TECHNICAL NOTES

NATURAL RESOURCES CONSERVATION SERVICE – WYOMING

AGRONOMY NO. 20 **July 18, 2002**

SUBJECT: Liquid Waste Utilization Application Guidelines/Sizing Vegetated Areas

This Technical Note is only for use where retention of wastewater runoff is a possibility. The data herein is NOT to be used for any other purpose. The following guidelines provide information that NRCS personnel can use in the **preliminary steps of planning** Agricultural Waste Systems. These are only intended as general guidelines, as development of site-specific Waste Utilization/Nutrient Management plans still requires quantification of application rates based upon soil test values, site-specific crop yield goals, and using approved tools such as the ECS – 45B.

LIQUID PRODUCTION

This technical note assumes that the average animal requires 300 square feet of feedlot space to meet its various requirements. Table 1 converts animal numbers to acreage of feedlot.

TABLE 1 – FEEDLOT AREA BY ANIMAL NUMBER

Number of Animals	Square Feet	Acres
150	45,000	1.0
200	60,000	1.4
250	75,000	1.7
300	90,000	2.1
350	105,000	2.4
400	120,000	2.8
450	135,000	3.1
500	150,000	3.4
550	165,000	3.8
600	180,000	4.1
650	195,000	4.5
700	210,000	4.8
750	225,000	5.2
800	240,000	5.5
850	255,000	5.9
900	270,000	6.2
950	285,000	6.5
1000	300,000	6.9
1250	375,000	8.6
1500	450,000	10.3
1750	525,000	12.2
2000	600,000	13.8
2500	750,000	17.2
3000	900,000	20.7

Once the approximate or actual area of the feedlot is calculated from animal numbers **(if the actual area of the feedlot is known, use that value)**, we can determine the runoff volumes. Table 2 provides runoff depths for various Runoff Curve Numbers and rainfall events (see Figures 1 and 2 for various Runoff Depths by Storm Event). Feedlot facilities typically have a curve number of 90; however, a weighted curve number for the area may need to be determined if there are buildings, paved areas, etc. contained within the area. Any clean water runoff from upstream fields, etc. should be diverted around and/or away from the feedlot area.

TABLE 2 - RUNOFF DEPTH FOR SELECTED CN'S AND RAINFALL AMOUNTS

	Runoff Curve Number								
Rainfall	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**
1.0	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56
1.2	0.00	0.00	0.00	0.03	0.07	0.15	0.27	0.46	0.74
1.4	0.00	0.00	0.02	0.06	0.13	0.24	0.39	0.61	0.92
1.6	0.00	0.01	0.05	0.11	0.20	0.34	0.52	0.76	1.11
1.8	0.00	0.03	0.09	0.17	0.29	0.44	0.65	0.93	1.29
2.0	0.02	0.06	0.14	0.24	0.38	0.56	0.80	1.09	1.48
2.5	0.08	0.17	0.30	0.46	0.65	0.89	1.18	1.53	1.96
3.0	0.19	0.33	0.51	0.71	0.96	1.25	1.59	1.98	2.45
3.5	0.35	0.53	0.75	1.01	1.30	1.64	2.02	2.45	2.94
4.0	0.53	0.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43
4.5	0.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92
5.0	0.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42

Once we know our area and runoff depth, we can calculate the runoff volume.

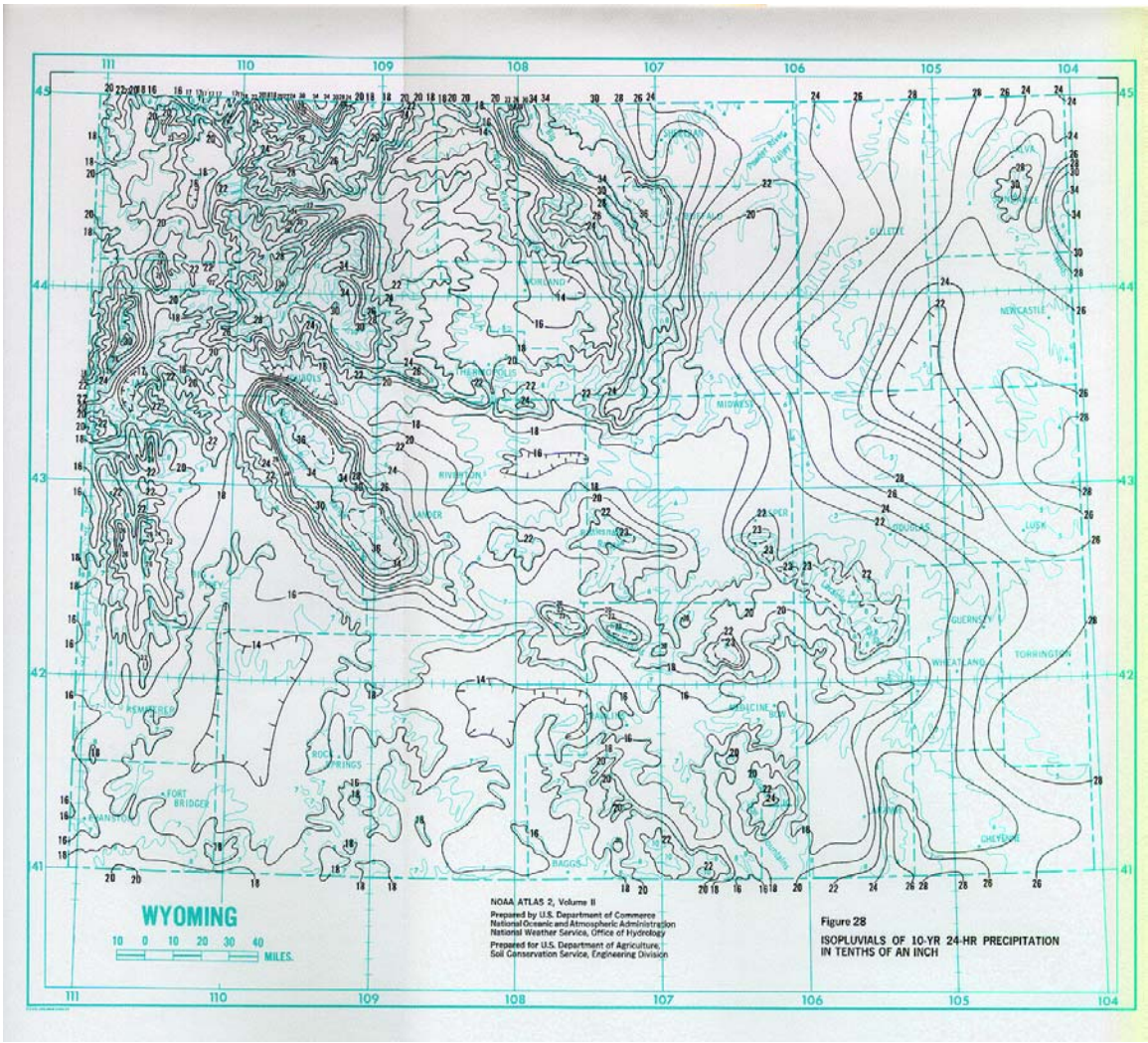
$$\text{Runoff Volume} = \frac{\text{Runoff Depth (From Table 2) x Runoff Area}}{\text{12"/foot}}$$

This yields a runoff volume in cubic feet (ft^3). To convert to gallons, multiply by 7.481 gallons per cubic foot. Because most feedlots have a weighted Runoff Curve Number of 90, we can calculate total gallons of runoff for varying areas and typical Wyoming rainfall events.

TABLE 3 – TOTAL GALLONS FOR VARIOUS AREAS AND RAINFALL EVENTS – RUNOFF CURVE NUMBER 90

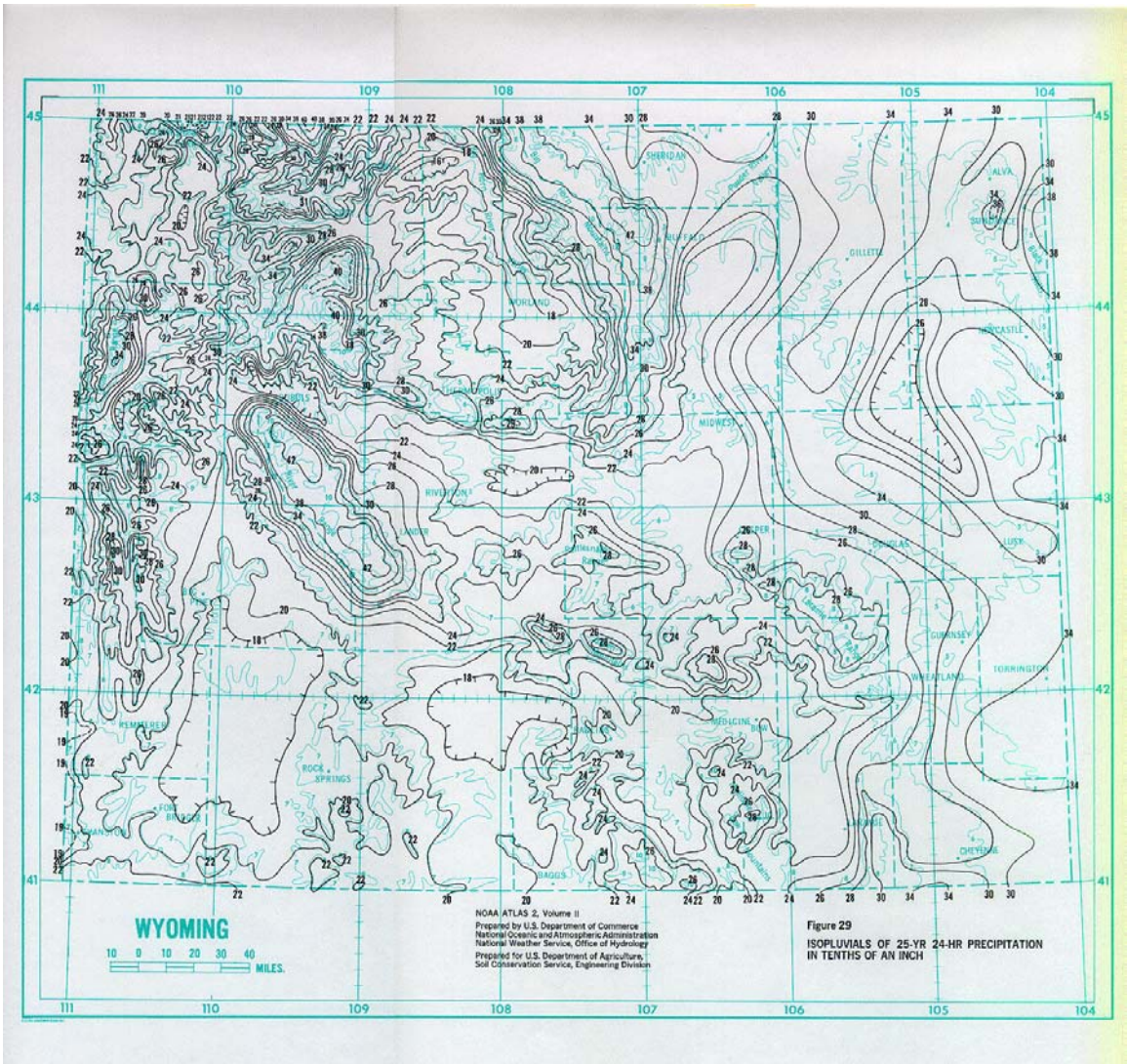
	Area (acres)								
Rainfall	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
1.4	8,283	16,565	24,849	33,132	41,415	49,698	57,981	66,264	74,547
1.6	10,319	20,639	30,958	41,277	51,596	61,915	72,235	82,554	92,873
1.8	12,628	25,255	37,883	50,510	63,138	75,765	88,393	101,020	113,648
2.0	14,800	29,600	44,400	59,200	74,000	88,800	103,600	118,400	133,200
2.5	20,774	41,549	62,323	83,097	103,872	124,646	145,421	166,195	186,969
3.0	26,884	53,769	80,653	107,538	134,422	161,307	188,191	215,076	241,960

FIGURE 1 – ISOPLUVIALS OF 10 YR – 24 HR PRECIPITATION IN TENTHS OF AN INCH



SEE NOAA ATLAS 2 PRECIPITATION FREQUENCY ATLAS OF THE WESTERN UNITES STATES FOR FURTHER INFORMATION

FIGURE 2 – ISOPLUVIALS OF 25 YR – 24 HR PRECIPITATION IN TENTHS OF AN INCH



SEE NOAA ATLAS 2 PRECIPITATION FREQUENCY ATLAS OF THE WESTERN UNITES STATES FOR FURTHER INFORMATION

NUTRIENT PRODUCTION

Unless site-specific data is available, the nutrient content of liquid waste can be approximated by; Nitrogen – 1.67 lbs per 1,000 gallons; Ammonia – 1.5 lbs per 1,000 gallons; Phosphorus – 0.5 lbs per 1,000 gallons; Potassium – 7.5 lbs per 1,000 gallons (AWMFH Table 4-10).

However, only a portion of these totals is plant available. For instance, we convert the phosphorus to P_2O_5 by multiplying the 0.5 by 2.29 and by 90% mineralization rate. Table 4 shows the assumed plant-available nutrient values as N, P_2O_5 and K_2O.

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TABLE 4 – PLANT AVAILABLE NUTRIENTS

Nutrient	Lbs Available per 1,000 Gallons
Nitrogen (all forms)	2.7
Phosphorus (P_2O_5)	1.0
Potassium (K_2O)	8.6

Since potassium presents no known environmental hazard, and the application of the retained water will not be a frequent event, it is appropriate to determine the application rate based upon the nitrogen or phosphorus rates. Therefore, no potassium-based data follows.

CROP NUTRIENT REQUIREMENTS

Crop nutrient requirements vary widely depending upon realistic yield goals and inherent and/or residual soil nutrient content. Approximate crop nutrient values are reflected in Table 5 and are based on average soil organic matter values, low soil test values for N, P, and K and a medium textured soil. **More accurate crop nutrient requirements would be realized by the use of proper soil test information and by using the Wyoming Guide to Fertilizer Recommendations (Agronomy Tech Note 10).**

TABLE 5 – AVERAGE CROP NUTRIENT REQUIREMENTS

Crop	Yield	Nitrogen (lbs/acre)	Phosphorus (lbs/acre)
Corn	20 ton silage	145	70
	25 ton silage	190	85
	30 ton silage	235	100
Corn	100 bu grain	155	70
	125 bu grain	195	85
	150 bu grain	235	100
Barley	50 bu grain	43	5
	75 bu grain	81	23
	100 bu grain	120	40

TABLE 5 – AVERAGE CROP NUTRIENT REQUIREMENTS (cont'd)

Crop	Yield	Nitrogen (lbs/acre)	Phosphorus (lbs/acre)
Wheat	50 bu grain	51	0
	75 bu grain	94	15
	100 bu grain	137	50
Alfalfa[1]	1 ton	0	25
	2 ton	0	40
	3 ton	0	55
	4 ton	0	70
	5 ton	0	85
Alfalfa[2]	1 ton	65	25
	2 ton	125	40
	3 ton	190	55
	4 ton	250	70
	5 ton	315	85
Grass Hay	1 ton	50	0
	2 ton	90	15
	3 ton	130	30
	4 ton	170	45
	5 ton	210	60

[1] Assumes producer has inoculated with proper Rhizobium species, and wishes to maintain proper symbiotic fixation. Therefore, manure will be applied at a phosphorus-based rate, and symbiotic fixation by Rhizobium bacteria will satisfy the alfalfa nitrogen requirement.

[2] Assumes producer is not concerned with maintaining a functioning legume/Rhizobium symbiosis and will apply at a nitrogen-based rate. Therefore, symbiotic fixation by Rhizobium bacteria will not account for any of the alfalfa nitrogen requirement. These rates assume an average alfalfa nitrogen requirement of 50 lbs per ton adjusted upwards 25% to account for volatilization losses due to surface application with no incorporation of applied manure. In these scenarios, planners should pay close attention to subsequent soil nitrate levels after application at nitrogen-based rates.

LIQUID APPLICATION RATES AND AREA DETERMINATION

Once the nutrients supplied by the liquid, and the nutrients required by the crop are determined, an approximate liquid application rate can be calculated. To determine the application rate, divide the pounds per acre of nutrient required by the crop, by the pounds of nutrient per 1,000 gallons of liquid.

Example:

STEP 1 – Area Determination

The ABC Feedlot feeds 500 steers. From Table 1, column #3, we assume that is approximately equal to 3.4 acres. The planner may want to add additional acres for feed lanes, and other miscellaneous areas, therefore we will use 4 acres for our example.

STEP 2 – Liquid Production

The ABC Feedlot wants to retain the runoff from a 25-year, 24-hour event, which for our example location is 1.8 inches. From Table 3, we find that equates to approximately 101,020 gallons of liquid to retain.

STEP 3 – Nutrient Production

From Table 4, we determine that the 101,020 gallons of liquid will contain approximately 270 lbs of available nitrogen, 100 lbs of available phosphorus (as P_2O_5) and 860 pounds of available potassium (as K_2O).

STEP 4 – Nutrient Requirement

The ABC Feedlot will apply the retained liquid on a grass meadow. They estimate the production to be 2 tons per acre. From Table 5, the grass will need approximately 90 lbs of nitrogen per acre, and 15 lbs of phosphorus per acre.

STEP 5 – Nutrient Utilization

Knowing the nutrient production and the nutrient utilization, the acreage requirement is calculated:

270 lbs of nitrogen ÷ 90 lbs of N/acre = 3.0 acres of grass meadow required for nitrogen-based application.

100 lbs of phosphorus ÷ 15 lbs of P_2O_5/acre = 6.6 acres of grass meadow required for phosphorus-based application.

WORKSHEET FOR CALCULATING ACREAGE BASE

PRODUCER _____ DATE_____ FIELD_____

ASSISTED BY_____ CROP_____ YIELD _____

RAINFALL EVENT _____YR _____HR. RAINFALL EVENT (IN)_____

STEP 1 – AREA DETERMINATION

Number of Animals	Table 1, Column 3	OR	Known Feedlot Area (Acres)
_____	_____	OR	_____ Acres

STEP 2 – LIQUID PRODUCTION

Table 3 Value
_____ gallons

STEP 3 – NUTRIENT PRODUCTION

Nitrogen

Step 2 Value (gallons)	x	Table 4 Value (lbs/1,000 gallons)	÷	1,000	=	Pounds of Nutrient
_____	x	_____	÷	1,000	=	_____ Lbs.

Phosphorus

Step 2 Value (gallons)	x	Table 4 Value (lbs/1,000 gallons)	÷	1,000	=	Pounds of Nutrient
_____	x	_____	÷	1,000	=	_____ Lbs.

STEP 4 – NUTRIENT REQUIREMENT

Table 5 Value for Nitrogen	Table 5 Value for Phosphorus
_____ lbs/acre	_____ lbs/acre

STEP 5 – AREA REQUIREMENT

Nitrogen

Step 3 Product	÷	Step 4 Value	=	Required Area of Crop (Acres)
_____		_____		_____ Acres

Phosphorus

Step 3 Product	÷	Step 4 Value	=	Required Area of Crop (Acres)
_____		_____		_____ Acres

STEP 6 – WIDTH REQUIREMENT

Nitrogen

Step 5 Value	x	43,560	÷	Crop/Filter Strip Length (ft.)	=	Required Width (ft.)
_____	x	43,560	÷	_____ (ft.)	=	_____ (ft.)

Phosphorus

Step 5 Value	x	43,560	÷	Crop/Filter Strip Length (ft.)	=	Required Width (ft.)
_____	x	43,560	÷	_____ (ft.)	=	_____ (ft.)

An alternative method to determine the required acreage is the use of Tables 6A – 6F. Each of the values in the tables represents the required crop acreage needed to utilize the nutrients in various runoff events (1.8 inch – 3.0 inch events) from 1.0 acre of feedlot area. Therefore, to calculate the approximate area needed for any size feedlot, simply multiply the estimated or known area by the "Area Required" value from the appropriate table.

For the example above, we would use Table 6C since it represents the areas needed for the 1.8-inch storm event. We calculated the approximate feedlot area to be 4.0 acres.

From Table 6C, we find that the area of 2-ton grass hay to utilize our nutrients is:
Nitrogen-based – 0.76
Phosphorus-based – 1.68 acres

However, we have approximately 4 acres in our example, so we must multiply the acreage values by 4. Therefore the acreage required is:
Nitrogen- based – 4 x 0.76 = 3.0 acres
Phosphorus-based – 4 x 1.68 = 6.7 acres

The ABC Feedlot feels they can achieve uniform flow over 200 feet of the grass hay. Based on the 3.0 acres of area we need, a minimum width of grass hay can be calculated.
(200 ft x Z ft)/43,560 ft^2/acre = 3.0 acres

Solving for Q gives us a minimum width of 653 feet for a nitrogen-based application.

Conservation planners MUST use caution in using this Technical Note to size vegetated filter strips. There are many variables that determine the potential efficacy of filter strips to retain nutrients or fecal coliform. Some of them include:

- Ability to achieve laminar flow
- Slope Gradient
- Slope Length
- Runoff Curve Number
- Surface Soil Properties
- Roughness Coefficient
- Storm Intensity

This Technical Note is ONLY for preliminary planning purposes. It is the policy of the NRCS to base all Nutrient Management Plans on soil test values that are no more than 5 years old. Refer to Agronomy Tech Notes 10 and 12, 14, 15, 18 and 19 for completing site-specific Nutrient Management Plans.

This Technical Note is NOT to be used for purposes of sizing retention structures.

WORKSHEET FOR CALCULATING ACREAGE BASE USING TABLES 6A – 6F

PRODUCER _____ DATE_____

FIELD_____ ASSISTED BY_____

CROP _____ YIELD _____ ACRES AVAILABLE_____

RAINFALL EVENT _____YR _____HR. RAINFALL EVENT (IN)_____

STEP 1 – AREA DETERMINATION

Number of Animals	Table 1, Column 3	OR	Known Feedlot Area (Acres)
_____	_____	OR	_____ Acres

STEP 2 – AREA DETERMINATION FOR 1 ACRE

Nitrogen

Table 6 Value
_____ Acres

Phosphorus

Table 6 Value
_____ Acres

STEP 3 – AREA DETERMINATION FOR FEEDLOT

Nitrogen

Step 1 Value	x	Step 2 Value	=	Required Area of Crop (Acres)
_____		_____		_____ Acres

Phosphorus

Step 1 Value	x	Step 2 Value	=	Required Area of Crop (Acres)
_____		_____		_____ Acres

STEP 4 – WIDTH REQUIREMENT

Nitrogen

Step 3 Value x 43,560 ÷ Crop/Filter Strip Length (ft.) = Required Width (ft.)

_____ x 43,560 ÷ Crop/Filter Strip Length (ft.) = _____ (ft.)

Phosphorus

Step 3 Value x 43,560 ÷ Crop/Filter Strip Length (ft.) = Required Width (ft.)

_____ x 43,560 ÷ Crop/Filter Strip Length (ft.) = _____ (ft.)

TABLE 6A – AVERAGE REQUIRED AREA BY CROP AND CROP YIELD FOR 1 ACRE OF RETAINED FEEDLOT RUNOFF AND A 1.4" RAINFALL EVENT

Crop	Yield	N Based Rate Area Required (acres)	P Based Rate Area Required (acres)
Corn	20 ton silage	0.31	0.24
	25 ton silage	0.24	0.19
	30 ton silage	0.19	0.17
Corn	100 bu grain	0.29	0.24
	125 bu grain	0.23	0.19
	150 bu grain	0.19	0.17
Barley	50 bu grain	1.04	3.30
	75 bu grain	0.55	0.72
	100 bu grain	0.37	0.41
Wheat	50 bu grain	0.88	N/A
	75 bu grain	0.48	1.10
	100 bu grain	0.33	0.33
Alfalfa	1 ton	N/A	0.66
	2 ton	N/A	0.41
	3 ton	N/A	0.30
	4 ton	N/A	0.23
	5 ton	N/A	0.19
Alfalfa	1 ton	0.69	0.66
	2 ton	0.36	0.41
	3 ton	0.24	0.30
	4 ton	0.18	0.23
	5 ton	0.14	0.19
Grass Hay	1 ton	0.90	N/A
	2 ton	0.50	1.10
	3 ton	0.34	0.55
	4 ton	0.26	0.37
	5 ton	0.21	0.28

Table 6A displays approximate areas by crop and crop yield. This table assumes a RCN of 90, a 1.4 inch rainfall event and 1.0 acres of feedlot (16,565 gallons of liquid to utilize).

Application at nitrogen-based rates may over-apply phosphorus. Therefore, it becomes important to evaluate potential phosphorus losses using a risk assessment tool such as the Phosphorus Index. See Agronomy Technical Note #15.

TABLE 6B – AVERAGE REQUIRED AREA BY CROP AND CROP YIELD FOR 1 ACRE OF RETAINED FEEDLOT RUNOFF AND A 1.6" RAINFALL EVENT

Crop	Yield	N Based Rate Area Required (acres)	P Based Rate Area Required (acres)
Corn	20 ton silage	0.38	0.29
	25 ton silage	0.29	0.24
	30 ton silage	0.24	0.21
Corn	100 bu grain	0.36	0.29
	125 bu grain	0.29	0.24
	150 bu grain	0.24	0.21
Barley	50 bu grain	1.30	4.13
	75 bu grain	0.69	0.89
	100 bu grain	0.46	0.52
Wheat	50 bu grain	1.09	N/A
	75 bu grain	0.59	1.38
	100 bu grain	0.41	0.41
Alfalfa	1 ton	N/A	0.83
	2 ton	N/A	0.52
	3 ton	N/A	0.37
	4 ton	N/A	0.29
	5 ton	N/A	0.24
Alfalfa	1 ton	0.85	0.83
	2 ton	0.44	0.51
	3 ton	0.30	0.38
	4 ton	0.22	0.29
	5 ton	0.18	0.24
Grass Hay	1 ton	1.10	N/A
	2 ton	0.62	1.37
	3 ton	0.43	0.69
	4 ton	0.33	0.46
	5 ton	0.27	0.34

Table 6B displays approximate areas by crop and crop yield. This table assumes a RCN of 90, a 1.6 inch rainfall event and 1.0 acres of feedlot (20,639 gallons of liquid to utilize).

Application at nitrogen-based rates may over-apply phosphorus. Therefore, it becomes important to evaluate potential phosphorus losses using a risk assessment tool such as the Phosphorus Index. See Agronomy Technical Note #15.

TABLE 6C – AVERAGE REQUIRED AREA BY CROP AND CROP YIELD FOR 1 ACRE OF RETAINED FEEDLOT RUNOFF AND A 1.8" RAINFALL EVENT

Crop	Yield	N Based Rate Area Required (acres)	P Based Rate Area Required (acres)
Corn	20 ton silage	0.47	0.36
	25 ton silage	0.36	0.30
	30 ton silage	0.29	0.25
Corn	100 bu grain	0.44	0.36
	125 bu grain	0.35	0.30
	150 bu grain	0.29	0.25
Barley	50 bu grain	1.59	5.05
	75 bu grain	0.84	1.10
	100 bu grain	0.57	0.63
Wheat	50 bu grain	1.34	N/A
	75 bu grain	0.73	1.68
	100 bu grain	0.50	0.51
Alfalfa	1 ton	N/A	1.01
	2 ton	N/A	0.63
	3 ton	N/A	0.47
	4 ton	N/A	0.36
	5 ton	N/A	0.29
Alfalfa	1 ton	1.05	1.01
	2 ton	0.55	0.63
	3 ton	0.36	0.46
	4 ton	0.27	0.36
	5 ton	0.22	0.29
Grass Hay	1 ton	1.36	N/A
	2 ton	0.76	1.68
	3 ton	0.52	0.84
	4 ton	0.40	0.56
	5 ton	0.32	0.42

Table 6C displays approximate areas by crop and crop yield. This table assumes a RCN of 90, a 1.8 inch rainfall event and 1.0 acres of feedlot (25,255 gallons of liquid to utilize).

Application at nitrogen-based rates may over-apply phosphorus. Therefore, it becomes important to evaluate potential phosphorus losses using a risk assessment tool such as the Phosphorus Index. See Agronomy Technical Note #15.

TABLE 6D – AVERAGE REQUIRED AREA BY CROP AND CROP YIELD FOR 1 ACRE OF RETAINED FEEDLOT RUNOFF AND A 2.0" RAINFALL EVENT

Crop	Yield	N Based Rate Area Required (acres)	P Based Rate Area Required (acres)
Corn	20 ton silage	0.55	0.42
	25 ton silage	0.42	0.35
	30 ton silage	0.34	0.30
Corn	100 bu grain	0.52	0.42
	125 bu grain	0.41	0.35
	150 bu grain	0.34	0.30
Barley	50 bu grain	1.86	5.92
	75 bu grain	0.99	1.29
	100 bu grain	0.67	0.74
Wheat	50 bu grain	1.57	N/A
	75 bu grain	0.85	1.97
	100 bu grain	0.58	0.59
Alfalfa	1 ton	N/A	1.18
	2 ton	N/A	0.74
	3 ton	N/A	0.54
	4 ton	N/A	0.42
	5 ton	N/A	0.34
Alfalfa	1 ton	1.23	1.18
	2 ton	0.64	0.74
	3 ton	0.42	0.54
	4 ton	0.32	0.42
	5 ton	0.25	0.34
Grass Hay	1 ton	1.60	N/A
	2 ton	0.89	1.97
	3 ton	0.61	1.00
	4 ton	0.47	0.66
	5 ton	0.38	0.49

Table 6D displays approximate areas by crop and crop yield. This table assumes a RCN of 90, a 2.0 inch rainfall event and 1.0 acres of feedlot (29,600 gallons of liquid to utilize).

Application at nitrogen-based rates may over-apply phosphorus. Therefore, it becomes important to evaluate potential phosphorus losses using a risk assessment tool such as the Phosphorus Index. See Agronomy Technical Note #15.

TABLE 6E – AVERAGE REQUIRED AREA BY CROP AND CROP YIELD FOR 1 ACRE OF RETAINED FEEDLOT RUNOFF AND A 2.5" RAINFALL EVENT

Crop	Yield	N Based Rate Area Required (acres)	P Based Rate Area Required (acres)
Corn	20 ton silage	0.77	0.59
	25 ton silage	0.59	0.49
	30 ton silage	0.48	0.42
Corn	100 bu grain	0.72	0.59
	125 bu grain	0.57	0.49
	150 bu grain	0.48	0.42
Barley	50 bu grain	2.60	8.30
	75 bu grain	1.40	1.80
	100 bu grain	0.93	1.00
Wheat	50 bu grain	2.19	N/A
	75 bu grain	1.19	2.80
	100 bu grain	0.82	0.83
Alfalfa	1 ton	N/A	1.67
	2 ton	N/A	1.04
	3 ton	N/A	0.76
	4 ton	N/A	0.59
	5 ton	N/A	0.49
Alfalfa	1 ton	1.72	1.66
	2 ton	0.89	1.04
	3 ton	0.59	0.76
	4 ton	0.45	0.59
	5 ton	0.36	0.49
Grass Hay	1 ton	2.24	N/A
	2 ton	1.25	2.77
	3 ton	0.86	1.38
	4 ton	0.66	0.92
	5 ton	0.53	0.69

Table 6E displays approximate areas by crop and crop yield. This table assumes a RCN of 90, a 2.5 inch rainfall event and 1.0 acres of feedlot (41,549 gallons of liquid to utilize).

Application at nitrogen-based rates may over-apply phosphorus. Therefore, it becomes important to evaluate potential phosphorus losses using a risk assessment tool such as the Phosphorus Index. See Agronomy Technical Note #15.

TABLE 6F – AVERAGE REQUIRED AREA BY CROP AND CROP YIELD FOR 1 ACRE OF RETAINED FEEDLOT RUNOFF AND A 3" RAINFALL EVENT

Crop	Yield	N Based Rate Area Required (acres)	P Based Rate Area Required (acres)
Corn	20 ton silage	1.00	0.77
	25 ton silage	0.76	0.63
	30 ton silage	0.62	0.54
Corn	100 bu grain	0.94	0.77
	125 bu grain	0.74	0.63
	150 bu grain	0.62	0.54
Barley	50 bu grain	3.37	10.75
	75 bu grain	1.79	2.34
	100 bu grain	1.21	1.34
Wheat	50 bu grain	2.84	N/A
	75 bu grain	1.54	3.58
	100 bu grain	1.06	1.07
Alfalfa	1 ton	N/A	2.15
	2 ton	N/A	1.34
	3 ton	N/A	0.98
	4 ton	N/A	0.77
	5 ton	N/A	0.63
Alfalfa	1 ton	2.23	2.15
	2 ton	1.16	1.34
	3 ton	0.76	0.98
	4 ton	0.58	0.77
	5 ton	0.46	0.63
Grass Hay	1 ton	2.90	N/A
	2 ton	1.61	3.58
	3 ton	1.12	1.79
	4 ton	0.85	1.19
	5 ton	0.69	0.89

Table 6F displays approximate areas by crop and crop yield. This table assumes a RCN of 90, a 3.0 inch rainfall event and 1.0 acres of feedlot (53,769 gallons of liquid to utilize).

Application at nitrogen-based rates may over-apply phosphorus. Therefore, it becomes important to evaluate potential phosphorus losses using a risk assessment tool such as the Phosphorus Index. See Agronomy Technical Note #15.