Pasture Guidance

NRCS Prescribed Grazing Job Sheet- Code 528

A prescribed grazing system consists of properly managed stands of forage crops that are managed in such a way as to protect the natural resources. Stocking rates and grazing management are linked together to accomplish the objectives.

DEFINITION

The controlled harvest of vegetation with grazing or browsing animals, managed with the intent to achieve a specified objective.

PURPOSES

This practice is to be applied as part of a conservation management system to maintain or improve the following: the health and vigor of desired plant communities, livestock health and productivity, soil condition, water quality or quantity and availability, economic stability and reduction of accelerated erosion.

RESOURCE MANAGEMENT SYSTEM

Prescribed grazing systems are a combination of practices installed and managed to protect the forage resources to reduce erosion, improve water quality and quantity, improve air quality, conserve energy, complement and or improve wildlife habitat, and promote economic viability of producers.

OPERATION AND MAINTENANCE

Apply the prescribed grazing plan annually, adjusting as conditions require. Maintain travel surfaces, stream crossings, feeding areas and other conservation practices to insure for protection of natural resources. Repair or replace fences to control livestock. Maintain the watering system to provide proper quality and quantity of water and adjust available forage or livestock numbers to assure proper forage utilization. In times of prolonged drought or excessive moisture, livestock shall be moved to an area for confinement and feeding until weather conditions allow for proper grazing.

SPECIFICATIONS FOR GRAZING SYSTEMS

Information that is needed to successfully plan and manage a grazing operation is included on this job sheet. Specifications are prepared in accordance with the NRCS Conservation Practice Standard Prescribed Grazing (Code 528). Formulas needed to calculate animal information, stocking rates, grazing information, available forage, additional feed needed, number of paddocks and total acres needed are presented in each section of the job sheet. If co-grazing, do not use this job sheet and instead contact your grazing specialist.

Specifications for Grazing Systems

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1. Landowner Objectives:

2. Animal Information **Total Live Weight = total number of animals * average animal weight**

	Benchmark	Option #1	Option #2	Option #3
Animal Type / Species				
Feed Supplement (lbs/animal/day)				
Number of Animals				
Average Animal Weight (lbs) *(See Table 2)*				
Total Live Weight (lbs)	-	-	-	-
% Body Weight DM Needs/Day *(See Table 4)*				
% Utilization *(See Table 5)*				

3. Stocking Rate Calculation (Whole Farm) = AU/Acres Planned to be Grazed

AU = total number of animals * average animal weight / 1,000 lbs.

	Benchmark	Option #1	Option #2	Option #3
Total Number of Animals Grazing				
Average Weight of Animal				
Animal Unit (AU)				
Acres Planned to be Grazed				
AU/Ac*				

*Note - If there is **more than 1 AU/Ac**, complete the pasture nutrient calculator to determine if the stocking rate

4. Grazing Information

	Benchmark	Option #1	Option #2	Option #3
Length of Grazing Season (days) *(Reference Table 3)*	0	0	0	0
Start Date				
Stop Date				
Number of Hours per Day on Pasture				
Shade Preferred?	YES	NO	NO	NO
Occupation Period (Days/Paddock)				

5. Forage Information

Pasture Fields **Lbs of Forage produced = Lbs DM/Ac. Produced/ Acres of Pasture**

Forage Species/Mix 1	
Turn in Height (in.) *(See Table 1)*	
Removal Height (in.) *(See Table 1)*	
Acres of Pasture	
Lbs DM/Ac. Produced *(See Table 1)*	
Lbs Forage Produced	0
Forage Species/Mix 2	
Turn in Height (in.) *(See Table 1)*	
Removal Height (in.) *(See Table 1)*	
Acres of Pasture	
Lbs DM/Ac. Produced *(See Table 1)*	
Lbs Forage Produced	0
Forage Species/Mix 3	
Turn in Height (in.) *(See Table 1)*	
Removal Height (in.) *(See Table 1)*	
Acres of Pasture	
Lbs DM/Ac. Produced *(See Table 1)*	
Lbs Forage Produced	0

Grazed Hay Fields **Lbs of Forage produced = Lbs DM/Ac. Produced/ Acres of Grazed Hay Fields**

Forage Species/Mix 1	
Turn in Height (in.) *(See Table 1)*	
Removal Height (in.) *(See Table 1)*	
Acres of Grazed Hay Fields	
Lbs DM/Ac. Produced *(See Table 1)*	
Lbs Forage Produced	0

5. Forage Information (continued)

Field Residue Gleaned **Lbs of Forage produced = Lbs DM/Ac. Produced/ Acres of Field Residue Gleaned**

Forage Species/Mix 1	
Acres of Field Residue Gleaned	
Lbs DM/Ac. Produced *(See Table 1)*	
Lbs Forage Produced	

Annual Crops Grazed **Lbs of Forage produced = Lbs DM/Ac. Produced/ Acres of Annual Crops Grazed**

Forage Species/Mix 1	
Turn in Height (in.) *(See Table 1)*	
Removal Height (in.) *(See Table 1)*	
Acres of Annual Crops Grazed	
Lbs DM/Ac. Produced *(See Table 1)*	
Lbs Forage Produced	

TOTALS

Total Acres of Forage = sum of acres of all fields	**0**
Total Forage Produced = sum of lbs forage produced from all fields	**-**

	Benchmark	Option #1	Option #2	Option #3
Total Forage Produced	-	-	-	-
Available Forage = total forage produced * pasture utilization rate	-	-	-	-

6. Forage Balance

1. Total lbs. Forage needed/day = total live weight * % body weight DM needs/day - supplementation in lbs.

2. Total lbs. Forage Needed/Season = total lbs. forage needed/day * total time (in days) grazing throughout season

3. Total lbs. Available Forage/Season = total forage produced * % pasture utilization rate

4. Remaining Forage after Grazing = total lbs. available forage/season - total lbs forage needed/season

5. Lbs. of Additional Supplement Needed/Animal/Day = (remaining forage after grazing / length of grazing season) / number of animals

6. Final Forage Balance (lbs.) After Grazing w/o Utilization % = remaining forage after grazing / % pasture utilization rate

7.Forage Balance as a Percentage of Total Forage Need = final forage balance (lbs.) after grazing w/o utilitation % / total lbs. forage needed/season

	Benchmark	Option #1	Option #2	Option #3
Total Live Weight				
Total lbs Forage needed / day[1]				
Total Time (in days) Grazing Throughout Season				
Total lbs Forage needed / season[2]				
Total lbs Available Forage / Season [3]				
				0
				0
Forage Balance* as a Percentage of Total Forage Need[7]				

0% shows a balanced forage to animal ratio. A negative % indicates a forage deficit and will require supplemental feed (as calculated above in Lbs. of Additional Supplement Needed/Animal/Day), additional acres of forage, or decreased animal numbers. A positive % indicates a surplus of forage; forage may need to be mechanically harvested or animal numbers can be increased.

Is Feed Management Needed?				

***NOTE - If deficit (shown as negative number) is greater than 70%, livestock are being fed supplements at a very high level. Feed Management should be considered to evaluate nutrient levels in manure.**

This area will be evaluated for nutrient management concerns for surface and groundwater. The management of the area must change or livestock access to the area will be restricted and the exercise area will be managed for grass cover and nutrient balance.

7. Acres Needed

1. Paddock Size in Acres = (total lbs. forage needed/day x occupation period) / (total forage from all fields / total acres of forage) / 5 rotations per year

2. Number of Paddocks = rest period in days / occupation period in days + 1

3. Acres Needed per Animal Unit = (paddock size in acres * number of paddocks) / AU

4. Acres Needed for ALL Animal Units = paddock size in acres * number of paddocks

	Benchmark	Option #1	Option #2	Option #3
Paddock Size in Acres	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Number of Paddocks				
15 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
30 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
45 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
60 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Acres Needed per Animal Unit				
15 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
30 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
45 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
60 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Acres Needed for ALL Animal Units				
15 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
30 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
45 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
60 day rest	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

8. Additional Requirements

Contingency Plan:

Sensitive Area Location & Treatment / Management Options:

Planned Enhancements / Additional Practices:

Table 1- Suggested PA Grazing Stubble Heights and Typical Yields for Forages in a Grazing System

Species	Height In Inches		Quality Yield* (lbs DM/Ac.)	
	Turn In	Removal	Good	Poor
COOL SEASON GRASS				
Kentucky bluegrass	4 to 6	1 to 2	4500	2000
Smooth bromegrass	6 to 8	2 to 3	6500	3000
Orchardgrass	6 to 8	2 to 3	8000	3000
Reed canarygrass	8 to 10	2 to 3	8000	3000
Ryegrass	6	1 to 2	7500	4000
Tall fescue	6 to 8	2 to 3	7000	3500
Timothy	8	4	6500	3000
GRASS-LEGUME MIX				
Alfalfa / Grass	6 to 8	2 to 3	10000	4500
Orchardgrass - ladino clover	6 to 8	2	6500	3000
Birdsfoot trefoil / Grass	6	3	8500	3500
Ryegrass - clover	6	1 to 2	6000	2750
Tall fescue - ladino clover	6 to 8	2 to 3	6000	3000
Red Clover / Grass	4 to 7	2	9000	6000
Kentucky bluegrass - white clover	4 to 6	1 to 2	3500	1500
LEGUMES				
Alfalfa	6	1 to 3	8000	4000
Ladino / White clover	6 to 8	2		
WARM SEASON GRASS				
Bermudagrass	4	1	5000	2500
Switchgrass	10 to 14	6 to 8	9000	6000
ANNUAL CROPS				
Small grains	4 to 6	3	3500	1500
Sorghum	18 to 30	10	10000	5000
Brassicas (spring seeding)	30 days	6	10000	5000
Brassicas (summer seeding)	30 days	6	9000	4000
CROP RESIDUES				
Corn Stover	N/A		6000	3000
Soybean	N/A		2000	1000

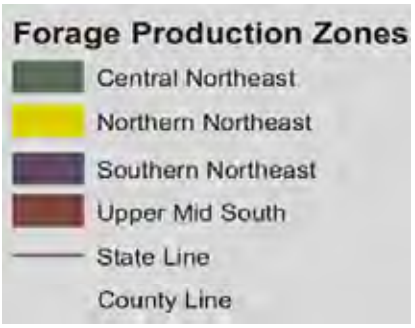
**Select Poor Quality Yields for soil types with low productivity. Select Good Quality Yields for soil types with high productivity.*

Table 2. Average Weights of Livestock

Type	Animal			
	Beef	Dairy	Sheep	Horse
Female	1300	1400	300	1300
Immature	900	1000	250	950
Growing	750	800	120	750
Young	550	600	95	400
Nursing	300	300	45	225
Male	2200	2600	450	1500

Table 3. Average Length of Grazing Season (Based on Forage Production Zone)

Pennsylvania Average	180 days
Central Northeast	180
Northern Northeast	165
Southern Northeast	195
Upper Mid-South	210



Forage Production Zone Map

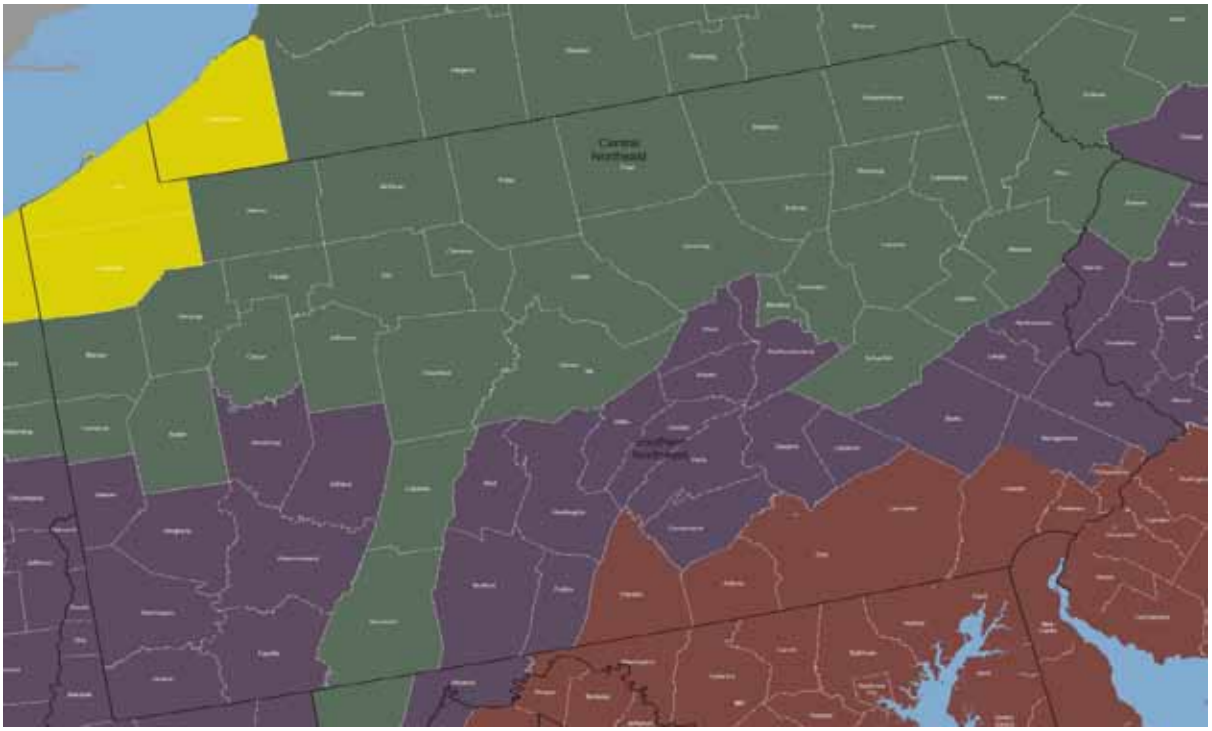


Table 4. Dry Matter Intake as % Body Weight (BW) per Day

Beef Animals	2.5%
Ewes- Lactating	2.5 - 4.0%
Horses	2.0%
Goats- Lactating	5.0%
Goats- Maintenance	1.8-2.0%
Lactating Dairy Cows- Pasture Only	3.0%
Lactating Dairy Cows- TMR/Grain (High Milk Production)	4.0%
Dry Cows/Heifers	2.4%

Table 5. Utilization Rate Based on Length of Paddock Occupation

Length of Occupation (days)	Utilization Rate (%)
1 day or less	80%
2-3 days	75%
4 days	70%
5 days	65%
6+ days	60%
Continuous	35%

Pasture Nutrient Calculator

Introduction

The Pennsylvania Nutrient Management Program's pasture nutrient calculator is to be used to evaluate the potential for excess nutrients to degrade water quality on pasture systems that have a pasture stocking rate greater than 1 AU/Acre and no mechanical applications of manure.If the pasture nutrient calculator shows that Total Available Nitrogen per acre does not exceed Net Nitrogen requirements to produce pasture forage, then there is no water quality problem from excess nitrogen. If the Total Available Nitrogen per acre exceeds the Net Nitrogen requirements, then adjust the pasture stocking rate downward until meeting or below the required nitrogen level for the forage.

Use the P Index screening tool to determine if there is a need to further evaluate water quality concerns from excess phosphorous. If part B of the P Index needs to be determined, follow the pasture management guidance for the P Index Rating found. Pasture mangement guidance for the P Index can be found in exhibit 4 of the Planning Guidance for Treating Concentrated Livestock Areas.

This calculator uses book values to estimate the nutrients coming from manure deposited by the animals grazing on the pasture or confined to a concentrated livestock area. On pastures where additional nutrients from mechanical applications of manure are applied, follow the procedure for evaluating the excess nutrients degrading water quality concern presented in NRCS practice code 590 and the Pennsylvania Nutrient Management Program. Code 590 and the PA NMP balance nutrients according to soil test data.

For grazing systems where excessive levels of potassium are a concern for the nutritional needs and production goals of the kinds and classes of livestock in the system, soil and/or forage testing should be conducted to determine if a problem exists.

The pasture nutrient calculator has an information input section. The shaded boxes show the calculations. The pasture nitrogen balance worksheet is included as it presents the formulas used in deriving the nitrogen calculations in the shaded boxes. Links to the appropriate Agronomy Guide Table are provided in the calculator and are also referenced again in the pasture nitrogen balance worksheet. As the Agronomy Guide is updated periodically, we recommend checking the links to ensure the current values are being used. For example only, the current version of the tables are provided in this tool.

Pasture Nutrient Calculator

Net Nitrogen Requirement (lb/A):	**50**
Total Available N Per Acre (lb/A):	**0**

Total Available N/A < Net N Requirement (OK)

Total Available N/A > Net N Requirement (Adjust stocking rate)

Information Input

	Benchmark	Option 1	Option 2	Option 3	
Number of Animals	0	0	0	0	
Weight	0	0	0	0	Agronomy Facts 54
Daily Manure Production					Agronomy Guide Table 1.2-13
Total Days	0	0	0	0	
Hours Per Day	0	0	0	0	
Manure N Analysis					Agronomy Guide Table 1.2-13
Manure P2O5 Analysis					Agronomy Guide Table 1.2-13
Acres	0.0	0.0	0.0	0.0	
Expected Yield (tons/acre)					
Planned Fertilizer N (lb/acre)					
Residual Manure N (lb/acre)					Agronomy Guide Table 1.2-14
N Availability					Agronomy Guide Table 1.2-14

Total Pounds of Nitrogen	0	0	0	0	0
Total Pounds of N/Acre		0			
N Recommendation		50			
Total Pounds of P2O5	0	0	0	0	0
AUs	0.00	0.00	0.00	0.00	0.00

P2O5 Crop Removal (lb/A):	**15**
Total Pounds of P2O5/A:	**0**

Pennsylvania Nutrient Management Program

Adapted from Pennsylvania Nutrient Management Program

For explanation of the formulas used to make the calculations see the Pasture Nitrogen Balance Worksheet.

Pasture Nitrogen Balance Worksheet

Area Identification [1]		Acres [1]		Expected Yield [2]	

[1] Operation Data Collection
[2] Estimating Forage Yields For Pastures
[3] Penn State Agronomy Guide - Table 1.2-6
[4] Penn State Agronomy Guide - Table 1.2-14B
[5] Penn State Agronomy Guide - Table 1.2-7
[6] Agronomy Facts 54 (Act 38 Standard Weights Table)
[7] Penn State Agronomy Guide - Table 1.2-13
[8] Penn State Agronomy Guide - Table 1.2-14A

N Recommendation (lb/A) [3]	
Planned Fertilizer (lb/A) [1]	
Residual Manure N [4]	
Residual Legume N (lb/A) [5]	
Net Nitrogen Requirement (lb/A)	

Calculation of Uncollected Manure Nitrogen & Available Nitrogen Per Acre				
Animal Group [1]				
Number of Animals [1] x				
Weight [6] ÷ 1000				
Number of AUs x				
Daily Manure Production Per AU (lb) [7] x				
Total Days Animals Have Access To Area [1]				
Hours Per Day Animals Have Access To Area [1]				
Total Uncollected Manure (tons) (AUs x daily production x days uncollected x hours uncollected ÷ 24 ÷ 2000)				
Manure Nitrogen Analysis (lb/ton) [7]				
Total Pounds of Nitrogen (tons x analysis)				
Pounds of Nitrogen Per Acre (pounds of N ÷ acres)				
Total Pounds of Nitrogen Per Acre (sum of each animal group)		**Total Available N/A < Net N Requirement** (Manure deposited at this stocking rate is under N balanced rate; may need supplemental N)		
Total Available N Per Acre (lb/A x N Availability Factor) [8]		**Total Available N/A > Net N Requirement** (Manure deposited at this stocking rate is over N balanced rate; stocking rate must be adjusted to reach N balance)		

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Table 1.2-13. Average daily production and total nutrient content of manure.

Animal type	*Daily production*	*Manure % dry matter*	*Analysis units*	*N*	*P_2O_5*	*K_2O*	*Comments*
Dairy cattle							
Lactating cows, liquid	13 gal/AU/day	<5	lb/1,000 gal	28	13	25	Production does not include dilution. Analysis includes dilution to approximately 5% solids.
Lactating cows, solid	106 lb/AU/day	12	lb/ton	10	4	8	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by dairy cows.
Dry cow	82 lb/AU/day		lb/ton	9	3	7	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by dairy dry cattle.
Calf and heifer	87 lb/AU/day		lb/ton	7	2	7	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by dairy young cattle.
Veal	3.5 gal/AU/day	4	lb/1,000 gal	36	27	55	Production and analysis do not include dilution.
Beef cattle							
Cow and calf	60 lb/AU/day	12	lb/ton	11	7	10	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by a beef cow and calf.
Calf	60 lb/AU/day	12	lb/ton	11	7	10	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by beef calves.
Steer	75 lb/AU/day	8	lb/ton	14	5	8	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by steers.
Swine							These comments apply to all swine categories:
Gestation	4 gal/AU/day	4	lb/1,000 gal	30	35	15	Production includes a typical amount of in-barn dilution water but not rainfall for an outdoor storage. Analysis includes dilution to approximately the % dry matter indicated.
Lactation	10 gal/AU/day	2	lb/1,000 gal	25	20	15	
Nursery	14 gal/AU/day	6	lb/1,000 gal	40	40	25	
Grow-finish	11 gal/AU/day	7	lb/1,000 gal	50	55	25	
Farrow to feeder	7 gal/AU/day	4	lb/1,000 gal	40	35	15	
Swine, anaerobic lagoon							These figures apply only to a treatment lagoon.
Supernatant	—	0.25	lb/1,000 gal	2.9	0.6	3.2	
Sludge	—	7.6	lb/1,000 gal	25	23	63	
Sheep	40 lb/AU/day	25	lb/ton	23	8	20	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by sheep.
Horse	45 lb/AU/day	20	lb/ton	12	5	9	No bedding included in production or analysis figures. Use these analyses for estimating nutrients deposited on pastures by horses.
Poultry							
Layer (364 d)[1]	26 lb/AU/day	41	lb/ton	37	55	31	
Pullet (126 d)[1]	48 lb/AU/day	35	lb/ton	43	46	26	
Light broiler (44 d)[1]	22 lb/AU/day	34	lb/ton	79	62	42	Production and analysis figures include litter.
Heavy broiler (57 d)[1]	20 lb/AU/day	25	lb/ton	66	63	47	Production and analysis figures include litter.
Turkey (tom) (123 d)[1]	13 lb/AU/day	60	lb/ton	52	76	42	Production and analysis figures include litter.
Turkey (hen) (88 d)[1]	11 lb/AU/day	65	lb/ton	73	88	46	Production and analysis figures include litter.

Note: When possible, have manure analyzed. Actual values may vary over 100 percent from averages in the table.

1. Typical production days.

Table 1.2-6. Nitrogen Recommendations for Agronomic Crops.

Crop	Recommendation (lbs N/unit of expected yield)	Comments
Corn grain	1	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 and 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is major nutrient source.
Corn silage	7	For better N efficiency, delay application of the nitrogen until the corn is between 10 and 20 inches tall. If the field has a history of manure and/or legumes, delay all of the N. If there is no history of manure and/or legumes, split the N, applying one-third near to planting and delaying the balance. Adjust this recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 and 1.2-15). The PSNT or chlorophyll meter test can be used to refine N recommendations for corn, especially where manure is major nutrient source.
Grain sorghum	0.75	Adjust the recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 and 1.2-15).
Forage sorghum	7	Adjust the recommendation for any previous legume in the rotation (see Table 1.2-8) and for residual N from previous manure applications (see Tables 1.2-14 and 1.2-15).
Oats	0.8	Apply the N with any other fertilizer before planting. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 and 1.2-15).
Wheat/rye	1	If plants did not tiller well, apply N by mid-March, otherwise apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 and 1.2-15).
Barley	0.8	If plants did not tiller well, apply N by mid-March, otherwise apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 and 1.2-15).
Small grain silage	17	Apply at greenup in the spring.
Grass hay	50	Split the nitrogen recommendation and apply it based on the expected yield for each cutting. For grass-legume mixtures, if the legume is more than 50% of the stand, the field should be managed as a legume; thus, no nitrogen is recommended. If plants did not tiller well, apply N by mid-March, otherwise apply any time up to growth stage 5. Adjust this recommendation for any residual N from previous manure applications (see Tables 1.2-14 and 1.2-15).

Table 1.2-7. Residual Nitrogen Contribution from Legumes[1]

Previous crop	Percent Stand	High-productivity fields	Moderate-productivity fields	Low-productivity fields
		Soil productivity group[2] 1	Soil productivity groups[2] 2 & 3	Soil productivity groups[2] 4 & 5
		Nitrogen credit (lb/A)		
First year after clover or trefoil	>50	90	80	60
	25–49	60	60	50
	<25	40	40	40
First year after alfalfa	>50	120	110	80
	25–49	80	70	60
	<25	40	40	40
First year after soybeans harvested for grain.		---- 1 lb N/bu soybeans ----		

1. When a previous legume crop is checked on the Penn State soil test information sheet, the residual nitrogen for the year following the legume is calculated and given on the report. This credit should be deducted from the N recommendation given on the soil test report.

2. See table 1.1-1 in the basic soils section for information on soil productivity groups.

Table 1.2-8. Nitrogen Removal by Legumes.

Legume crop (no nitrogen application recommended)	Pounds of N removed/ unit of yield	Pounds of N removed/A	Comments
Alfalfa (5 tons/A)	50	250	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Soybeans (40 bu/A)	3.2	130	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Trefoil (3.5 tons/A)	50	175	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.
Clover (3.5 tons/A)	40	140	Although legumes will use N from manure and other sources, applying N may increase the competition from weeds and grasses. If you apply manure, limit it to an application rate that balances the crop's P requirement.

Table 1.2-9. Typical Crop Nutrient Removal for Phosphorus and Potassium.

Crop (units)	Per unit of yield		Typical yield/A	Removal for given yield	
	P_2O_5	K_2O		P_2O_5	K_2O
Corn (bu)	0.4	0.3	125 (bu)	50	40
Corn silage (T)[1]	5	11	21 (T)	105	230
Grain sorghum (bu)	0.6	0.8	125 (bu)	75	100
Forage sorghum (T)[1]	3	10	15 (T)	45	150
Sorghum/sudangrass[1]	7	7	15 (T)	105	105
Alfalfa (T)[2,3]	15	50	5 (T)	75	250
Red Clover (T)[2,3]	15	40	3.5 (T)	55	140
Trefoil (T)[2,3]	15	40	3.5 (T)	55	140
Cool-season grasses (T)[2,3]	15	50	4 (T)	60	200
Bluegrass (T)[2,3]	10	30	2.5 (T)	25	75
Wheat/rye (bu)[4]	1	1.8	60 (bu)	60	110
Oats (bu)[4]	0.9	1.5	80 (bu)	70	120
Barley (bu)[4]	0.6	1.5	75 (bu)	45	110
Soybeans (bu)[4]	1	1.4	40 (bu)	40	55
Small grain silage (T)[1]	7	26	6 (T)	40	160

1. 65% moisture.
2. For legume-grass mixtures, use the predominant species in the mixture.
3. 10% moisture.
4. Includes straw.

Table 1.2-14. Manure nitrogen availability factors for use in determining manure application rates based on planning conditions.

A. Current Year

To use this table, find the ***planned manure application season*** in the left column, then move to the right in that row and select the ***target crop utilization***. Continue to the right in that row to find the ***nitrogen availability factor*** for the ***planned manure application management***.

			Nitrogen availability factor[1]		
Planned manure application season	*Planned manure target crop utilization*	*Application management*	*Poultry manure*	*Swine manure*	*Other manure*
Spring or summer	Spring utilization by grass hay and small grains. Summer utilization by corn, other summer annuals, and grass hay.	Incorporation the same day	0.75	0.70	0.50
		Incorporation within 1 day	0.50	0.60	0.40
		Incorporation within 2–4 days	0.45	0.40	0.35
		Incorporation within 5–7 days	0.30	0.30	0.30
		Incorporation after 7 days or no incorporation	0.15	0.20	0.20
Early fall[2]	Fall and spring utilization by grass hay and small grains.	Incorporation within 2 days	0.50	0.45	0.40
		Incorporation within 3–7 days	0.30	0.30	0.30
		Incorporation after 7 days or no incorporation	0.15	0.20	0.20
	Following summer utilization by corn and other summer annuals.	All situations	0.15	0.20	0.20
Late fall or winter[3]	Spring utilization by small grains and grass hay	All situations	0.50	0.45	0.40
	Following summer utilization by corn or other summer annuals	No cover crop	0.15	0.20	0.20
		Cover crop harvested for silage	0.15	0.20	0.20
		Cover crop used as green manure	0.50	0.45	0.40
Grazing	Late spring through early fall grazing	Manure deposited more or less continuously by grazing cattle	—	—	0.20
	Year-round grazing	Manure deposited more or less continuously by grazing cattle	—	—	0.30

1. Multiply this factor times the manure N content to estimate the manure N available for the planning conditions.
2. Early fall would be when it is still warm enough for plant growth and microbial activity to continue (soil temperature >50ºF at 2 inches).
3. Late fall and winter is when it is so cold that there is no plant growth or microbial activity (soil temperature <50ºF at 2 inches).

B. Historical Frequency of Manure Application on the Field

To use this table, determine the frequency of manure application and go across to the amount of residual N that is available from past manure applications. Deduct this amount of residual N from the basic N recommendation before determining any additional fertilizer or manure application rates.

	Residual N availability (lbs N/A)
Rarely received manure in the past (<2 out of 5 years)	0
Frequently received manure (2–3 out of 5 years)	20
Continuously received manure (4–5 out of 5 years)	35

Estimating Forage Yields For Pastures

Management Intensive Grazing

The following are expected yield ranges for different soils and fertility levels when utilizing management intensive grazing systems. Yields can increase or decrease by 1 ton when increasing or decreasing soil fertility

Species *	Good Soils & High Fertility Levels	Average Soils & Average Fertility Levels	Poor Soils & Poor Fertility Levels
Orchardgrass with a moderate yielding legume species (25 to 40%)	7.0 tons/ac/yr	5.0 tons/ac/yr	2.5 tons/ac/yr
Perennial Ryegrass with a moderate yielding legume species (25 to 40%)	5.0 tons/ac/yr	3.5 tons/ac/yr	2.0 tons/ac/yr
Timothy or Bromegrass (no legume present)	6.5 tons/ac/yr	4.5 tons/ac/yr	3.0 tons/ac/yr
Kentucky Bluegrass with 25 to 40% legume present	4.0 tons/ac/yr	2.5 tons/ac/yr	1.5 tons/ac/yr
Reed Canarygrass	8.0 tons/ac/yr	5.5 tons/ac/yr	3.5 tons/ac/yr
Orchardgrass	8.0 tons/ac/yr	5.5 tons/ac/yr	3.5 tons/ac/yr

Rotational Grazing

The following are expected yield ranges for management and soil fertility levels when utilizing rotational grazing systems.

Good Management & High Yielding Soils	Poor Management & Poor Yielding Soils
4 to 5 tons/ac/yr	2 to 3 tons/ac/yr