

Seedings for conservation purposes rather than production, such as Conservation Cover and Critical Area Planting, will use fertilizer recommendations from:

A Revegetative Guide for Conservation Use in Alaska

1991, University of Alaska Cooperative Extension Service Publication 100C-00146

REFERENCES:

The Effect of Nitrogen Fertilization Rates on Yields of Transplanted and Direct Seeded Head Lettuce.
Walworth, J. L., D. E. Carling,., G. J. Michaelson, C. L. Ping, 1990 University of Alaska Agricultural Experiment Station Research Progress Report #10

Effect of Residual Soil Nitrogen and Applied Nitrogen on Yields of Head Lettuce.
Carling, D. E., G. J. Michaelson, C. L. Ping, 1988 University of Alaska Agricultural Experiment Station Research Progress Report #6

Field Crop Fertilizer Recommendations For Alaska - CEREAL GRAINS.
G. A. Mitchell, 1992. University of Alaska Cooperative Extension Service Publication 100G-00442

Field Crop Fertilizer Recommendations For Alaska - FERTILIZER NUTRIENT SOURCES AND LIME.
Gavlak, R. G., 1992. University of Alaska Cooperative Extension Service Publication 100G-00348

Field Crop Fertilizer Recommendations For Alaska - FORAGE CROPS.
M. T. Panciera and R. G. Gavlak, 1993. University of Alaska Cooperative Extension Service Publication 100G-00149A

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Loynachan, T. E. 1979, University of Alaska Agricultural Experiment Station Bulletin 52.

Nitrogen Fixation By Legumes in Interior Alaska.
Sparrow, S. D. 1990, University of Alaska Agricultural Experiment Station Research Progress Report #17

Organic Fertilizers.
Johnson, C. L., 1992. University of Alaska Cooperative Extension Service Publication 100G-00349

Plant Tissue Testing.
Walworth, J. L. 1992, University of Alaska Cooperative Extension Service Publication 100G-00243D

Relating Mehlich 3 extractable P to Morgan and Bray 1 extractable P for Alaska soils.
Michaelson, G. J., R. G. Gavlak, C. L. Ping 1991,University of Alaska Agricultural Experiment Station Circular 81

Soil Fertility Basics.
Walworth, J. L. 1992, University of Alaska Cooperative Extension Service Publication 100G-00242A

Soil Sampling and Analysis.
Walworth, J. L. 1992, University of Alaska Cooperative Extension Service Publication 100G-00044G