NUTRIENT MANAGEMENT PLAN
FOR
Allen Ranch



Beau Allen
94315 Lower Norway Lane
Myrtle Point, OR 97458
(541) 297-4072

Farm: NA
FSA Tract: NA
EQIP Contract: NA

Prepared By:
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July 2, 2012

CLEAN MP
COMPREHESIVE LIVESTOCK
ENVIRONMENTAL
ASSESSMENT & NUTRIENT
management plan WEST

CLEANmp WEST
Nutrient Management Plan (NMP)
Signature Page

Farm Contact Information: Beau Allen
94315 Lower Norway Lane
Myrtle Point, OR 97458
(541) 297-4072

Plan Period: Oct 2012 - Sep 2016

NMP Plan Approval

I certify that I have reviewed this NMP for technical adequacy and that the elements of the documents are technically compatible, reasonable and can be implemented.

Signature: _____ Date: _____
Name: Bruce D. Wilson
Title: Individual TSP Number: TSP-05-4719

Owner/Operator

As the owner/operator of this NMP, I, as the decision maker, have been involved in the planning process and agree that the items/practices listed in each element of the NMP are needed. I understand that I am responsible for keeping all the necessary records associated with the implementation of this NMP. It is my intention to implement/accomplish this NMP in a timely manner as described in the plan.

Signature: _____ Date: _____
Name: Beau Allen for Allen Ranch

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Section 1. Background and Site Information

This Nutrient Management Plan (NMP) is an important part of the conservation management system (CMS) for your Animal Feeding Operation (AFO). This NMP documents the planning decisions and operation and maintenance for the animal feeding operation. It includes background information and provides guidance, reference information and Web-based sites where up-to-date information can be obtained.

1.1 Objectives

Beau Allen has the following objectives:

1. Operate the farm in a socially and environmentally acceptable manner to make a profit that financially supports Beau Allen and his families.
2. Apply manure to obtain maximum nutrient benefit while eliminating runoff and minimizing leaching of nutrients.

1.2 General Site Information

Allen Ranch is located approximately 24 miles southeast of Coos Bay, Oregon in the Coquille River watershed at elevation 29 feet above mean sea level. The Coquille River watershed flows east to west in the Coast Range Mountains and drains into the Pacific Ocean near Bandon, Oregon. The annual precipitation varies from 56 to 60 inches of which 70% falls within a 5 month period from November to March and less than 7% falls within June to August. Winds are generally moderate in the winter and from the southwest and are slight in the summer from the northwest. Inland areas along the coast have a frost free period of 160 to 220 days depending on their elevation. Soils vary from well drained silt loams to poorly drained silty clay loams.

Allen Ranch is owned and managed by Beau Allen who is currently raising beef livestock. Currently there are approximately 150 beef cows, 125 calves and 5 bulls being cared for on the Allen Ranch. All of the livestock are out on pasture except for when there are high water events that force them to be confined to the livestock barns which is about 15% of the time during the winter months. The calves are moved off of the ranch by October of each year. Beau Allen is planning to expand the number of livestock cared for on the ranch to 200 beef cows, 160 calves and 7 bulls over the next 4 to 5 years.

Manure, bedding and wasted feed is collected on the alleyways of the livestock barns is scraped to a solids storage barn (SSB) shown on the Operation Area Map in Section 2.2. Rainfall runoff coming into contact with manure drains to an underground collection and storage tank (UCST) shown on the Operation Area Map in Section 2.2. Solids stored in the solids storage barn and wastewater stored in the underground collection and storage tank are applied to the hay and pasture land fields to utilize the nutrients and organics as a nutrient source. Wastewater is applied using a stationary big gun sprinkler and the solids are applied using a tractor pulled solids spreader.

Mortalities that occur during the year on the farm are buried within 24 hours.

Allen Ranch owns approximately 226.6 acres that contains the beef livestock facilities, wetlands and the hay and pasture land fields used to produce forage for the beef livestock. These acres consist of 7.1 acres for the livestock facilities, shops and houses, 3.6 acres of wetland area and 215.9 acres of irrigated hay and pasture land. The crop rotation for the acres owned by Allen Ranch consists of 5 to 7 years of perennial grass that is harvested by grazing livestock and for hay which is fed to the beef livestock. The target yields for the grass harvested by grazing livestock and as hay is estimated at 3 to 6 tons per acre at 85% dry matter depending on the soil type and whether the field is irrigated or not. Wastewater from the underground collection and storage tank and solids stored in the solids storage barn will be applied to the hay and pasture land fields owned by Allen Ranch by employees of the ranch and Beau Allen.

The soil concentration of phosphorus is very low in the hay and pasture land fields owned by Allen Ranch. Applications of wastewater and solids containing manure are planned on a nitrogen basis on all fields.

Allen Ranch is located in the Coquille River watershed which is heavily used recreational area and important stream for endangered fish species and other wildlife habitat. Any runoff containing animal manure or leaching of nutrients from animal manures would have a significant negative impact on the wildlife habitat and water quality of the Coquille River.

1.3 Applicable Permits or Certifications

Allen Ranch is required by Oregon state law to have confined animal feeding operation permit from the Oregon Department of Agriculture and the Oregon Department of Environmental Quality to operate. Allen Ranch is covered by the Oregon Confined Animal Feeding Operation National Pollutant Discharge Elimination System General Permit Number 01-2009. A copy of the Oregon Confined Animal Feeding Operation National Pollutant Discharge Elimination System General Permit is located in Appendix A. The following table provides the location of information in this plan in reference to the minimum required elements for an Animal Waste Management Plan (AWMP) as required by the permit in Appendix A:

AWMP Minimum Required Elements	Location
1. Summary of CAFO Operation	
a) Contact name, address, phone number	Cover and Signature Page
b) Facility address	Cover and Signature Page
c) Type of operation	Page 1
(i) Number and size of animals by species, expansion	Page 1, 12
d) Manure, litter and process waste system – provide a general Narrative description of each	Page 11
(i) Collection – How is manure, litter and process waste removed from housing, confinement lots? How is clean water diverted from storage?	Page 11
(ii) Storage – Types and size of manure, litter and process waste storage tanks, ponds	Page 11, 19, 20
(iii) Transfer – How is manure, litter and process waste moved to storage, application areas?	Page 11, 21, 221
(iv) Use – How is manure, litter and process waste treated (composted, separated, anaerobic digestion or storage, aeration?) How is manure, litter and process waste water used on crops? If export is utilized, describe that process.	Page 11
2. Specific descriptions and calculations	
a) A narrative of production area and land application locations	Page 1
(i) Aerial photo or topographical map showing numbered field locations, production area facilities, clean water diversions, and surface water features.	Page 7, 8, 45
(ii) Soil maps of all application fields, including those not owned, and map unit descriptions. Indicate areas with application limitations.	Page 121
b) Manure, litter and process waste volumes	Page 11
(i) Manure (feces and urine), litter and process waste output that is collected and stored in this system.	Page 11
(ii) Bedding added and collected.	Page 11
(iii) Process and wash waster collected, including footbath use when appropriate	Page 11
(iv) Silage and feed processing leachate	Page 11
c) Contaminated storm water	Page 11
(i) Direct rainfall into storage.	Page 11
(ii) Slab or lot runoff collected.	Page 11
(iii) Overflow from gutters or other diversions.	Page 11
d) Nutrient content of manure, litter and process waste water	Page 81, 159, 162, Appendix G

AWMP Minimum Required Elements	Location
(i) Content and volume of nutrients in manure, litter and process waste generated – can come from NRCS Animal Waste Field Handbook (Table 6.6 Oregon amendment), land grant university publications, or analyses of manure, litter and process waste. Actual test values are required of large CAFOs.	Page 81, 159, 162, Appendix G
e) Farm nutrient balance	Page 218
(i) Show amount of nutrients (N,P,K) generated, lost in storage, lost during application, used by crops, and/or exported off the farm on an annual basis.	Page 218
(ii) Nutrient application must balance to most limiting nutrient as determined by NCRS Agronomy Technical Note #26 and the NCRS Phosphorus Index.	Page 151, 166
(iii) Include all acres required to balance nutrients owned or leased by the operator.	Page 41
f) Application schedule and limitations	Page 159
(i) Show scheduled applications of solids and liquids. Include date, amount and method of application to identified fields. Describe calibration of equipment used to apply manure, litter and process waste water.	Page 175, 183, 72, 74, 75
(ii) Describe limitations to manure, litter and process waste applications. Indicate buffer areas and management to avoid frozen or saturated soils. Justify buffer width and management.	Page 76
(iii) Using agronomic rates, application limitations, and scheduled applications, calculate the minimum storage required for liquids and solids.	Page 11, 24
(iv) How is irrigation water managed relative to manure, litter and process waste water application? Indicate general timing and application rates of irrigation water. Irrigation water management must not allow leaching of soluble nutrients or runoff.	Page 51
g) Animal mortality management	Page 31
(i) Describe how farm handles mortalities	Page 31
3. Record keeping and reporting requirements	
a) Testing – Monitoring	Page 66
(i) Include the protocol for testing manure, litter and process waste.	Page 66
(ii) Include the protocol for testing and measuring crop nutrient removals.	Page 66
(iii) Include the protocol for soil testing to evaluate nutrient applications and crop uptake.	Page 66
b) Record keeping. Include the following:	Page 227
(i) Date and amount of manure, litter and process water applied by field. Calculate N and P applied.	Page 227
(ii) Manure, litter and process waste volume exported.	Page 227
c) Reporting to Oregon Department of Agriculture	Page 227
(i) Any discharge within 24 hours.	Page 35, 227
(ii) Amount of manure, litter and process water applied annually.	Page 227
(iii) Amount of manure, litter and process waste exported annually.	Page 227

AWMP Minimum Required Elements	Location
4. Additional requirements for large CAFOs	
a) Inspections	Page 227
(i) Storm water diversions, runoff diversions, waste transport, storage structures, storage structure volume weekly.	Page 227
(ii) Water lines daily.	Page 227
(iii) Application equipment leaks periodically.	Page 227
b) Record keeping	Page 227
(i) Results of daily inspections.	Page 227
(ii) Results of weekly inspections.	Page 227
(iii) Results of periodic inspections.	Page 227
(iv) Corrective actions taken, explain those not corrected.	Page 227
(v) Expected crop yields if not in the plan.	Page 227

Table 1-1 provides the general location information for the Allen Ranch farm.

Table 1-1. Geographic Location

Farm	County, State	FSA Tract Number	Legal Description (S-T-R)	UTM Coordinates
Allen Ranch	**Coos, OR**	**NA**	Section 30, 31, 32, T28S, R12W from the Willamette Meridian	UTM Zone 10 UTM Projection: x- 0405500 y- 4772300

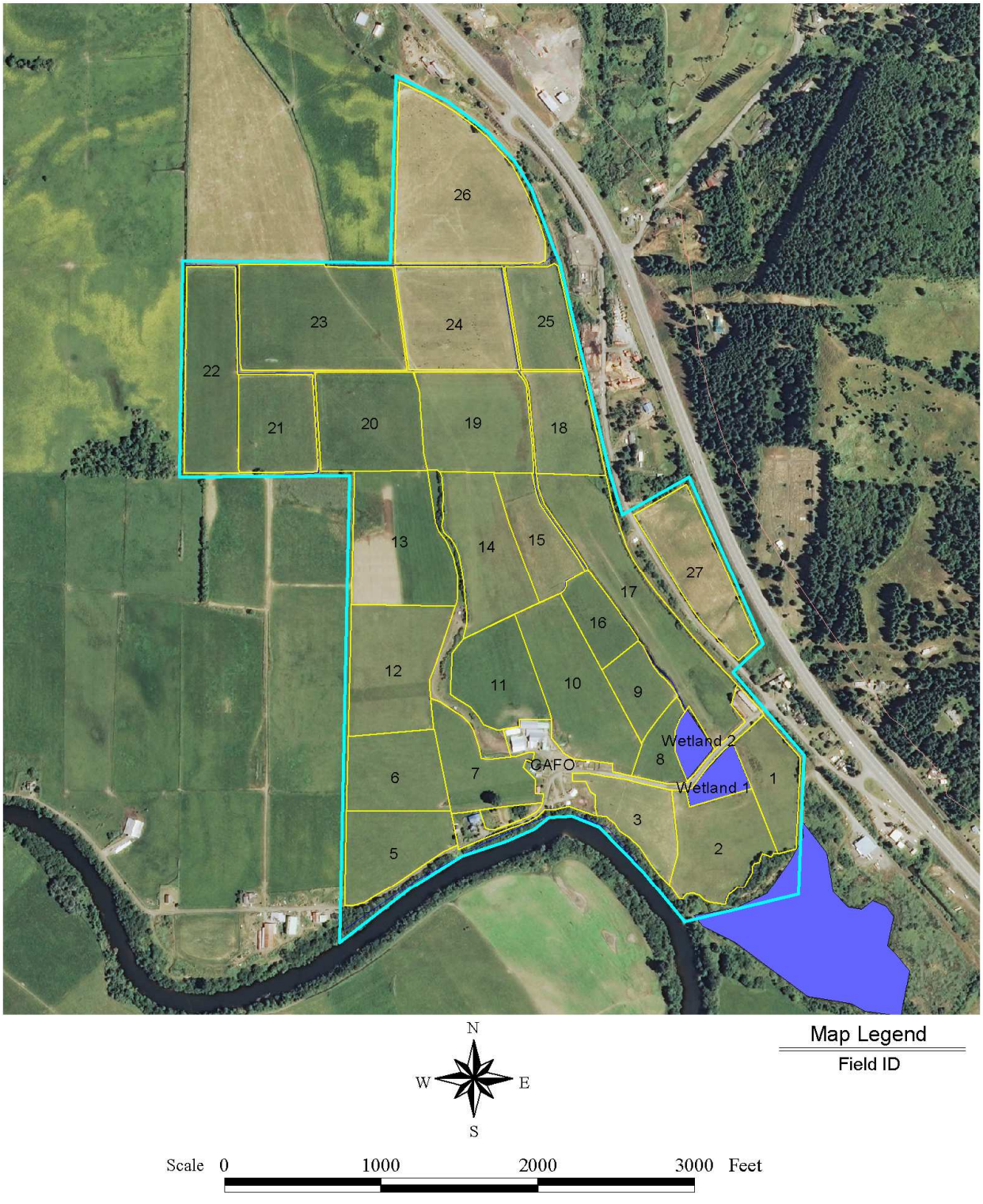
Driving Instructions: (See Farm Location Map)

From exit 253 near Salem Oregon, travel south on Interstate 5 highway for 133.94 miles to exit 119. Take exit 119 and merge onto state highway 99S and travel 3.06 miles to state highway 42 (Coos Bay-Roseburg highway). Turn right onto state highway 42 (Coos Bay-Roseburg highway) and travel west 52.84 miles to Lower Norway Lane. Turn left onto Lower Norway Lane and travel 0.51 miles to the Allen Ranch.

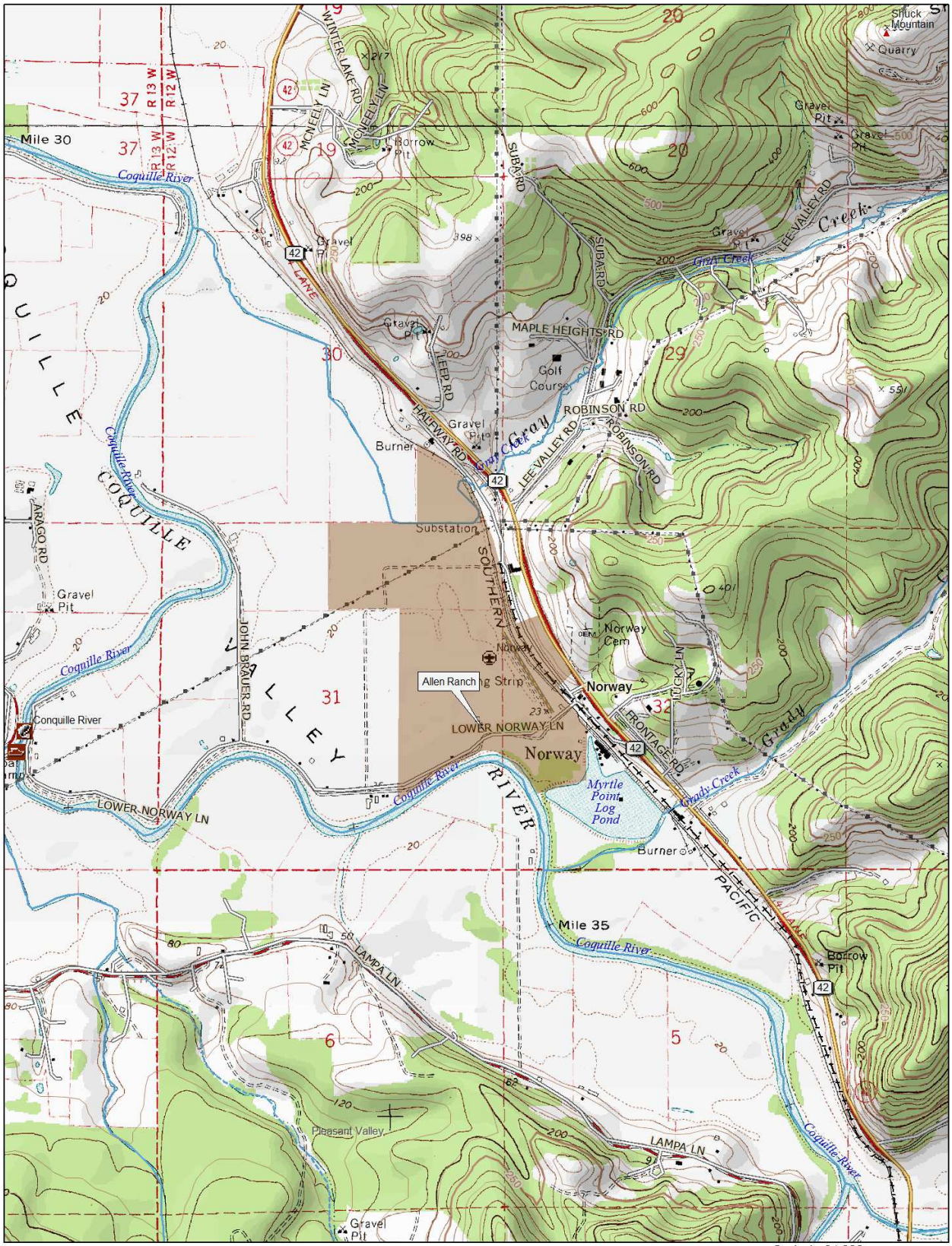
1.4 Location Map for Allen Ranch



1.5 Allen Ranch Farm Fields Overview Map



1.6 Topographic Map for Allen Ranch



1.7 Resource Concerns

The following resource concerns are addressed by the conservation practices listed in Section 2.3, "Production Area Conservation Practices" and in Section 4.4, “Land Treatment Conservation Practices”:

Soil Quality Concerns

	Soil Quality Concern	*Fields*
	Ephemeral Gully Erosion	NA
	Gully Erosion	NA
	Sheet and Rill Erosion	1-27
	Stream/Ditchbank Erosion	NA
	Wind Erosion	NA

Water Quality Concerns

	Water Quality Concern	*Fields*
	Facility Wastewater Runoff	CAFO
	Manure Runoff (Field Application)	1-27
	Manure Runoff (From Facilities)	CAFO
	Nutrients in Groundwater	CAFO1-27
	Nutrients in Surface Water	CAFO, 1-27
	Silage Leachate	CAFO
	Excessive Soil Test Phosphorus	1-27
	Tile-Drained Fields	NA

Other Concerns Addressed

	Other Concern	*Fields*
	Acres Available for Manure Application	1-27
	Aesthetics	CAFO, 1-27
	Maximize Nutrient Utilization	1-27
	Minimize Nutrient Costs	1-27
	Neighbor Relations	CAFO, 1-27
	Profitability	CAFO, 1-27
	Regulations	CAFO, 1-27
	Soil Compaction	CAFO, 1-27
	Time Available for Manure Application	CAFO, 1-27
	Odors	CAFO, 1-27
	Air Quality	CAFO, 1-27
	Biosecurity	CAFO

Section 2. Production Information (Manure and Wastewater Handling and Storage)

2.1 Animal and Manure Resources

Allen Ranch is owned and managed by Beau Allen who is currently raising beef livestock. Currently there are approximately 150 beef cows, 125 calves and 5 bulls being cared for on the Allen Ranch. All of the livestock are out on pasture except for when there are high water events that force them to be confined to the livestock barns which is about 15% of the time during the winter months. The calves are moved off of the ranch by October of each year. Beau Allen is planning to expand the number of livestock cared for on the ranch to 200 beef cows, 160 calves and 7 bulls over the next 4 to 5 years. See Table 2.1 for a description of the livestock this plan is based on.

It is estimated that 11,141 cubic feet or 237 tons of manure, bedding and wasted feed will be collected annually from Allen Ranch. Of the total amount of manure, bedding and wasted feed collected, 2,785 cubic feet or 20,835 gallons will be collected as a liquid and 8,356 cubic feet or 150 tons will be collected as a solid. It is also estimated that 11,802 cubic feet or 88,277 gallons of rainfall runoff from exposed paved lot areas will be collected annually. All of the rainfall runoff from roofs is collected using gutters and downspouts and directed to drainage ditches.

The solids storage barn (SSB) shown on the Operation Area Map in Section 2.2 is a roofed reinforced concrete slab with reinforced concrete walls where solids removed from the livestock barns can be stored. The solids can be stacked to a height of 10 feet which provides 11,200 cubic feet or 403 tons of capacity that provides more than 365 days of storage capacity. The storage capacity of the solids storage barn exceeds the NRCS recommended minimum storage period of 154 days computed using Worksheet OR10A-7 located in Section 2.4. The solids storage barn (SSB) will serve as intended as long as operation and management guidelines are followed for this facility.

The underground collection and storage tank (UCST) shown on the Operation Area Map in Section 2.2 has a total storage capacity of 2,025 cubic feet or 15,147 gallons. The capacity of the underground collection and storage tank (UCST) is estimated to provide 26 days of storage for normal precipitation runoff and will overflow during a 25 year-24 hour storm. Overflow from the underground collection and storage tank will flow to the adjacent pasture area that will serve as a vegetated treatment area to capture nutrient and organics in the runoff. The storage capacity of the underground collection and storage tank provides less than the recommended minimum storage period of 154 days computed using Worksheet OR10A-7 located in Section 2.4. The underground collection and storage tank (UCST) and pasture area that serves as a vegetated treatment area will serve as intended as long as operation and management guidelines are followed.

See Table 2-2 for a list of manure storages and their capacities.

Wastewater containing manure generated by the Allen Ranch is applied to the fields as a nutrient source using a big gun sprinkler which applies wastewater at a rate of 458 gallons per minute at a wetted diameter of 383 feet. The big gun sprinkler has the capability to apply liquids at a minimum rate of 0.25 inches per acre and a maximum rate of 4 inches per acre. Solids containing

manure generated by the Allen Ranch are applied to the fields as a nutrient source using a solids spreader with a capacity of 6.7 tons. The solids spreader can apply solids at a rate of 1 ton per acre up to 33 ton per acre.

Table 2-1. Animal Inventory

Animal Group	Type or Production Phase	Number of Animals	Average Weight (Lbs)	Confinement Period	Manure Collected (%)	Storage Where Manure Will Be Stored
Beef Cows CL	Brood cow/heifer (beef)	200	1,000	Nov Early - Apr Late	2	Tank
Beef Cows CS	Brood cow/heifer (beef)	200	1,000	Nov Early - Apr Late	8	Solids Storage Barn
Beef Cows CP	Brood cow/heifer (beef)	200	1,000	Nov Early - Apr Late	90	Livestock
Beef Cows P	Brood cow/heifer (beef)	200	1,000	May Early - Oct Late	100	Livestock
Calves CL	Suckling calf (beef)	160	400	Mar Early - Apr Late	2	Tank
Calves CS	Suckling calf (beef)	160	400	Mar Early - Apr Late	8	Solids Storage Barn
Calves CP	Suckling calf (beef)	160	400	Mar Early - Apr Late	90	Livestock
Calves P	Weaned heifer/steer (dairy)	160	400	May Early - Oct Late	100	Livestock
Bulls CL	Finishing steer (beef)	7	1,800	Nov Early - Apr Late	2	Tank
Bulls CS	Finishing steer (beef)	7	1,800	Nov Early - Apr Late	8	Solids Storage Barn
Bulls CP	Finishing steer (beef)	7	1,800	Nov Early - Apr Late	90	Livestock
Bulls P	Finishing steer (beef)	7	1,800	May Early - Oct Late	100	Livestock

(1) Number of Animals is the average number of animals that are present in the production facility at any one time.
(2) If Manure Collected is less than 100%, this indicates that the animals spend a portion of the day outside of the production facility or that the production facility is unoccupied one or more times during the confinement period.

2.2 Operation Area Map

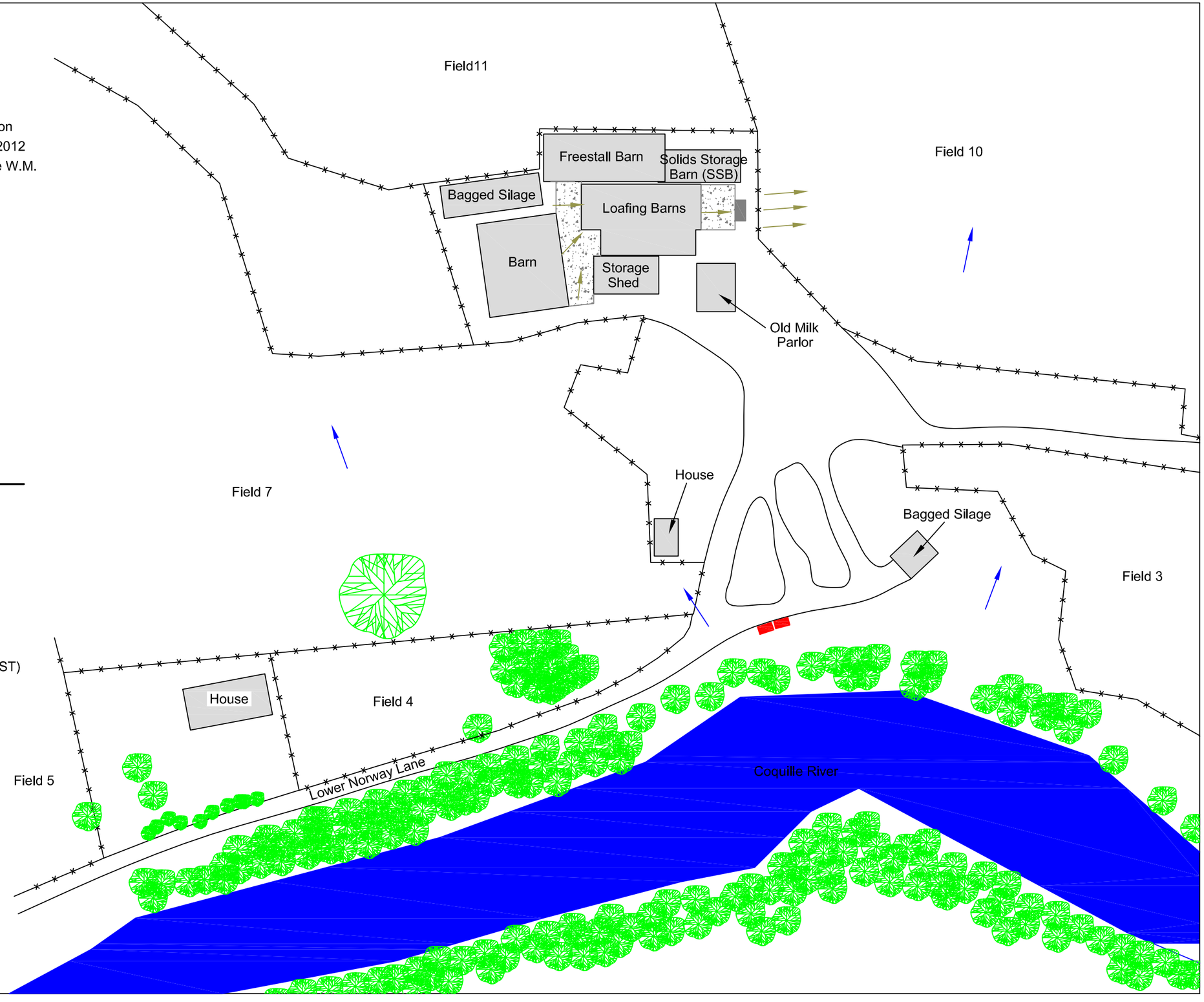
Owner/Operator: Beau Allen
Farm Name: Allen Ranch
County: Coos State: Oregon
Approximate Acres: 8.0 Date: July 2012
Location: Section 31, 32, T28S, R12W from the W.M.

Assisted By: Bruce D. Wilson, H&R Engineering LLC

100 0 100
SCALE IN FEET

Map Legend

- Paved Areas
- Roofed Areas
- Fence
- Drainage
- Fuel Tank
- Collection & Storage Tank (UCST)
- Trees and Shrubs



2.3 Operation Area Practices

Following are practices that the Allen Ranch has implemented or plans to implement that address resource concerns for the Production Area identified in Section 1.7:

Access Control

Field(s): CAFO

Status: Existing

Description: Fences are used to control animal and human access to the production area and livestock housing facilities.

Operation and Maintenance: Do not allow livestock access to open water courses and drainageways. Provide off stream watering facilities where possible and limit access to designated watering areas.

Inspect fences periodically and repair or replace broken or decayed posts and tighten sagging wire as needed. Broken wire can be spliced or replaced. Replace broken or missing insulators on electric fences as needed and repair or replace inoperative electric fence controllers.

Insure gates and other appurtenances are in good working order. Replace or repair components as needed.

Specification: NA

Access Road

Field(s): CAFO

Status: Existing

Description: Existing roadways allow access to farm facilities and fields to perform needed management operations.

Operation and Maintenance: Maintain road, parking lot and pathway surfaces in good condition, which includes periodic grading and addition of surface material when necessary. Prevent surface ponding by localized grading or addition of surface materials to remove depressions. Road base-course rock may be required to stabilize the road and parking lot foundations. If so, remove unstable materials and rebuild travelway. Limit traffic and animal access with fencing or barriers, where needed.

Remove debris, litter or blockages from roads, parking lots and walkways. Also remove debris and maintain capacity of associated drainage ditches, drop inlets, culverts, bridges, waterways and storm water outlets.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Immediately repair any vandalism, vehicular, or livestock damage to earthfills, side slopes, drainage facilities, water ways and storm water outlets or other appurtenances.

Maintain good vegetative cover, mulches, and other covering installed for erosion protection.

Specification: NA

Feed Management

Field(s): CAFO

Status: Planned **Units: 367 Animals – 277 Animal Units**

Description: The quantity of available nutrients fed to the livestock will be evaluated to improve efficiency of nutrients fed and excreted.

Operation and Maintenance: See Section 7.

Specification: See Section 7.

Fence

Field(s): CAFO

Status: Existing

Description: Fences are installed to control the movement and access of animals and humans.

Operation and Maintenance: Do not allow livestock access to open water courses and drainageways. Provide off stream watering facilities where possible and limit access to designated watering areas.

Inspect fences periodically and repair or replace broken or decayed posts and tighten sagging wire as needed. Broken wire can be spliced or replaced. Replace broken or missing insulators on electric fences as needed and repair or replace inoperative electric fence controllers.

Insure gates and other appurtenances are in good working order. Replace or repair components as needed.

Specification: NA

Heavy Use Area Protection

Field(s): CAFO

Status: Existing

Description: Travel and confinement areas shown on the Operation Area Map are stabilized with suitable materials to control soil erosion, improve air and water quality, improve aesthetics and improve animal health.

Operation and Maintenance: Periodically inspect concrete and asphalt slabs and curbs and repair or replace broken sections as needed. Prevent manure from building up next to the curbs or over topping them.

Regrade and regravel areas as need to prevent puddling or ponding of rainfall.

Specification: NA

Clean Water Pipelines

Field(s): CAFO

Status: Existing

Description: Pipelines are installed to convey water from the river shown on the Operation Area Map to the livestock barns to provide water for livestock. Pipelines also supply water to the house from tanks used to capture roof water.

Operation and Maintenance: Check to make sure all valves and air vents are set at the proper operating condition so they can provide protection to the pipeline.

Inspect pipelines for signs of failure. Inspect risers and valves periodically for leaks or worn gaskets. Repair or replace pipeline, risers and valves as needed.

Drain the pipeline and components in areas that are subject to freezing. If parts of the pipeline cannot be drained, a non-toxic antifreeze solution may be added.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Specification: NA

Pumping Plant

Field(s): CAFO

Status: Existing

Description: Pumping plants shown on the Operation Area Map are used to transfer wastewater to storage facilities and the hay and pasture land fields as a nutrient source.

Operation and Maintenance: Operate and maintain pumps in accordance with good judgment and manufacture's manuals and recommendations.

Drain liquid manure from pumps during cold weather to prevent freezing. If parts of the system cannot be drained, a non-toxic antifreeze solution may be added.

Inspect pumps periodically and remove debris wrapped around shafts and impellers. Maintain foot valves and check valves for proper operation.

For proper operation of electric motors and controls, maintain lubrication for all bearings, keep electric panel free from obstructions and debris. Maintain electrical safety devices, assure all electrical contacts are tight, and lock main electrical switch to "OFF" position during non-use season. Maintain adequate shade and ventilation for pump motors.

For proper operation of pumps, maintain lubrication for all bearings and pump shafts, assure belts are adjusted properly, maintain safety covering devices on open shafts and belt drives, check to make sure all safety valves and devices are set at proper operating conditions so they may provide protection to the pump and power unit. For centrifugal pumps, periodically measure tolerance between pump impeller and pump casing (i.e. wearing) and replace wear ring as needed to help restore new pump operating characteristics.

Use portable pressure gauge (preferably a liquid filled gauge) to monitor pump performance.

Operate and maintain agitators in accordance with the manufacture's manual and recommendations. Inspect all plumbing annually as a minimum.

Replace, tighten, or repair broken or loose connections and lines as needed.

Specification: NA

Gutters and Downspouts

Field(s): CAFO

Status: Existing

Description: Gutters and downspouts are installed on the livestock barns to collect, control and transport rainfall runoff away from the manure management system to suitable drainageways.

Operation and Maintenance: Annually inspect rain gutters, downspouts, pipelines, trash guards, pumps, structures and appurtenances for proper operation. Keep them free of all foreign material, weeds and sediment. Repair or replace any damaged component as needed.

Keep downspouts and outlets free flowing. Repair or replace broken rodent guards as needed. If the hydraulic capacity is insufficient, replace gutters and downspouts if needed or make provisions for the waste management system to handle the extra water.

Protect downspouts from damage by livestock and equipment and repair any damaged components as needed.

Specification: NA

Underground Outlet

Field(s): CAFO

Status: Existing

Description: Underground pipelines convey water from downspouts connected to gutters on the barns and other surface water sources to suitable drainageways.

Operation and Maintenance: Annually inspect underground outlets for proper operation. Check fields for signs of positive pressure (blow holes) or negative pressure (sink holes) in underground pipelines. Repair or replace damaged or broken pipelines as needed maintaining designed depth of cover.

Keep outlets free of vegetation and sediment. Correct and prevent erosion at outlets by installing riprap or other measures. Repair or replace damaged or broken rodent guards as needed.

Avoid travel over underground pipelines with heavy equipment when the soil is saturated except at crossings designed for this purpose.

Eradicate or otherwise remove all rodents and/or burrowing animals that have or can potentially damage any part of the system. Immediately repair any damage caused by their activity.

Immediately repair any damage due to vandalism, vehicular or livestock.

Specification: NA

Waste Storage Facility

Field(s): CAFO

Status: Existing

Description: The underground collection and storage tank (UCST) shown on the Operation Area Map in Section 2.2 is used to collect and store rainfall runoff from the paved lot area that comes into contact with manure produced from the livestock on Allen Ranch. Approximately 17,353 cubic feet or 129,800 gallons of wastewater is stored and applied to the hay and pasture land fields annually. The underground collection and storage tank (UCST) has an operating capacity of 2,025 cubic feet or 15,147 gallons that provides 26 days of storage for normal precipitation runoff but will overflow if a 25 year-24 hour storm should occur. The storage capacity of the underground collection and storage tank provides less than the NRCS recommended storage period of 154 days computed using Worksheet 10A-7 found in Section 2.4.

Approximately 8,356 cubic feet or 150 tons of solids are produced annually and applied on farm to the hay and pasture land fields. The storage capacity of the existing solids storage barn (SSB) is estimated to be 11,200 cubic feet or 403 tons. The capacity of the solids storage barn will provide more than 365 days of storage capacity which exceeds the NRCS recommended storage period of 154 days computed using Worksheet 10A-7 found in Section 2.4.

All storage facilities for Allen Ranch are summarized in Table 2-2.

Table 2-2. Manure Storage

Storage ID	Type of Storage	Pumpable or Spreadable Capacity	Annual Manure Collected	Maximum Days of Storage
Tank	Outside tank, covered	15,147 Gal	129,800 Gal	26
Solids Storage Barn	Manure pack, roofed	403 Tons	150 Tons	>365
Livestock	Daily scrape & haul (liquid)	923,640 Gal	923,640 Gal	365

Operation and Maintenance:

WASTEWATER COLLECTION AND STORAGE TANK-

The wastewater collection and storage tank shown on the Operation Area Map collect rainfall runoff, manure, bedding and other liquefied organic waste. Wastewater collected in the tank is periodically pumped to the hay and pasture land fields to be utilized as a nutrient source. To function properly and have the greatest management flexibility, the underground collection and storage tank (UCST) must be as empty as possible in October before the fall and winter rainy season begins.

Inspect the tank weekly to insure structural integrity. If the structural integrity of the tank is compromised, immediately empty the tank to determine the cause and make necessary repairs before putting the tank back into service. Do not allow equipment that exceeds the design limit of the tank on or within 20 feet of the structure.

Keep pumps, agitators, piping, valves and all other electrical and mechanical equipment in good condition by following the manufacturer's recommendations. Maintain grounding rods and wiring for all electrical equipment in good condition. Immediately remove all foreign debris within the structure that may cause damage to pumps or agitators.

Pump the wastewater collection and storage tank completely empty during the summer months and cleanout any debris and other solid materials that may have accumulated in the tank. Inspect the tank for structural damage and if structural damage to the tank is discovered seek the services of a qualified engineer to assess the damage and recommend necessary repairs before putting the tank back into service.

Do not dispose of animal carcasses in any wastewater collection and storage tank. It is against the law to do so.

Maintain all fences, railings, and/or warning signs to provide warning and/or prevent unauthorized human or livestock entry. Immediately repair vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances. Maintain lids, grates and shields on openings.

Provide proper ventilation before entering the tank, for any reason what so ever. Provide and use self - contained breathing apparatus (scuba) equipment when entering a tank. No persons should enter the tank unless safety ropes are used and someone else capable of providing rescue assistance is outside the tank.

Do not assume any storage tank, including open top storage tanks, are well ventilated.

SOLIDS STORAGE BARN-

The solids storage barn (SSB) shown on the Operation Area Map is the primary storage facility to store manure, bedding, and wasted feed produced from Allen Ranch.

Emptying of the solids storage barn should begin in the summer months as weather conditions permit applying the solids to the hay and pasture land fields. To function properly and have the greatest management flexibility, the solids storage barn must be as empty as possible in October before the fall and winter rainy season begins.

Periodically inspect concrete and asphalt slabs, walls and curbs and repair or replace broken sections as needed. Cleanup any spillage of manure and organics from outside of the solids and compost storage areas and place them back in the facility.

Maintain all fences, railings, and/or warning signs to provide warning and/or prevent unauthorized human or livestock entry. Immediately repair vandalism, vehicular or livestock damage to the structure, earthen areas surrounding the structure, or any appurtenances.

BUILDING ROOFS-

Inspect building roofs annually as a minimum. Repair and/or replace all rusted sections and secure loose sections as needed. Immediately replace all broken trusses, rafters, beams, poles as needed. Immediately determining the cause and necessary modification(s) to prevent reoccurring structural failure is essential.

Specification: NA

Waste Transfer

Field(s): CAFO

Status: Existing

Description: Rainfall runoff coming into contact with manure is directed to the small underground collection and storage tank (UCST) shown on the Operation Area Map. All solids containing manure, bedding and wasted feed removed from the livestock barns is transferred to the solids storage barn (SSB) using farm equipment.

All planned exports, imports and internal transfers of solids and wastewater containing manure are shown in Tables 2-3, 2-4 and 2-5.

Wastewater stored in the underground collection and storage tank (UCST) is pumped to the hay and pasture land fields during the spring and summer months for utilization as a nutrient source using underground waste transfer pipelines. Solids stored in the solids storage barn (SSB) are transferred to the hay and pasture land fields during the spring and summer months for utilization as a nutrient source using a tractor pulled solids spreader.

Operation and Maintenance: Remove debris and sediment from grates as needed. Annually inspect grates and receiving structures and repair or replace as necessary.

Flush pipelines used for liquid waste applications with clean water following waste application, or as needed, to prevent particle buildup.

Drain the pipeline and components in areas that are subject to freezing. If parts of the pipeline cannot be drained, a non-toxic antifreeze solution may be added.

Check to make sure all valves and air vents are set at the proper operating condition so they can provide protection to the pipeline.

Inspect pipelines for signs of failure. Inspect risers and valves periodically for leaks or worn gaskets. Repair or replace pipeline, risers and valves as needed.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Specification: NA

Table 2-3. Planned Manure Exports off the Farm

Month-Year	Manure Source	Amount	Receiving Operation	Location

(None)

Table 2-4. Planned Manure Imports onto the Farm

Month-Year	Manure's Animal Type	Amount	Originating Operation	Location

(None)

Table 2-5. Planned Internal Transfers of Manure

Month-Year	Manure Source	Amount	Manure Destination

(None)

Watering Facility

Field(s): CAFO

Status: Existing

Description: Watering facilities are installed in the barns to provide livestock access to water.

Operation and Maintenance: Check all above ground connections, valves, gates, rodent guards, inlets and outlets to make sure they are functioning properly. Check troughs and tanks for leaks or cracks and repair or replace immediately, if necessary.

Make certain the area adjacent to the trough is well protected with gravel, paving, or good cover. Be sure that the outlet pipe has a free outlet and is not causing any serious erosion problems. Check periodically to see if debris has fallen into the trough or tank which may restrict inflow or planned functions of the outflow system.

Clean the entire system periodically and remove moss, algae growth, and/or sludge. Chemicals such as copper sulfate and chlorine can be used to prevent moss and algae growth. Local rules and regulations are to be followed when using chemicals to make sure they are safe for animals.

Where necessary maintain coverings and insulation to prevent-damage by freezing.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Immediately repair any vandalism, vehicular or livestock damage.

Specification: NA

2.4 Storage Period Worksheet 10A-7

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM) 7/2/2012

Version 4.1

CLIENT: **Allen Ranch**
ASSISTED BY: **Bruce D. Wilson, H&R Engineering**

Worksheet OR10A-7--Waste storage period determination

Basic Storage Period, SPb = 213 Days

Enter average monthly Evapotranspiration(**ET**) from OSU Extension Publication 8530, Oregon Crop Water Use and Irrigation Requirements, and Precipitation(Ppt) Data from

Climatic Station- BANDON 2 NNE

Day of Year	MONTH	Crop ET, Inches	Accum ET, Inches	Ppt, Inches
1-31	January	0.25	0.25	9.22
32-59	February	0.46	0.71	7.76
60-90	March	0.71	1.42	7.39
91-120	April	2.60	4.02	4.61
121-151	May	3.43	7.45	3.16
152-181	June	3.62	11.07	1.68
182-212	July	3.90	14.97	0.43
213-243	August	3.35	18.32	0.90
244-273	September	2.80	21.12	1.63
274-304	October	2.13	23.25	3.88
305-334	November	0.83	24.08	9.12
335-365	December	0.53	24.61	9.70

a. Determine last day for the month of the year when 3/4 of Annual ET is exceeded-

3/4 of Annual ET = 0.75 x **24.61** = **18.46** Inches

L = Last Day for Month Accum ET exceeds 3/4 of Annual ET

L = 273 Days

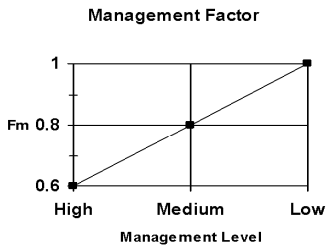
b. Determine first day for the month of the year when ET >= Ppt-

E = First Day of Month ET >= Ppt

E = 121 Days

c. **SPb =** 365 - (L - E) = 365 - (**273** - **121**) = **213** Days

Management Factor, Fm = 0.8



Low Level, Fm = 1.0
...The operator does not utilize a waste management plan.
...Proper operation and maintenance may not be performed.

Medium Level, Fm = 0.8
...The operator utilizes an up-to-date waste management plan.
...Manure application equipment is calibrated for nutrient applications.
...Maintains adequate soil moisture for crop growth.
...Agronomic treatments which would maximize crop nutrient uptake are not fully utilized.
...Proper operation and maintenance is planned.

High Level, Fm = 0.6
...The operator utilizes an up-to-date waste management plan.
...Soil fertility testing is performed annually.
...Manure in storage is tested for nutrient concentrations.
...Records of time, rate and location of manure applications are maintained.
...Manure application equipment is calibrated for nutrient applications.
...Irrigation water management techniques are practiced.
...Crop nutrient uptake is maximized with appropriate agronomic treatments such as residue management, conservation crop rotation, crop variety selection, prescribed grazing, and pest management.
...Proper operation and maintenance is planned.

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

Version 4.1

CLIENT: **Allen Ranch**

ASSISTED BY: **Bruce D. Wilson, H&R Engineering**

Worksheet OR10A-7--Waste storage period determination

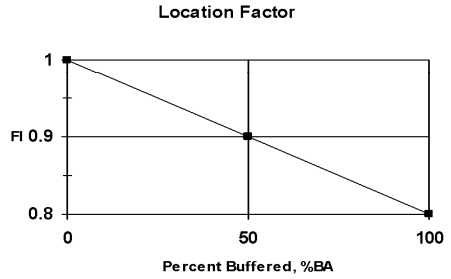
Soils Factor: Fs_{LIQUID} = **0.90** Fs_{SOLID} = **0.70**

Soils must meet the following criteria for Fs to be less than 1.0-
- The average water holding capacity for the profile greater than 3.0 inches.
- A cation exchange capacity greater than 5 meq/100g of soil.
- Depth to a thin layer/cemented pan greater than 20 inches.
- Depth to high water table greater than 2 feet.
- A permeability greater than 0.06 inches/hr but less than 6 inches/hr.
- Cobbles less than 35% by weight in the surface layer.
- Stones and boulders less than 15% by weight in the surface layer.
- A pH greater than 5.0.
- Sodium Adsorption Ratio less than 13.
- Land slope less than 15%.

	Soils Factor (Fs)			
	Consistency of Waste			
HSG	Liquid	Slurry	Semi-Solid	Solid
A	1	0.95	0.9	0.8
B	0.8	0.75	0.7	0.6
C	0.9	0.85	0.8	0.7
D	1	1	0.95	0.85

HSG	Area	Fs_{LIQUID}	Wtd Fs_{LIQUID}	Fs_{SOLID}	Wtd Fs_{SOLID}
C	100	0.9	90.00	0.7	70.00
		Fs_{LIQUID} =	0.90	Fs_{SOLID} =	0.70

Location Factor: Fl = **1.00**

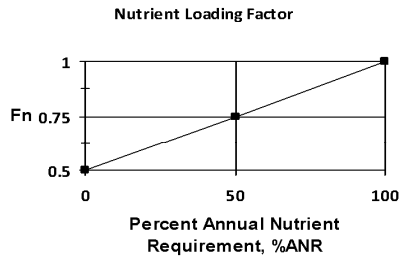


For an application area to be considered buffered there must be a 0 to 5 percent chance of flooding and the area must be at least 50 feet from water bodies, ground water sources(wells), and areas of concentrated flow. The percent buffered area(%BA) is determined by taking the total buffered area(TBA) and dividing it by the total land area(TLA) available for manure application.

$$\%BA = \frac{TBA}{TLA} \times 100\%$$

$$\%BA = \frac{0}{206} \times 100\% = \mathbf{0\%}$$

Nutrient Loading Factor: Fn = **1.00**



In order for the Nutrient Loading Factor, Fn to be less than 1, the Location Factor, Fl must be 0.95 or less.

The percent of annual nutrient requirement(%ANR) is determined by taking the total nutrients applied(TNA) annually and dividing it by the total nutrient requirements(TNR) of all of the crops grown.

$$\%ANR = \frac{TNA}{TNR} \times 100\%$$

$$\%ANR = \frac{603}{840} \times 100\% = \mathbf{72\%}$$

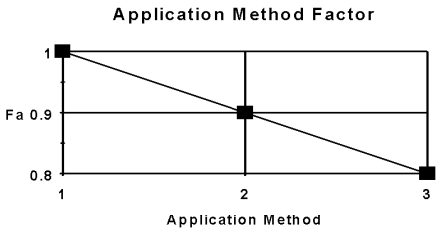
OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

Version 4.1

CLIENT: **Allen Ranch**
ASSISTED BY: **Bruce D. Wilson, H&R Engineering**

Worksheet OR10A-7--Waste storage period determination

Application Method Factor: Fa_{LIQUID} = 0.90 Fa_{SOLID} = 1.00



Method 1 - Surface applied solid manure, no incorporation.

Method 2 - Surface applied liquid manure, no incorporation.

Method 3 - Injection or immediate incorporation.

Adjusted Storage Period: ASP_{LIQUID} = 138 Days ASP_{SOLID} = 119 Days

ASP = SPb X Fm X Fs X Fl X Fn X Fa

ASP_{LIQUID} = 213 X 0.8 X 0.9 X 1 X 1 X 0.9

ASP_{SOLID} = 213 X 0.8 X 0.7 X 1 X 1 X 1

Adjusted earliest Day of Year for application, E_a = ASP - (365 - L)

$E_{a\ LIQUID}$ = 46

$E_{a\ SOLID}$ = 27

Storage Period: SP_{LIQUID} = 138 Days SP_{SOLID} = 124 Days

The storage period must span the seasonal flooding conditions and must also span frozen ground and snow conditions where the land slope exceeds 5% and a buffer strip of less than 100 feet exists next to open water courses that affect the application area-

a. Enter **L** from Sheet 1 and determine the Day of Year L_f when seasonal frozen ground, snow or flooding conditions are first anticipated for the application area-

L = 273 Days L_f = 365 Days

If L_f comes before L then $L_{sp} = L_f$

If L_f comes after L or there is no seasonal frozen ground, snow or flooding then L_{sp} = L

L_{sp} = 273 Days

b. Determine the Day of Year E_f when seasonal frozen ground, snow or flooded conditions are no longer anticipated for the application area-

E_f = 32 Days

If E_f comes after E_a then $E_{sp} = E_f$

If E_f comes before E_a or there is no seasonal frozen ground, snow or flooding then $E_{sp} = E_a$

$E_{sp\ LIQUID}$ = 46 Days $E_{sp\ SOLID}$ = 32 Days

c. SP_{LIQUID} = 365 - (Lsp - Esp LIQUID) = 138 Days

SP_{SOLID} = 365 - (L_{sp} - $E_{sp\ SOLID}$) = 124 Days

d. **Earliest date (E_{sp}) for manure application (month-day):**

$E_{sp\ LIQUID}$ = February 4

$E_{sp\ SOLID}$ = February 1

e. **Latest date (L_{sp}) for manure application (month-day) =** September 31

CLIENT: **Allen Ranch**
ASSISTED BY: **Bruce D. Wilson, H&R Engineering**

Worksheet OR10A-7--Waste storage period determination

Day of Year Calendar

Day of month	Month Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

2.5 Livestock Manure Storage Assessment Worksheet

Ground & Surface Water Contaminants - Nutrients, Organics & Pathogens					
Rating Item	**Low Risk 4 Points**	**Low-Mod Risk 3 Points**	**Mod-High Risk 2 Points**	**High Risk 1 Point**	**Score**
1. No on-farm storage facilities	Wastes hauled off farm for proper storage and disposal			Daily spreading of livestock wastes	NA
2. On-farm storage Manure stack and/or	Manure stack covered; on impermeable surface; rainfall and runoff diverted; built to NRCS standards.	Manure covered; on low permeable soil; rainfall and runoff diverted.	Manure partially covered; on slightly permeable soils; some runoff collected.	Manure not covered; runoff not collected.	4
Liquid/Slurry storage	Concrete, clay lined, or other liquid tight design; designed and built to NRCS standards; properly maintained; no cracks and leaks.	Earthen structure built to NRCS standards and properly maintained.	Not designed to NRCS standards; on slightly permeable soils; poorly maintained, some evidence of cracks and leaks.	Not designed to NRCS standards; on permeable soils; not maintained; leaks and cracks.	4
3. Storage volume	Not full at end of rainy season; if liquid/slurry adequate capacity to hold 25-year, 24-hour storm; solids removed to avoid loss of storage capacity.	Not full at end of rainy season; if liquid/slurry not adequate capacity to hold 25-year, 24-hour storm.	Storage facility requires occasional emptying during the rainy season; if liquid/slurry not adequate capacity to hold 25-year, 24-hour storm.	Storage facility requires regular emptying during the rainy season; if liquid/slurry not adequate capacity to hold 25-year, 24-hour storm.	1
4. Storage location	Manure stack or earthen pond located more than 500 feet from well, stream, pond, or drainageway. Or Liquid/slurry storage located more than 200 feet from well, stream, pond, or drainageway or has emergency containment dike for accidential spills or leaks.	Manure stack or earthen pond located between 250-500 feet from well, stream, pond, or drainageway. Or Liquid/slurry storage located betwen 100-200 feet from well, stream, pond, or drainageway	Manure stack or earthen pond located less than 250 feet downslope from well, stream, pond, or drainageway. Or Liquid/slurry storage located more than 100 feet downslope from well, stream, pond, or drainageway	Manure stack or earthen pond located less than 250 feet upslope from well, stream, pond, or drainageway. Or Liquid/slurry storage located 100 feet from upslope well, stream, pond, or drainageway	4
Livestock Waste Storage Rating for Ground & Surface Waters		Accumulative Score (sum of above ratings)			**13.00**
		Average Score (sum of ratings / number of items rated)			**3.25**
Overall Risk Rating-		**Low to Moderate Risk**			

Ratings: 3.6-4=Low risk, 2.6-3.5=Low to moderate risk, 1.6-2.5=Moderate to high risk, 1-1.5=High Risk

Source: Modification of Oregon Home*A*Syst, EM 8546, Worksheet #7, Livestock Waste Storage

2.6 Livestock Yard Management Assessment Worksheet

Ground & Surface Water Contaminants – Nutrients, Organics & Pathogens					
Rating Item	**Low Risk 4 Points**	**Low-Moderate Risk 3 Points**	**Mod-High Risk 2 Points**	**High Risk 1 Point**	**Score**
1. Location	More than 200 feet from well and more than 500 feet from stream, pond, or drainageway	Between 100-200 feet of well and between 250-500 feet from stream, pond, or drainageway	Between 50-100 feet of well and between 100-250 feet from stream, pond, or drainageway	Less than 50 feet of well and less than 100 feet from stream, pond, or drainageway	4
2. Livestock water source	Stock water in troughs, with overflow diverted to wastewater system	Stock water in troughs with overflow diverted from lot area. Stock excluded from streams or ditches.	Live water fenced, with stock water provided in water gap.	Stock water provided by live stream or irrigation ditch.	4
3. Surface water diversion	All upslope and roof water diverted. Diversion and gutters well maintained.	Most upslope surface and roof water diverted. Diversions and gutters occasionally maintained.	No surface water diverted. Some roof water collected and redirected. Gutters and diversions not maintained.	All water (surface and roof water) runs through the yard.	4
4. Lot runoff control system	No yard runoff. Fully covered area or runoff from surfaced lot directed to waste storage facility.	All runoff collected from compacted, earthen lot. Solids mounded and collected or stored.	Most of lot runoff diverted to filter strip and collected. Some solids removed.	Lot runoff uncontrolled. Solids rarely collected.	4
5. Yard cleaning and scraping	No yard (animals confined)	Every month or two lot smoothed, leveled, and regularly shaped.	Quarterly. Lot rough and irregular in shape.	Rarely. Lot poorly sited and developed for cleaning and scraping.	4
6. Dairy cow concentration on yard	No yard. Confined to barn, roofed yard or pasture.	75 sf/a or more on fenced, curbed concrete pad and/or 400 sf/a on graded earthen surface. More than 1800 sf/a in exercise area.	50 sf/a or more on concrete pad and/or 200-300 sf/a on earthen surface. More than 1200 sf/a in exercise area.	Some concrete, less than 50 sf/a and less than 200 sf/a on earthen surface.	NA
7. Dairy replacements concentration	No yard. Confined to barn, roofed yard, or pasture.	More than 40 sf/a on fenced, curbed concrete pad and/or more than 150 sf/a on earthen yard.	40-20 sf/a on concrete and/or 75-150 sf/a on earthen surface.	Less than 75 sf/a on earth.	NA

Ground & Surface Water Contaminants – Nutrients, Organics & Pathogens					
Rating Item	**Low Risk 4 Points**	**Low-Moderate Risk 3 Points**	**Mod-High Risk 2 Points**	**High Risk 1 Point**	**Score**
8. Beef feeder concentrations	No yard. Confined to barn.	Barn and/or paved lot more than 50 sf/a. Earthen lot with mound more than 300 sf/a, or without mound more than 500 sf/a.	No shelter. Paved lot with 30-50 sf/a. Earthen lot with mound 150-300 sf/a or earthen without mound 250-500 sf/a.	Paved less than 30 sf/a. Earthen less than 250 sf/a.	4
9. Beef cows/heifers concentrations	Barn, roofed yard, or pasture.	Barn with paved lot more than 60 sf/a. Earthen with mound 400 sf/a or without mound 600 sf/a.	Paved lot more than 30 sf/a. Earthen with mound 200-400 sf/a or without mound 300-600 sf/a.	Paved less than 30 sf/a. Earthen without mound less than 200 sf/a.	4
10. Sheep/ewes concentrations	No yard. Confined to barn, roofed yard, or pasture.	Barn and paved lot more than 20 sf/a. Earthen more than 40 sf/a.	Barn and paved lot 15-20 sf/a. Earthen 25-40 sf/a.	Barn and paved lot less than 15 sf/a. Earthen less than 25 sf/a.	NA
11. Feeder lambs concentrations	No yard. Confined to barn, roofed yard, or pasture.	Barn and paved lot more than 10 sf/a. Earthen more than 25 sf/a.	Barn and paved lot 5-10 sf/a. Earthen 10-25 sf/a.	Barn and paved lot less than 5 sf/a. Earthen less than 10 sf/a.	NA
12. Hogs/sows Concentrations	No yard. Confined to barn.	Shed and paved lot more than 30 sf/a.	Shed and earthen lot more than 10 sf/a	Shed and earthen lot less than 10 sf/a.	NA
13. Horses concentrations	No yard. Confined to barn, roofed yard, or pasture.	Earthen exercise lot more than 2,500 sf/a.	Earthen exercise lot 1,000-2,500 sf/a.	Earthen exercise lot less than 1,000 sf/a	NA
14. Poultry concentrations	No lot. In building.	.	Earthen lot of more than 4 sf/a.	Earthen lot of less than 4 sf/a.	NA
Livestock Yard Rating		Accumulative Score (sum of above ratings)			**28.00**
		Average Score (sum of ratings / number of items rated)			**4.00**
Overall Rating-		**Low Risk**			

Ratings: 3.6-4=Low risk, 2.6-3.6=Low to moderate risk, 1.6-2.5=Moderate to high risk, 1-1.5=High Risk

Note: sf/a = square feet per animal

Source: Modification of Oregon Home*A*Syst, EM 8546, Worksheet #8, Livestock Yards Management

2.7 Mortality Management

Currently mortalities for Allen Ranch are being disposed of by burial at the time of death.

Having dead animals sent to an acceptable disposal site is the best method to deal with animal mortalities. A list of landfills and phone numbers can be found on the internet at http://www.deq.state.or.us/lq/sw/disposal/permittedfacilities.html. If a local landfill is not permitted to accept animal carcasses, the Oregon Department of Environmental Quality (DEQ) may grant an exception. Phone numbers to local DEQ offices can be found in most phone books or on the internet at http://www.deq.state.or.us/about/locations.html.

Under no circumstances are animal mortalities to be disposed of in any type of liquid manure storage facility.

Refer to Section 3 for guidance on steps to take for a catastrophic animal mortality event.

Guidance for various methods for disposing of animal mortalities are:

Composting- Components of this plan are considered adequate to meet the requirement for having a composting plan for the Oregon Department of Agriculture, Natural Resources Division. The composting facility for animal mortalities must have a concrete floor or similar impervious surface to prevent nutrient leaching. A roof covering the animal mortality composting facility is recommended to control moisture added by rainfall and rainfall runoff. A permit is also needed from the Department of Environmental Quality (DEQ) if animal mortalities will be imported from other farms for composting.

Rapid composting of dead animals occurs when the carbon to nitrogen (C:N) ratio of the compost mix ranges between 10 and 20 to 1. To achieve the recommended C:N ratio, build the initial compost pile by placing 18 inches of sawdust or other bulking agent on the floor of the composting area. The bulking agent should extend beyond the perimeter of the animal to be composted by at least 2 feet. If using a compost bin the bulking material should extend at least 1 foot beyond the perimeter of the animal being composted. Using a bulking agent such as sawdust will absorb any liquids as the animal decomposes during the composting process.

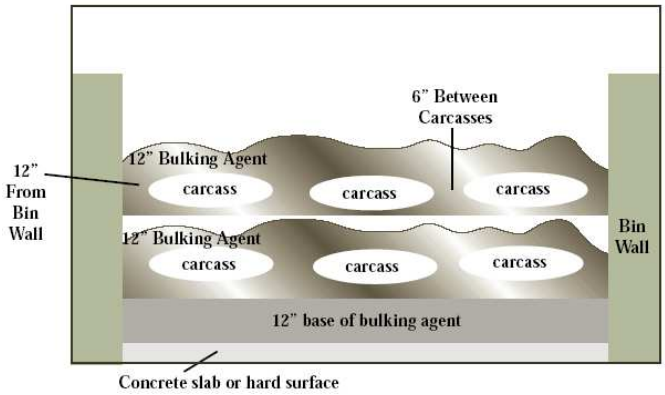
Once the bulking agent has been placed on the floor of the composting area, place the animal carcass on top. To decrease composting time and prevent bloating the body cavity should be cut open. Cover the carcass with 1 to 3 feet of separated manure solids or other material that has a moisture content between 30 to 60 percent and a C:N ratio of not more than 30 to 1. Use 1 foot of material for small carcasses and 3 feet for large carcasses such as cattle. Be careful not to add material that is to wet as it will hinder the composting process and cause odors. Small animals can be layered in a compost pile by placing 12 inches of the bulking agent between layers as shown in the figure below. Be sure the total height of the compost pile does not exceed 7 feet in height as it may spontaneously combust causing a fire.

The first heating or primary composting cycle will take approximately 15 to 90 days depending on the size of the animal being composted. Refer to the table below for estimated primary composting times. Check pile temperature using thermometer probe on a daily basis. The pile temperature should be checked at multiple points around the compost pile and at a point approximately 3 feet into the pile. The temperature of the compost pile should reach 130 degrees Fahrenheit (F) within a few days. Temperatures should peak between 130 and 150 degrees F in 3 to 4 days. When the temperature of the compost pile falls below 130 degrees F, the compost

needs to be aerated by turning or other means. Be sure carcasses remain covered with the bulking agent after being aerated. It is important to maintain a temperature above 130 degrees F for at least 7 days during the primary composting cycle as failure to do so may result in the incomplete destruction of pathogens and can cause fly and odor problems. After aerating the compost pile, the secondary composting times will be similar to the first.

CAUTION: It is unclear whether prions that are the proteins that cause Bovine Spongiform Encephalitis (BSE or Mad Cow Disease) are destroyed in the composting process. Animals showing signs of Mad Cow Disease and those with anthrax should not be composted and must be reported to the Oregon Department of Agriculture, Animal Health and Identification Division at (503) 986-4680 for guidance on disposal.

After aerating the compost pile by turning or other means, be sure to check the moisture content and add water if necessary being careful not to add to much water. The compost pile should feel moist to the touch but you should not be able to squeeze any water out of it.



Primary Composting Times

Carcass Size (lb)	*Estimated Primary Composting Days*
0-10	15
10-25	22
25-300	45
300-750	60
750-1400	90

Odors given off by the composting operation is a good indicator of how the compost operation is proceeding. Foul odors may mean that the process has turned from aerobic to anaerobic. Anaerobic conditions are the result of insufficient oxygen in the compost. This may be caused by excessive moisture in the compost or the need for turning or aerating of the compost pile.

After the composting process is finished, it may be used as a bulking agent for a new compost pile. A rule of thumb is to use 50 percent of the composted material for a bulking agent but you may want to use more or less depending on how degraded the bulking agent is in the finished compost. Using finished compost in a new compost pile reduces the amount of bulking agent needed for the new pile and provides microbial inoculants to get the composting process started.

Finished compost can also be applied to crop and pasture land fields for utilization of the nutrients and organics in the composted material. Compost from animal mortalities should not be applied to crops that will be consumed directly by humans. The nutrient content of the composted material should be determined and application equipment calibrated to ensure nutrients contained in the composted material are not over applied.

Natural Disposal- To allow nature to take its course the dead animal needs to be transported to a location at least ½ mile from any off-farm dwelling and at least ¼ mile from any water way in accordance with ORS 601.140. Once this criteria is met the carcass can be left to degrade naturally with the help of scavengers. This method is not an acceptable means of disposal for a large number of animal mortalities or for byproducts generated during butchering.

Landfill- Dead animals may be transported to a permitted landfill that accepts animal carcasses for disposal. Be sure to call the chosen landfill first to insure a landfill will accept your animal

carcasses. Refer to the website given previously for permitted landfills to call. Contact the landfill operator and the DEQ at (800) 452-4011 if the landfill you would like to use is not a permitted facility to see if an exception may be granted for the disposal of animal carcasses.

Incineration- Dead animals may be burned as a method of disposal and as a method to control diseases. The economics of incineration and availability of incineration units usually make this option undesirable. A permit is needed from the Oregon Department of Environmental Quality (DEQ) Air Quality program to operate an incineration unit. Contact your DEQ at (800) 452-4011 for guidance on incineration of animal carcasses.

Burial- Dead animals may be buried in accordance with ORS 601.090(7) as a method of disposal. Large animals such as an adult cow will require a hole approximately 2 feet by 7 feet by 8 feet deep. Be sure to select a site that doesn't have a water table to insure the bottom of the hole will be dry. The animal carcass should be covered with hydrated lime and covered with at least 4 feet of soil mounded 2 feet above the natural ground line to allow for settling as the carcass decomposes. Burial sites should be located at least 500 feet down slope from surface waters or wells.

Burial is not an acceptable method of disposal for animal byproducts generated from butchering. Burial of large numbers of animal mortalities is not acceptable unless performed in accordance with a Catastrophic Animal Mortality Management Plan. Burial of imported animal mortalities is subject to disposal regulations and the Oregon Department of Environmental Quality (DEQ), the Oregon Department of Agriculture (ODA) and the local land use planning authority should be contacted.

Section 3. Farmstead Safety and Security

3.1 Emergency Response Plan

In Case of an Emergency Storage Facility Spill, Leak or Failure

Implement the following steps:

a. Stop all other activities to address the spill.
b. Stop all flow into the facility.
c. If the storage facility is at maximum capacity or overtopping, draw the waste level in the facility down by making an application to the emergency application area shown on the Land Treatment Area Map.
d. Assess the extent of the emergency and determine how much help is needed to correct the problem.
e. Call for help (See Table 3.1 and 3.2) and excavator if needed.
f. If possible, use a skid loader or tractor with blade to contain or divert spill or leak away from environmentally sensitive areas.
g. If containment material is needed, excavate soil from appropriate areas away from the storage facility.
h. Complete the clean-up and repair the necessary components.
i. Assess the extent of the emergency and request additional help if needed.
j. If a Discharge to ground or surface waters occurs, the Oregon Department of Agriculture is to be Notified within 24 hours (See Table 3.3) and a Written Report is to be made by the Owner or Operator to Oregon Department of Agriculture within 5 Days that contains the following information:
   (1) A description and cause of the discharge.
   (2) The period of discharge including exact dates, times and duration of discharge.
   (3) An estimate of discharge volume.
   (4) Name or location of receiving water.
   (5) Corrective steps taken, if appropriate, to reduce, eliminate or prevent reoccurrence of the discharge.

In Case of an Emergency Spill, Leak or Failure During Transport or Land Application

Implement the following first containment steps:

a. Stop all other activities to deal with the emergency.
b. Call sheriff's office (See Table 3.1) if manure is spilled on road for traffic control and clean the spill immediately from the road and roadside if needed.
c. Contain the spill or runoff from entering surface waters using straw bales, saw dust, soil or other appropriate materials.
d. If flow is coming from a tile, plug the tile with a tile plug immediately.
e. Assess the extent of the emergency and request additional help if needed.
k. If a Discharge to ground or surface waters occurs, the Oregon Department of Agriculture is to be Notified within 24 hours (See Table 3.3) and a Written Report is to be made by the Owner or Operator to Oregon Department of Agriculture within 5 Days that contains the following information:
   (1) A description and cause of the discharge.
   (2) The period of discharge including exact dates, times and duration of discharge.
   (3) An estimate of discharge volume.
   (4) Name or location of receiving water.
   (5) Corrective steps taken, if appropriate, to reduce, eliminate or prevent reoccurrence of the discharge.

The land application equipment will be constantly monitored by the person conducting the land application of manure. In order to prevent an accident or spill during land application, operator should complete an inspection of the land application equipment to ensure proper function prior to performing land application. In addition, weather conditions (wind speed and direction, precipitation, etc.) and field conditions (proper setbacks noted, soil moisture, etc.) should be verified prior to land application.

Table 3-1. Department/Agency Phone Numbers

Department / Agency	Phone Number
Fire Emergency Fire Non-Emergency	**911** **(541) 396-2232**
Ambulance	**911**
Sheriff Emergency Sheriff Non-Emergency	**911** **(541) 396-3121 x371**

Table 3-2. Available equipment/supplies for responding to emergency

Equipment Type	Contact Person	Phone Number
Nearest excavation equipment	Beau Allen	(541) 297-4072

Table 3-3. Contacts to be made by the Owner or Operator within 24 hours of Manure Spill, Leak or Facility Failure.

Organization	Phone Number
Oregon Department of Agriculture Confined Animal Feeding Program 635 Capitol Street N.E. Salem, OR 97301-2532	**(503) 986-4700** **TTD (503) 986-4762**
Oregon Emergency Response System (ORES)	**(800) 452-0311**
County Environmental Health Department	**(541) 756-2020 x513**

Be prepared to provide the following information:

a. Your name and contact information.
b. Farm location and other pertinent identification information.
c. Description of the emergency.
d. Estimate of the amounts, area covered, and distance traveled.
e. Whether manure has reached surface waters or major field drains.
f. Whether there is any obvious damage; i.e., employee injury, fish kill, or property damage.
g. Current status of containment efforts.

In Case of an Catastrophic Animal Mortality Event

a. Remove animal mortality from the livestock production area and place in an area designated for mortality storage.
b. Contact a veterinarian if animal death is suspicious or animal displayed unusual symptoms before death.
c. If it is determined that a disease outbreak is eminent, implement procedures as directed by the State Veterinarian. This may include killing exposed animals, burning there carcasses and burial of their ashes in a predetermined catastrophic mortality burial area.

Table 3-4. Catastrophic Mortality Management Contacts

Organization	Phone Number
Oregon Department of Agriculture **Natural Resources Division** **635 Capitol St. N.E.** **Salem, OR 97301-2532**	**(503) 986-4700** **TTD (503) 986-4762**
Oregon Emergency Response (System ORES)	**(800) 452-0311**
County Environmental Health Department	**(541) 756-2020 x513**
State Veterinarian	**(503) 986-4680**

Be prepared to provide the following information:

1. Your Name and phone number.
2. Farm Identification (See Above).
3. Cause of catastrophic animal mortality event.
4. Estimate of the number of current and projected animal mortalities.
5. What is currently in progress to deal with the situation?

3.2 Safety

Waste collection and management facilities should be kept in a state of good repair and safe operating condition at all times. Warning signs, ladders, ropes, bars, rails, and other safety devices should be provided, as appropriate, to help insure the safety of humans and livestock. Each device should be structurally adequate to support anticipated loads. (A rope may be adequate sight warning, but inappropriate to support a person who accidentally slips on wet concrete.)

At least four noxious gasses are generated when organic waste is subject to anaerobic processes. They are: Methane (CH4), Hydrogen Sulfide (H2S), Ammonia (NH3) and Carbon Dioxide (C02). In high enough concentrations, all can be lethal through lack of oxygen or poisoning. (Three gases are heavier than air and will exclude oxygen from depressed areas.) All but carbon dioxide can be explosive. Ventilation and warning signs must be provided for enclosed waste holding structures to help prevent explosions, poisoning or asphyxiation. Pipelines from an enclosed tank(s) in a building should be provided with a water - sealed trap and vent to prevent gas entry into the building.

Entry into pits, ponds or tanks should not be allowed but if entry cannot be avoided the following procedures should be adhered to:

1) **Ventilate the facility before and during occupancy and use a self-contained breathing apparatus. Do not assume any storage tank, including open top storage tanks, are well ventilated.**
2) **Attach a tether or lead capable of supporting the weight of the person entering the facility and have a person outside the facility at all times tend the tether or lead.**

When inspecting or working on machinery, the following procedures should be adhered to:

1) **Disconnect all power connections and provide lockouts whenever possible.**
2) **Use blocks in front and behind rolling equipment to prevent movement.**

Obey all warning signs posted around manure storage structures.

Beware of vehicle traffic and avoid travel paths of rapidly moving equipment.

Beware of slip, trip and fall hazards such as extension cords, wet or manure coated floors, and rotted wood or loose boards.

Avoid equipment without proper safe guards such as tractor power take offs, grain augers, feed grinders, mowers and ventilation fans.

Wear a dust mask in dusty environments both indoors and outdoors.

Stay away from any loose electrical wiring or electrical fence wiring unless power has been turned off.

3.3 Biosecurity Measures

In order to reduce or prevent the spread of disease causing organisms (pathogens) a few simple guidelines should be followed:

1. Ask visitors to give advance notice before visiting the farm and be prepared to provide biosecurity practices they will have to follow during their visit. As a minimum it is recommended that visitors to the farm that will be entering the production area wash and disinfect their vehicle and boots prior to their visit. It is also a good idea to have visitors wait 24 hours before visiting the farm if they plan to visit other farms just prior to their scheduled visit.
2. If at all possible have visitors avoid livestock housing and feed storage areas. If visitors must enter livestock housing and feed storage areas make sure their boots are washed and disinfected before entering or have disposable boots on and are wearing clean clothes or disposable overalls.
3. Do not allow visitors to drive their vehicles through livestock housing and feed storage areas after driving through areas containing animal manure.
4. If potential visitors have visited a farm with Foot-and-Mouth Disease (FMD) make sure they disinfect all clothing and personal items and make them wait at least five days before visiting your farm.

3.4 Chemical and Petroleum Handling, Use and Storage

The owner and operator of Allen Ranch, Beau Allen plans to use the minimal amount of insecticides, herbicides, fungicides, or rodenticides to control pests on the ranch. All chemicals will be stored in their original container and store in the shop area on the ranch.

Allen Ranch maintains a 55 gallon above ground drum for gasoline and a 1,000 gallon above ground tank for diesel to fuel vehicles and equipment used on the ranch. The tanks do not have secondary containment so obtaining portable secondary containment booms or installing secondary containment measures is recommeded. Lubricants for vehicles and equipment used on Allen Ranch are stored in containers located in the shop area shown on the Operation Area Map. Any fuel or lubricant spills would be contained in and around the barns in the CAFO area shown on the Operation Area Map and would not be a threat to any surface or ground water sources.

All veterinary supplies are kept in the farm's business office under lock and key. All syringes are disposed of in a sharps container which is taken to a suitable disposal facility once the container is full.

The following measures shall be taken to prevent chemicals from contaminating process water or storm water storage and treatment systems:

1. Make sure all chemicals are stored in proper containers. Expired chemicals and empty containers are to be properly disposed of in accordance with state and federal regulations. Pesticides and associate refuse are to be disposed of in accordance with the FIFRA label.
2. Chemical storage areas are to be self-contained with no drains or other pathways that will allow spilled chemicals to exit the storage area.
3. Chemical storage areas are to be covered to prevent chemical contact with rain or snow.
4. Emergency procedures and equipment are to be in place to contain and clean up chemical spills.
5. Chemical handling and equipment wash areas are to be designed and constructed to prevent contamination of surface waters, waste water, and storm water storage and treatment systems.

Section 4. Land Application Site Information (Land Treatment)

4.1 Land Inventory

There are 215.9 acres of hay and pasture land area owned by Allen Ranch that are available to utilize nutrients and organics produced by Allen Ranch. The amount of spreadable acres for utilization of the nutrients and organics produced from Allen Ranch are shown in the following table:

Table 4-1. Field Information

Field ID	Sub-field ID	Total Acres	Spread-able Acres	County	Predominant Soil Type	Slope (%)	Watershed Code	FSA Farm	FSA Tract	FSA Field
1		5.0	4.7	Coos	41 (Nestucca SIL)	3.0	171003050501			
2		8.0	7.6	Coos	41 (Nestucca SIL)	3.0	171003050501			
3		5.0	5.0	Coos	40 (Nehalem SIL)	3.0	171003050501			
4		0.9	0.9	Coos	40 (Nehalem SIL)	3.0	171003050501			
5		7.0	7.0	Coos	40 (Nehalem SIL)	3.0	171003050501			
6		7.0	7.0	Coos	62 (Willanch FSL)	3.0	171003050501			
7		6.0	6.0	Coos	40 (Nehalem SIL)	3.0	171003050501			
8		2.5	2.0	Coos	41 (Nestucca SIL)	3.0	171003050501			
9		3.5	3.3	Coos	9 (Chetco SICL)	3.0	171003050501			
10		10.5	10.4	Coos	41 (Nestucca SIL)	3.0	171003050501			
11		7.0	7.0	Coos	40 (Nehalem SIL)	3.0	171003050501			
12		10.5	10.5	Coos	40 (Nehalem SIL)	3.0	171003050501			
13		11.5	11.5	Coos	40 (Nehalem SIL)	3.0	171003050501			
14		9.0	9.0	Coos	41 (Nestucca SIL)	3.0	171003050501			
15		5.0	4.3	Coos	9 (Chetco SICL)	3.0	171003050501			
16		3.5	2.9	Coos	9 (Chetco SICL)	3.0	171003050501			
17		14.0	12.5	Coos	9 (Chetco SICL)	3.0	171003050501			
18		6.0	5.6	Coos	40 (Nehalem SIL)	3.0	171003050501			
19		10.0	9.5	Coos	41 (Nestucca SIL)	3.0	171003050501			
20		9.5	9.2	Coos	40 (Nehalem SIL)	3.0	171003050501			

Field ID	Sub-field ID	Total Acres	Spread-able Acres	County	Predominant Soil Type	Slope (%)	Watershed Code	FSA Farm	FSA Tract	FSA Field
21		7.0	6.1	Coos	41 (Nestucca SIL)	3.0	171003050501			
22		10.0	9.4	Coos	9 (Chetco SICL)	3.0	171003050501			
23		15.5	14.8	Coos	9 (Chetco SICL)	3.0	171003050501			
24		10.5	9.5	Coos	9 (Chetco SICL)	3.0	171003050501			
25		5.5	5.2	Coos	9 (Chetco SICL)	3.0	171003050501			
26		18.0	17.5	Coos	9 (Chetco SICL)	3.0	171003050501			
27		8.0	8.0	Coos	13D (Dement SIL)	21.0	171003050501			
CAFO		7.1		Coos	40 (Nehalem SIL)	3.0	171003050501			
Wetland	1	2.0		Coos	41 (Nestucca SIL)	0.0	171003050501			
Wetland	2	1.6		Coos	41 (Nestucca SIL)	0.0	171003050501			

The land application fields and spreadable acres are shown on the Land Treatment Area Map in Section 4.3.

4.2 Environmental Inventory (Sensitive Areas)

Allen Ranch is located in the Hall Creek-Coquille River watershed having an twelve-digit Hydrologic Unit Code (HUC) of 171003050501. All rainfall runoff from Allen Ranch will be captured by drainage ditches and streams that drain to the Coquille River. The Land Treatment Area Maps located in Section 4.3 shows all surface water bodies that would receive rainfall runoff from the Allen Ranch and the Topographic Maps located in Section 1.6 shows the farm field locations and watershed(s).

The Coquille River provides important habitat for birds, fish and animals and provides critical food sources for endangered salmonid species of fish. Any polluted runoff entering the Coquille River would negatively impact wildlife habitat and water quality which are used by salmonids for spawning and rearing fry and for city water supplies downstream.

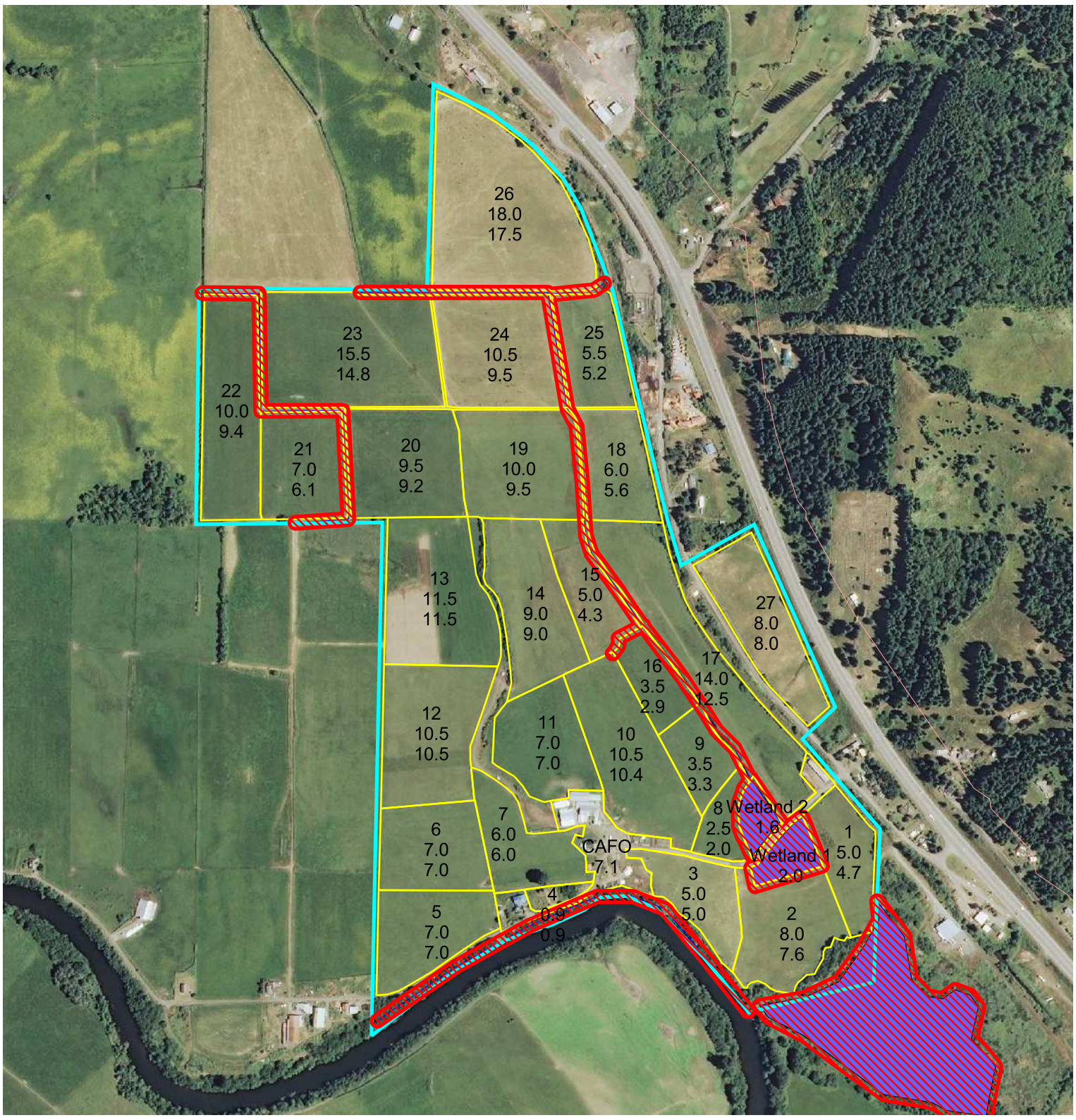
The Farm Fields Overview Map located in Section 1.5 and Topography Map located in Section 1.6 show the boundaries of Allen Ranch and its relation to the Coquille River and its tributaries. The Oregon Confined Animal Feeding Operation National Pollutant Discharge Elimination System General Permit Number 01-2009 requires a minimum vegetated setback of 35 feet and a 100 foot nonvegetated setback from any water course to prevent pollution of surface waters from polluted runoff due to land application of manure and runoff from production facilities. Minimum manure application setback distances from water features are shown in Table 4-1. Allen Ranch is planning to maintain vegetated setbacks along open water courses to help enhance wildlife habitat and reduce the risk of polluted runoff from the land application and production areas from reaching the Coquille River.

Allen Ranch uses river water to supply livestock with drinking water and uses roof runoff water to supply the house with water. The risk for animal manures to pollute the livestock and house water supplies is low.

4.3 Land Treatment Area Map(s)

Allen Ranch

Sections 30,31, & 32, Township 20 South, Range 12 West from the Willamette Meridian



Field ID	Landuses, Acres
CAFO	Headquarters, 7.1 acres
1,2,3,4, 5,6,7,8,9, 10,11,12, 13,14,15, 16,17,18, 19,20,21, 22,23,24, 25,26,27	Hay & Pasture Land, 215.9 acres
Wetland 1, Wetland 2	Wetland, 3.6 acres

Map Legend

Field Name
Acres
Spreadable Acres

- Field Boundary, Field ID, Acres

- 35 foot Vegetated Setback

N
W E
S

Scale 0 1000 2000 3000 Feet

4.4 Land Treatment Practices

Following are practices that Allen Ranch has implemented or plans to implement that address resource concerns for the land treatment areas identified in Section 1.7:

Fence

Field(s): 1-27

Status: Existing

Description: Fences are installed to control the movement and access of animals and humans.

Operation and Maintenance: Do not allow livestock access to open water courses and drainageways. Provide off stream watering facilities where possible and limit access to designated watering areas.

Inspect fences periodically and repair or replace broken or decayed posts and tighten sagging wire as needed. Broken wire can be spliced or replaced. Replace broken or missing insulators on electric fences as needed and repair or replace inoperative electric fence controllers.

Insure gates and other appurtenances are in good working order. Replace or repair components as needed.

Specification: NA

Forage and Biomass Planting

Field(s): 1-27

Status: Planned **Units: 215.9 Acres**

Description: As hay land fields need renovating, adapted and compatible species, varieties, or cultivars will be established in the fields as shown on the Land Treatment Area Map to provide forage and hay for livestock.

Operation and Maintenance: Evaluate pasture and hay land fields annually to determine what fields need to be reseeded. Generally if the pasture or hay lands are below a fair condition rating and the yields from the previous grazing or haying season were less than 50 percent of yield goals, the pasture or hay land field should be reseeded.

Take a soil sample of the top 12 inches of soil and have it analyzed for pH, Lime requirement(SMP), Phosphorus(P), Potassium(K), Calcium(Ca), and Magnesium(Mg) prior to seed bed preparation. See Oregon State University (OSU) Extension Publication PNW 570-E, Monitoring Soil Nutrients Using a Management Unit Approach, in Appendix H for more guidance on soil sampling.

Prior to October 15th: Prepare seed bed (including weed control and tillage) and add fertilizer and other amendments according to soil test recommendations.

Prior to October 15th: Seed pastures. It is best to seed a pasture or hay land between September 1st and October 15th so no irrigation will be needed.

Specification:

PLANTING PLAN-

Fertilizer: Refer to Oregon State University fertilizer guide (FG63) for pastures and soil test recommendations for the amounts of fertilizer and other amendments to add while preparing the seed bed.

Seedbed Preparation: Till the soil lightly with a disk and harrow to prepare for seeding the pasture or hay land. *The seedbed should be very firm (your foot should not sink into the soil more than 1/2 inch), weed-free and free of ruts.* Small clods are okay (they help prevent erosion).

Weed Control: The tillage will probably be sufficient weed control, however application of a labeled herbicide is optional if weeds remain.

Seeding dates: It is generally best to seed the pasture or hay land between September 1 and October 15 to ensure adequate grass establishment before the winter erosion period. Seedings can be made during other times when the soil is suitable for tillage operations but the new seeding will have to be irrigated to insure good germination and establishment.

Seed depth: Generally seeding depths should be 0.75 – 1.5 inch however actual seeding depths should be determined for the variety and species of the seed being planted.

Seeding method: Broadcast or use a grain drill and harrow lightly after seeding.

SEED-

Contact the local OSU Extension Service for recommendations on what varieties of grass to plant based on forage production goals and site conditions for the pasture or hay land.

Note: Be sure to use seed that is at least 72% Pure Live Seed (PLS). PLS is calculated by multiplying % Germination X % Purity. For example, seed that is 90% Pure and has 70% Germination has PLS = 90% X 70% = 63%. This seed would be considered too low in quality to produce adequate forage for pasture or hay land .

PASTURE AND HAY LAND ESTABLISHMENT:

Allow the pasture or hay land planting to grow throughout the rainy season and defer grazing of the new seeding until it is well established.

Control growth of volunteer plants and shading to reduce competition to the pasture or hay land.

Control weeds and volunteer plants in the pasture or hay land by mowing or by using herbicides. Do not allow noxious weeds to go to seed. Information on noxious weeds can be obtained from the Oregon Department of Agriculture website: http://egov.oregon.gov/ODA/PLANT/WEEDS/county_events.shtml or by calling (503) 986-4621.

Forage Harvest Management

Field(s): 1-27

Status: Planned **Units: 215.9 Acres**

Description: Forages harvested from the fields shown on the Land Treatment Area Map for hay or silage shall be cut and stored in a timely manner to provide high quality feed for the livestock. Care should be taken when feeding grass haylage harvested from fields testing high in soil concentrations of potash as the high amounts of potassium in the soil may be taken up by the hay crop and cause grass tetany if fed to lactating and dry cows.

Operation and Maintenance: Before forage harvest, clear fields of debris that could damage machinery, or if ingested by livestock lead to sickness (for example, hardware disease) or death. Monitor Weather conditions and take action accordingly before and after cutting to optimize forage wilting or curing time to preserve feed quality and prevent forage swaths or windrows from smothering underlying plants.

Select equipment sizes and capacities that will handle the acreage planned for harvest economically and in a timely manner.

Operate all forage harvesting equipment at the optimum settings and speeds to minimize loss of leaves.

Set shear-plate on forage chopper to the proper theoretical cut for the crop being harvested. Keep knives well sharpened. Do not use recutters or screens unless forage moisture levels fall below recommended levels for optimum chapping action.

Regardless of silage/haylage storage method, ensure good compaction and an air-tight seal to exclude oxygen on mold formation.

Inspect and repair harvesting equipment following the manufacturer's preventative maintenance procedures. All shields shall be in place during machine operation to prevent injury or death. Shut off machinery before working on or unplugging moving parts.

Specification: Apply animal waste in accordance with the guidance given in the Nutrient Management specification.

Apply irrigation water in accordance with the guidance given in the Irrigation Water Management specification.

The pasture shall be clipped and dragged a minimum of twice annually to promote uniform grazing and avoid damage to the plants and/or a reduction in forage production. Clipping and dragging after each grazing period will promote optimum pasture conditions.

If rodent, insect or weed control becomes a problem, a pest management program may need to be included. See your local OSU Extension Agent for recommended pest control methods.

When making hay, cut grasses when they are in the boot stage to produce hay with high quality protein and insure the minimum plant height after cutting is 3 inches to maximize production. Before harvest, clear fields of debris that could damage machinery, or if ingested by livestock, lead to sickness or death.

Delay harvest if prolonged or heavy precipitation is forecast that would seriously damage cut forage or forage swaths or windrows would smother underlying plants before removal from the field. Where weather conditions make it difficult to harvest the desired quality of forage, use mechanical or chemical conditioners and/or ensile. When harvested for ensilage forage should be chopped to a size that allows adequate packing to produce the anaerobic conditions necessary to ensure the proper ensiling process.

Harvest silage/haylage crops at the ideal moisture range for the type of storage planned. Treat direct cut hay crop silage with chemical preservatives or add dry feed stuffs to avoid fermentation and seepage digestible dry matter losses. For optimal forage quality, rake, ted, or invert swaths, and bale when hay has sufficient moisture to prevent leaf loss. Bale at optimum moisture levels to preserve forage quality and quantity. Approximate percent moisture should be as follows:

* Bale field cured hay at 15 to 20 percent moisture.
* Bale forced air dried hay at 20 to 35 percent moisture.
* Rake hay at 30 to 40 percent moisture.
* Ted or invert swaths when moisture is above 40 percent.

Keep records of forage harvest to document yields.

Wastewater and Irrigation Water Transfer Pipelines

Field(s): 1-27

Status: Existing

Description: Existing pipelines convey irrigation water and wastewater to hay and pasture land fields in an efficient manner to prevent contamination of ground and surface water sources.

Operation and Maintenance: Flush pipelines used for liquid waste applications with clean water following waste application, or as needed, to prevent particle buildup.

Drain the pipeline and components in areas that are subject to freezing. If parts of the pipeline cannot be drained, a non-toxic antifreeze solution may be added.

Check to make sure all valves and air vents are set at the proper operating condition so they can provide protection to the pipeline.

Inspect pipelines for signs of failure. Inspect risers and valves periodically for leaks or worn gaskets. Repair or replace pipeline, risers and valves as needed.

Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.

Specification: NA

Irrigation System-Sprinkler

Field(s): 1-26

Status: Existing

Description: A big gun sprinkler irrigation system is used to apply wastewater and hand line sprinkler irrigation systems supply irrigation water to the hay and pasture land fields. The irrigation systems apply irrigation water and wastewater in an efficient manner to the fields as shown on the Land Treatment Area Map to manage soil moisture and apply nutrients and organics to promote plant growth without causing excessive runoff and leaching.

The big gun sprinkler irrigation system has a nozzle diameter of 1.5 inch which can be expected to produce 458 gallons per minute at an operating pressure of 80 to 90 pounds per square inch.

The hand line sprinkler irrigation system uses 16 gallon per minute sprinklers at 70 pounds per square inch of operating pressure.

Operation and Maintenance: Maintain mechanical parts of the irrigation systems by oiling and greasing moving parts and the engine in accordance with the manufacturer's recommendations to help ensure trouble free operation. Prevent livestock access to equipment during operation.

Clean plugged nozzles and replace if worn or defective.

Promptly repair all leaks by replacing valves, fittings, gaskets, worn or damaged parts.

Specification: NA

Irrigation Water Management

Field(s): 1-26

Status: Planned **Units: 207.9 Acres**

Description: Irrigation Water Management is applied to the irrigated fields as shown on the Land Treatment Area Map to manage soil moisture to promote the desired crop response, optimize the available water supplies, minimize irrigation induced erosion, decrease non-point source pollution of surface and groundwater sources, manage salts in the crop root zone and manage the crop micro climate. Irrigation water is supplied by pumps through underground pvc pipelines to sprinkler irrigation systems. The average amount of irrigation water to be applied per application and total annual amount needed for irrigated crops with guidance on when and how much irrigation water to apply can be found in the specification.

Operation and Maintenance:
Permits: Under Oregon law all water is publicly owned and anyone planning to store or divert surface or groundwater for the purpose of irrigation must obtain a permit or water right from the Oregon Water Resources Department. These permits or water rights must be obtained prior to

the use of the water. It is the responsibility of the Farmer to file for the necessary permits or water rights.

Irrigation Water Flows, Volumes, and Relationships

$$Q \times T = D \times A$$

where:

Q = flow rate (acre-in/hr or cfs)
T = time (hr)
D = gross depth applied (in)
A = area (acres)

$$Q = \frac{453 \times A \times D}{F \times H}$$

where:

Q = flow rate (gpm)
A = area (acres)
D = gross application depth (in)
F = irrigation period (days)
H = hours of operation per day

Water Flow Rates:

1 cubic foot per second (cfs)
= 448.8 gallons per minute
1 cfs for 1 hour = 0.99 acre-inch
1 cfs for 24 hr = 1.98 acre-ft
1,000 gpm = 2.23 cfs
1,000 gpm for 24 hr = 4.42 ac-ft
1 gpm/acre = 0.053 ac-in/ac/day
1 cfs = 40 miner's inches in OR, No CA
1 cfs = 50 miner's inches in ID, WA
1 miner's inch = 11.22 gpm in OR
1 miner's inch = 9 gpm in ID, WA
1 cfs = 28.32 liters/sec
1 cubic meter/sec = 35.3 cfs
1 liter/sec = 15.85 gpm

Q x **T = D** x **A** *where:*

Q = cfs, T = hr; D = inches depth; A = acres

Gpm for 5 ft/s velocity in PVC pipe

6"	8"	10"	12"	14"
480	800	1250	1750	2150

Water Volumes & Weights:

1 cubic foot = 7.48 gallons
= 62.4 lb = 28.3 liters
1 acre-foot = 43,560 cubic feet
(1 acre covered 1 ft deep)
12 acre-in = 1 acre-ft = 325,829 gal
1 million gallons = 3.07 acre-ft
1 acre-ft = 1,234 cubic meters
1 cu meter = 1,000 liters = 35.3 cu ft

Pressure and Pressure Head:

1 psi = 2.31 ft of pressure head
1 atmosphere (sea level)
= 14.7 psi = 33.9 ft of head

Lengths and Areas:

1 mile = 5,280 ft = 1.61 km
1 meter = 3.28 ft = 39.37 inches
1 acre = 43,560 square ft
1 hectare = 2.47 acres

Pump Power Requirement

$$Horsepower = \frac{Pump\ \ Head\ \ in\ \ ft\ x\ gpm}{39.6\ x\ \%\ Pump\ \ Efficiency}$$

SOILS-

Refer to Section 5 for soils information.

CROPS-

CROP	MATURE ROOT DEPTH (INCHES)	MAXIMUM ALLOWED DEPLETION	CRITICAL PERIOD
Grass Hay and Pasture	**30**	**50%**	**July**

Above data are from EM8713, *Western Oregon Irrigation Guides*, June 1998, OSU: Corvallis, OR and NRCS *Irrigation Guide (National Engineering Handbook, Part 652)*.

IRRIGATION WATER SUPPLY-

Description of Oregon Water Right:	Certificate 6190, 17259
Description of Irrigation Water Supply (Well, Stream, Irrigation District, etc.):	Coquille River
Supply Flowrate (gpm or cfs):	1,166 gpm or 2.6 cfs
Annual Volume Available (Acre-ft.):	520 Acre Feet
Water Delivery Schedule:	On Demand
Method(s) of Water Measurement:	Unknown

IRRIGATION SYSTEM-

System	System Capacity (gpm)	Nozzle Size (in)	Pressure (psi)	Spacing (ft)	Application Rate (in/hr)	System Efficiency (%)
Big Gun Sprinkler	458	1.5	80 to 90	350 to 400	0.4 to 0.5	65
Periodic Move Sprinkler System	264	0.25	70	80	0.32	70

Specification:

TYPES OF MONITORING SYSTEMS-

- Radio-relayed (remote access) capacitance probes.
- Gypsum blocks (recorded at least twice per week during irrigation season).
- Check-book method using daily data from Agri-met.
- Monitoring of plant appearance.
- "Feel and Appearance Method" is digging soil in the root zone and then physically squeezing the soil to determine moisture level.

The "Feel and Appearance Method" shown on the next page is one of several irrigation scheduling methods used in IWM. It is a way of monitoring soil moisture to determine when to irrigate and how much water to apply. Applying too much water causes excessive runoff and/or deep percolation. As a result, valuable water is lost along with nutrients and chemicals, which may leach into the ground water.

The feel and appearance of soil vary with texture and moisture content. Soil moisture conditions can be estimated, with experience, to an accuracy of about 5 percent. Soil moisture is typically sampled in one-foot increments to the root depth of the crop at three or more sites per field. It is best to vary the number of sample sites and depths according to crop, field size, soil texture, and soil stratification. For each sample the "Feel and Appearance Method" involves:

1. Obtaining a soil sample at the selected depth using a probe, auger, or shovel;
2. Squeezing the soil sample firmly in your hand several times to form an irregularly shaped "ball";
3. Squeezing the soil sample out of your hand between thumb and forefinger to form a ribbon;
4. Observing soil texture, ability to ribbon, firmness and surface roughness of ball, water glistening, loose soil particles, soil/water staining on fingers, and soil color. [Note: A very weak ball will disintegrate with one bounce of the hand. A weak ball disintegrates with two to three bounces];
5. Comparing observations with photographs and/or charts to estimate percent water available and the inches depleted below field capacity.

Fine Sand and Loamy Fine Sand Soils

Appearance of Sandy Loam and Fine Sandy Loam Soils at Various Soil Moisture Conditions

Available Water Capacity = 0.6 to 1.2 inches per foot

Percent Available: Currently available soil moisture as a percent of available water capacity.
Inches per Foot Depleted: Inches of water needed to refill a foot of soil to field capacity.

0 to 25 percent available 1.2 to 0.5 inches per foot depleted

Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure (Not pictured)

25 to 50 percent available 0.9 to 0.3 inches per foot depleted

Slightly moist, forms a very weak ball with well-defined finger marks, light coating of loose and aggregated sand grains remains on fingers.



50 to 75 percent available 0.6 to 0.2 inches per foot depleted

Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.



75 to 100 percent available 0.3 to 0.0 inches per foot depleted

Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color heavy water staining on fingers, will not ribbon.



Go to http://www.wy.nrcs.usda.gov/technical/soilmoisture/spanishsoilmoisture.html to get this information in Spanish.

Sandy Loam, and Fine Sandy Loam Soils

Appearance of Sandy Loam and Fine Sandy Loam Soils at Various Soil Moisture Conditions

Available Water Capacity = 1.3 to 1.7 inches per foot

Percent Available: Currently available soil moisture as a percent of available water capacity.

Inches per Foot Depleted: Inches of water needed to refill a foot of soil to field capacity.

0 to 25 percent available 1.7 to 1.0 inches per foot depleted

Dry, forms a very weak ball, aggregated soil grains break away easily from ball. (Not pictured)

25 to 50 percent available 1.3 to 0.7 inches per foot depleted

Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away.



50 to 75 percent available 0.9 to 0.3 inches per foot depleted

Moist, forms a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not slick.



75 to 100 percent available 0.4 to 0.0 inches per foot depleted

Wet, forms a ball with wet outline left on hand, light to medium staining on fingers, makes a weak ribbon between the thumb and forefinger.



Go to http://www.wy.nrcs.usda.gov/technical/soilmoisture/spanishsoilmoisture.html to get this information in Spanish.

Sandy Clay, Loam, and Silt Loam Soils

Appearance of Sandy Clay, Loam, and Silt Loam Soils at Various Soil Moisture Conditions

Available Water Capacity = 1.5 to 2.1 inches per foot

Percent Available: Currently available soil moisture as a percent of available water capacity.

Inches per Foot Depleted: Inches of water needed to refill a foot of soil to field capacity.

0 to 25 percent available 2.1 to 1.1 inches per foot depleted

Dry, soil aggregations break away easily, no staining on fingers, clods crumble with applied pressure. (Not pictured)

25 to 50 percent available 1.6 to 0.8 inches per foot depleted

Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away.



50 to 75 percent available 1.1 to 0.4 inches per foot depleted

Moist, forms a ball, very light staining on fingers, darkened color, pliable, forms a weak ribbon between the thumb and forefinger.



75 to 100 percent available 0.5 to 0.0 inches per foot depleted

Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger.



Go to http://www.wy.nrcs.usda.gov/technical/soilmoisture/spanishsoilmoisture.html to get this information in Spanish.

Clay, Clay Loam, and Silty Clay Loam Soils

Appearance of Clay, Clay Loam, and Silty Clay Loam Soils at Various Soil Moisture Conditions

Available Water Capacity = 1.6 to 2.4 inches per foot

Percent Available: Currently available soil moisture as a percent of available water capacity.

Inches per Foot Depleted: Inches of water needed to refill a foot of soil to field capacity.

0 to 25 percent available 2.4 to 1.2 inches per foot depleted

Dry, soil aggregations separate easily, clods are hard to crumble with applied pressure. (Not pictured)

25 to 50 percent available 1.8 to 0.8 inches per foot depleted

Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure.



50 to 75 percent available 1.2 to 0.4 inches per foot depleted

Moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.



75 to 100 percent available 0.6 to 0.0 inches per foot depleted

Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger.



Go to http://www.wy.nrcs.usda.gov/technical/soilmoisture/spanishsoilmoisture.html to get this information in Spanish.

IRRIGATION WATER MANAGEMENT OPERATIONS:

Irrigation Water Management Worksheet						
Crop Name:	**Grass Hay and Pasture Land**					
Managed Rooting Depth:	**30 inches**					
Management Allowed Depletion, MAD:	**50 %**					
Irrigated Acres:	**207.9**					
Soil Name:	**Chetco, Nehalem, Nestucca, Willanch**					
Soil Depth (inches)**:**	**60**					
Available Water Capacity (in/in)**:**	**0.20**					
Soil Intake Rate (in/hr) **:**	**0.5**					
IRRIGATION REQUIREMENT HOW MUCH water to apply?	**Month**					
	April	**May**	**June**	**July**	**August**	**Sept**
Total Plant Available Water Capacity (in)**:** Soil or Root Depth * Available Water Capacity	6.00	6.00	6.00	6.00	6.00	6.00
Net Irrigation Application (in)**:** Total Plant Available Water Capacity * MAD	3.00	3.00	3.00	3.00	3.00	3.00
Irrigation System Application Rate (in/hr)**:** Determined based on the type of Irrigation System	0.38	0.38	0.38	0.38	0.38	0.38
IRRIGATION TIMING WHEN to apply water?						
Net Irrigation Water Requirement (in)**:** (From OSU Extension Miscellaneous Pub 8530, 1992)	0.94	2.36	3.31	3.86	3.31	2.52
Average Daily Crop Water Use (in/day)**:**	0.03	0.08	0.11	0.12	0.11	0.08
Irrigation Frequency (days)**:** Net Irrigation Application / Daily Crop Water Use	30	31	27	25	27	30
Irrigation System Set Time (hours)**:**	7.5	7.5	7.5	7.5	7.5	7.5
Actual Net Irrigation Application (in)**:** Gross Application * System Application Efficiency	2.00	2.00	2.00	2.00	2.00	2.00
Actual Irrigation Frequency (days)**:** Actual Net Irrigation Application / Daily Crop Water Use	**30**	**25**	**18**	**17**	**18**	**25**
IRRIGATION SYSTEM CAPACITY						
System Application Efficiency (%)**:** Water Required / Water Applied	70	70	70	70	70	70
Gross Irrigation Application (in)**:** System Application Rate * System Set Time	2.85	2.85	2.85	2.85	2.85	2.85
Volume of Water per Irrigation (acre-in)**:** Gross Irrigation Application * Irrigated Acres	593	593	593	593	593	593
Irrigation System Operation (hours/day)**:**	16	16	16	16	16	16
Required System Flow Rate (gpm)**:** (Equation 2)	**559**	**671**	**932**	**987**	**932**	**671**
Compare **Required** system flow rate with **Measured** flow noted on **Irrigation Application Record**						

IRRIGATION SYSTEM WALK-THROUGH INSPECTION EVALUATION

This form may be used to identify and evaluate those components of an irrigation system that directly affect irrigation system operation and water management. Other aspects not directly affecting irrigation water management, such as energy-use efficiency, may also be noted. Make additional copies as needed.

ITEM	OK	Needs attention	Comments
Irrigation water supply			
Adequate water supply for area irrigated			
Suitable quality of irrigation water supply			
Inflow controlled by valve and/or gate			
Inflow is measured easily and accurately			
Type of water measuring device:			
Source of irrigation water:			
Type of delivery schedule if applicable:			
Irrigation water conveyance			
Adequate capacity in ditch and/or pipe			
Ditch or pipe free of leaks			
Adequate water control devices			
Irrigation water application			
Adequate water control for uniform application			
Uniformity of application throughout field			
Wet and/or dry spots			
Excessive runoff Note: There should be no runoff from sprinkler-irrigated areas.			
Overall system condition			
General maintenance			
Other (note):			

Farmer's Name:			**Field:**		
Nickname:			**Crop:**		
Managed Soil:			**Rooting Depth:**		**inches**
Irrigation system provides:		**Inches at speed of:**		**Feet per minute**	

	Big gun speed			Irrigation	Rainfall
DATE	Weather	(ft/min)	X	(inches)	(inches)
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CHECKBOOK METHOD FOR IRRIGATION SCHEDULING AND DOCUMENTATION										
Date	Available Soil Water (inches)	-	Crop Water Use (inches)	+	Effective Rainfall (inches)	+	Effective Irrigation (inches)	=	Remaining Water (inches)	Comments
		-		+		+		=		
		-		+		+		=		
		-		+		+		=		
		-		+		+		=		
		-		+		+		=		
		-		+		+		=		
		-		+		+		=		
		-		+		+		=		
		-		+		+		=		
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		-		+		+		=		
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		-		+		+		=		
		-		+		+		=		
		-		+		+		=		

SENSOR INSTALLATION:

If soil moisture sensors will be used for soil moisture monitoring, install them according to the following schedule:

FIELD	SOIL	CROP	ACRES	# OF SITES	SENSORS/ SITE	TOTAL SENSORS	DEPTHS
Notes:							

SOIL WATER OBSERVATIONS AND MEASUREMENTS						
Record Results of Soil Probing *and/or* ***Sensor Readings from Tensiometers or Resistance Blocks at Least Twice per Week***						
	OBSERVATIONS or READINGS			Irrigation	Rainfall	COMMENTS
DATE	8-inch depth Other ( )	18-inch depth Other ( )	30-inch depth Other ( )	(inches)	(inches)	

Nutrient Management

Field(s): 1-27

Status: Planned **Units: 215.9 Acres**

Description: The site vulnerability rating for phosphorus movement off the listed fields is based on the Western Oregon Phosphorus Index. All fields have very low soil concentrations of phosphorus which allows manure applications to be made on a nitrogen basis. The site vulnerability rating for phosphorus runoff will be low and medium based on applying manure on a nitrogen basis during the planning period. Phosphorus will be monitored on all fields using soil tests and if soil phosphorus concentrations significantly increase, manure applications will be reduced which may result in some of the manure and wastewater to be exported off farm. It is estimated that 17,353 cubic feet or 129,800 gallons of wastewater and 150 tons or 8,356 cubic feet of solids containing manure will be applied annually to the hay and pasture land fields. In addition 923,640 gallons or 3,852 tons of manure will be applied by grazing livestock. The total nutrients applied to the grass hay and pasture land fields for the planning period are 67,542 pounds of nitrogen, 59,300 pounds of phosphate, and 101,938 pounds of potash with 164,683 pounds of nitrogen, 55,170pounds of phosphate and 193,766pounds of potash removed in the plant biomass.

The big gun sprinkler system and solids spreader will be calibrated to apply wastewater and solids at the rate needed to meet the nitrogen and phosphorus needs for the crops grown. The measured nutrient concentrations in the underground collection and storage tank used in developing this plan are 5.300 pounds per 1,000 gallons (lbs/th Gal) of Nitrogen, 1.833 lbs/th Gal of Phosphate and 3.301 lbs/th Gal of Potash. The measured nutrient concentrations for the separated solids used in developing this plan are 23.574 lbs/Ton of Nitrogen, 12.617 lbs/Ton of Phosphate and 25.387 lbs/Ton of Potash. No manure applications are to be made to the setback buffer shown on the Land Treatment Area Map.

The soil and manure test nutrient concentrations are based on soil and manure tests taken in 2012. The protocol for soil and manure testing, fall soil nitrate testing, guidance for making emergency applications, protocol and schedule for calibrating application equipment, and the months manure will be applied are contained in the specification.

Operation and Maintenance:

Phosphorus: Many streams and rivers are polluted with excessively high phosphorus levels. This phosphorus causes algae blooms, which cause dissolved oxygen levels and pH to fluctuate greatly, thus harming fish and other aquatic organisms. Most crops do not respond to phosphorus fertilizer unless soil test P levels are low (below 50 ppm P).

Phosphorus fertilizer comes from mines. There is a limited supply of high quality phosphorus ores to make phosphorus fertilizer (a consideration for future generations of farmers).

Nitrogen: Nitrogen loss reduces profits. Nitrogen runoff to streams from cropland, however, is usually not a major environmental issue, except where manure is applied at a high rate or ammonium type fertilizers are applied between May 1 to October 31 and excessive irrigation water washes them into the stream. Well and moderately well drained soils have a moderate to high risk of nitrate leaching. Poorly and somewhat poorly drained soils have a very low to low risk of nitrate leaching.

Excessive N fertilization can increase de-nitrification, which produces nitrous oxide (a greenhouse gas). Due to the local climate, most soil nitrogen in the nitrate form going into winter will be lost from the field and not be available for crop uptake. Nitrogen fertilizer is manufactured by the Haber process, which involves burning natural gas (a non-renewable resource).

Specification:

SCHEDULE FOR SAMPLING AND ANALYSIS

In order to effectively implement nutrient management samples of feed, soils, crops, irrigation water, manure, wastewater, and solids need to be obtained and analyzed in accordance with the following criteria-

SAMPLE	NUMBER	NOTES
Total Ration	**2**	See Section 7 in the NMP for guidance on sampling feed rations.
Solid Manure	**2**	Sample solids during applications in early spring and late summer if possible and have each sample analyzed for Total Nitrogen (TKN), Ammonium Nitrogen (NH_4-N), Phosphorus (P) and Potassium (K) plus percent moisture. Ask lab to report results in pounds per ton.
Liquid manure	**2**	Sample liquids during applications in early spring and late summer if possible and have each sample analyzed for Total Nitrogen (TKN), Ammonium Nitrogen (NH_4-N), Phosphorus (P) and Potassium (K) plus percent moisture. Ask lab to report results in pounds per thousand gallons.
Normal soil tests	**All Fields within a 4 year period**	Collect soil samples from fields in accordance with **Oregon State University Extension publication PNW570-E, "Monitoring Soil Nutrients Using a Management Unit Approach"** located in Section 10.3. Have the soil samples analyzed for Nitrates (NO_3-N)*, Ammonium (NH_4-N)*, P, K, pH, SMP (optional: test for B, Ca, Mg and % Organic Matter) and ask the lab to report results in parts per million (ppm). This test can be done during any month.
Corn pre-sidedress nitrate soil tests	**All Corn Fields Annually**	Collect soil samples from fields growing corn at the V5 stage (when corn is approx. 12" tall) in accordance with **Oregon State University Extension publication EM 8650, "The Pre Side Dress Soil Nitrate Test"** located in Section 10.3. Have the soil samples analyzed for Nitrates (NO_3-N) and ask the lab to report results in parts per million (ppm)
Fall nitrate soil tests	**All Manured Fields within a 4 year period**	Collect soil samples from the manure application areas every fall (September 15-October 15) in accordance with **Oregon State University Extension publication EM8832-E, "Post Harvest Soil Nitrate Testing"** located in Section 10.3. Have the soil samples analyzed for Nitrates (NO_3-N), Phosphorus (P) and Potassium (K) and ask the lab to report results in parts per million (ppm).

* Check crop fertilizer guide for what depth the soil sample should be taken for these tests.

Manure analyses should be performed by a laboratory that meets the requirements and performance standards of the Manure Testing Laboratory Certification Program (MTLCP), http://www.mda.state.mn.us/licensing/pestfert/manurelabs.htm.

To develop a cumulative manure analysis history as a basis for nutrient allocation to the fields, manure should be analyzed annually for a minimum of three (3) consecutive years during the plan period beginning in October 2012.

Soil test analyses should be performed by laboratories that meet the requirements and performance standards of the North American Proficiency Testing Program (NAPT) Proficiency Assessment Program (PAP); http://www.naptprogram.org/pap/.

SAMPLING LIQUID MANURE

Liquid manure samples submitted for analysis should meet the following requirements:

- Manure samples submitted to a laboratory should represent the average composition of the material that will be applied to the field.
- Place sample in a sealed, clean plastic container with about a 1-pint volume. Glass is not suitable because it is breakable and may contain contaminants.
- Leave at least 1 inch of air space in the plastic container to allow for expansion caused by the release of gas from the manure material.
- Refrigerate or freeze samples that cannot be shipped on the day they are collected, minimizing chemical reactions and pressure buildup from gases.

Following are guidelines for obtaining liquid manure samples**:**

Wastewater: Premixing the surface liquid in the storage structure is not needed, provided it is the only component that is being pumped. Operators with multistage systems should draw samples from the storage structure they intend to pump for application to crops.

Samples should be collected using a clean, plastic container similar to the one shown in figure for liquid manure sampling on the next page. One pint of material should be taken from at least eight sites around the storage structure and then mixed in the larger clean, plastic container. Effluent should be collected at least 6 feet from the storage structure's edge at a depth of about a foot. Shallower samples from storage structure may be less representative than deep samples because oxygen transfer near the surface sometimes alters the chemistry of the solution. Floating debris and scum should be avoided.

One pint of mixed material should be sent to the lab. Galvanized containers should never be used for collection, mixing, or storage due to the risk of contamination from metals like zinc in the container. These recommendations are adequate for making applications that draw the liquid level in the storage structure down a few feet. If an entire storage structure is to be emptied, more frequent sampling with many more sampling points is recommended.

Slurry: Manure materials applied as a slurry from a storage structure should be mixed prior to sampling. A liquid sampling device can be used to obtain a sample from agitated storage structure. If you wish to sample a storage structure without agitation, you must use a composite sampling device as the one shown in the figure on the next page.

Samples should be collected from approximately eight areas around the storage structure and mixed thoroughly in a clean, plastic container. An 8- to 10-foot section of 0.5- to 0.75-inch plastic pipe can also be used: extend the pipe into the pit with ball plug open, pull up the ball plug (or press your thumb over the end to form an air lock), and remove the pipe from the manure, releasing the air lock to deposit the manure in the plastic container.

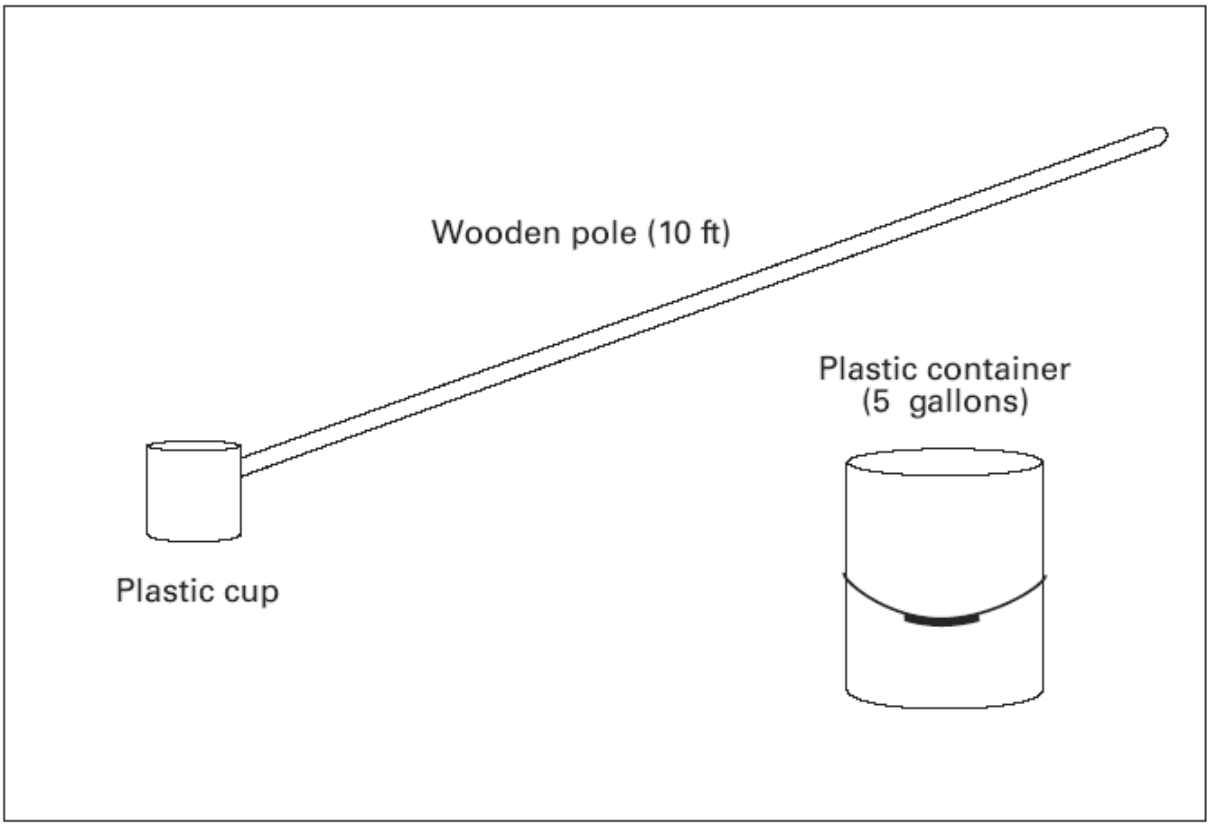
One pint of mixed material should be sent to the lab. Galvanized containers should never be used for collection, mixing, or storage due to the risk of contamination from metals like zinc in the container.

Sludge: Sludge is somewhat more difficult to obtain a representative sample. Two common methods are used.

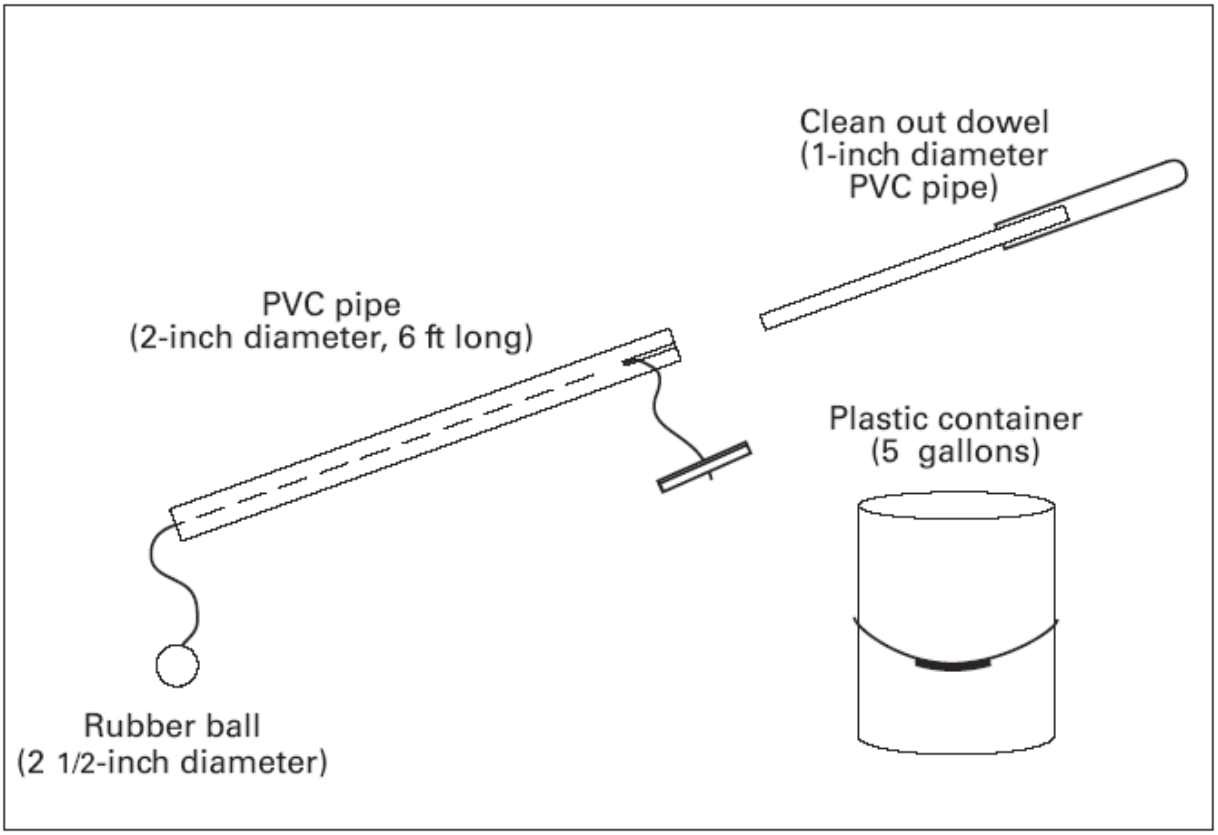
One method requires pumping the storage structure down to the sludge layers. Then, during sludge agitation, a composite sampling device as shown in the figure on the next page can be used to obtain a sample.

The other method requires insertion of a probe to the bottom of the storage structure to obtain a column of material. The sludge component of this column is then released into a clean plastic bucket, and several (12-20) other sampling points around the storage structure are likewise collected to obtain a composite, representative sample.

For analysis, most labs require at least 1 pint of material in a plastic container. The sample should not be rinsed into the container because doing so dilutes the mixture and distorts nutrient evaluations. However, if water is typically added to the manure prior to land application, a proportionate quantity of water should be added to the sample.



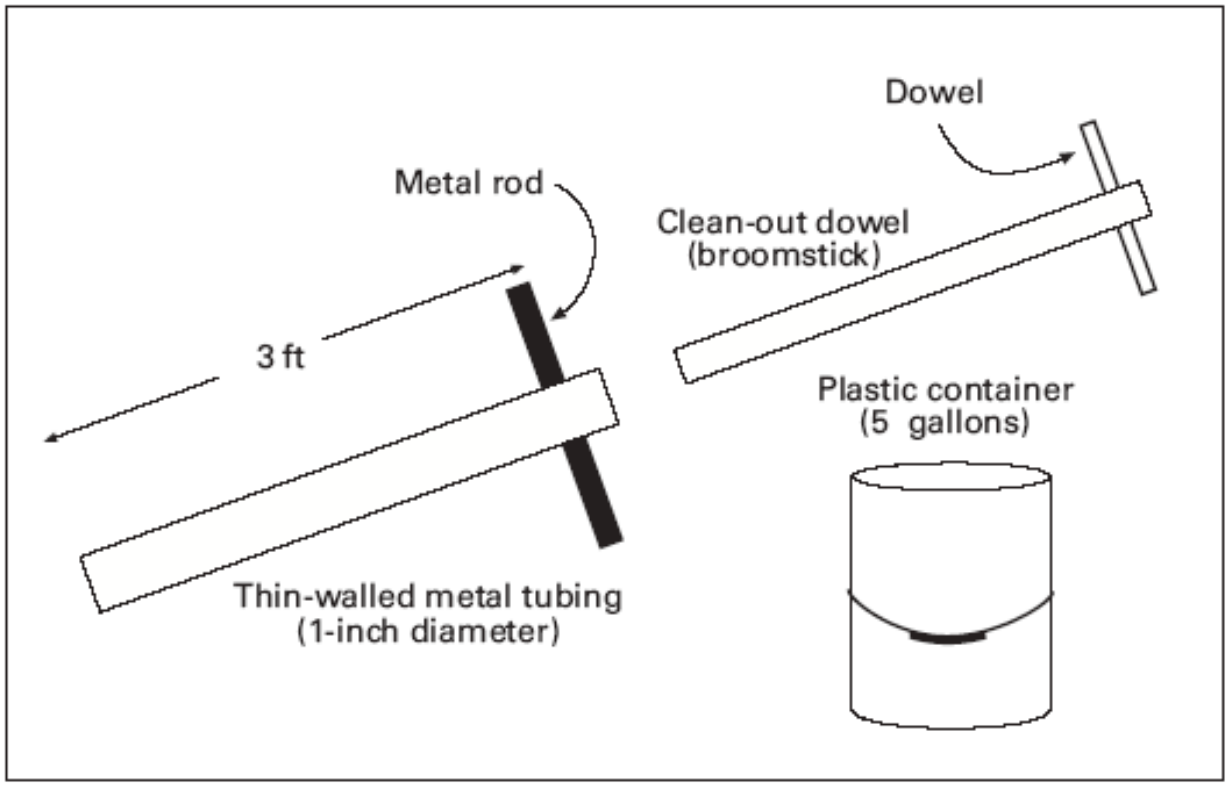
Typical Sampling Equipment for Liquids



Typical Sampling Equipment for Obtaining Composite Samples

SAMPLING SOLID MANURE

Solid manure samples should represent the manure's average moisture content. A 1-quart sample is adequate for analysis. Samples should be taken from approximately eight different areas in the manure pile at a depth of 18 inches, placed in a clean plastic container, and thoroughly mixed. Approximately 1 quart of the mixed sample should be placed in a plastic bag, sealed, and shipped directly to the lab. It is recommended to ship the samples early in the week so it doesn't sit in a post office or shipping area of the laboratory for several days. Samples stored for more than two days should be refrigerated. The figure below shows a device that can be constructed and used for sampling solid manure.



Typical Solids Sampling Equipment

APPLICATION EQUIPMENT CALIBRATION

The worksheets on the following pages can be used to calibrate manure application equipment so that manure is applied at the proper rate to achieve the planned application rates.

SPREADER EQUIPMENT CALIBRATION

(Using Bucket, Pan or Tarp)

Name:_____ Date:_____

Perform the following operations to calibrate the solids spreader equipment:

- ✓ Place buckets, pans, or tarps in the application area to collect the applied or spread waste material.
- ✓ Spread waste material over the application area using the spreading pattern normally used in the field. Make sure the spreader is traveling at the speed it typically travels over the collection area. Record engine rpm and gear settings used.
- ✓ Collect and weigh the waste material and calculate the average application rate. Use this worksheet to record the weights and calculations.

Note: Use Tarps instead of buckets or pans when using dry stack manure or separated solids as the variability in the weight will be less.

Data and Calculations:

Steps	ID of Bucket, Pan or Tarp				
	A	**B**	**C**	**D**	**E**
1. Date of calibration test-					
2. Engine RPM during spreading -					
3. Gear selected during spreading -					
4. Weight of empty bucket (lb) =					
5. Weight of bucket with waste (lb) =					
6. Weight of Waste (lb) - line 5 – line 4 =					
7. Collection Area (sq ft) - Area of the top of the bucket, pan or tarp used to collect the waste =					
8. Waste Applied (lb/sq ft) - line 6 ÷ line 7 =					
9. Covert to tons per acre - line 8 x 21.78 =					
10. Average Application Rate (tons per acre)- Sum of values in cells A9 through F9 divided by the total number of calibrations completed =					

Additional Notes:

SPREADER EQUIPMENT CALIBRATION

(Using a Full Spreader Load)

Name:_____ Date:_____

Perform the following operations to calibrate the solids spreader equipment:

- ✓ Determine the weight of the waste material loaded in the spreader by using truck scales to weigh the spreader equipment when it is empty and full.
- ✓ Spread the loaded spreader on the field using consistent speed and spreader settings to cover the field uniformly. Spread in a rectangular pattern so the area calculation will be simple. Record engine rpm and gear settings used.
- ✓ Measure the length and width covered by the full load and compute the application rate in tons per acre using this worksheet.

Data and Calculations:

Steps	ID of Calibration Test				
	A	B	C	D	E
1. Date of calibration test-					
2. Engine RPM during spreading -					
3. Gear selected during spreading -					
4. Weight of empty spreader (lb) =					
5. Weight of loaded spreader (lb) =					
6. Weight of Waste in spreader (lb) - line 5 – line 4 =					
7. Length of spreading area (ft) =					
8. Width of spreading area (ft) =					
9. Area spread (sq ft) - line 7 x line 8 =					
10. Waste applied (lb/sq ft) – line 6 ÷ line 9=					
11. Convert to tons per acre - Line 10 x 21.78=					
12. Average Application Rate (tons per acre) – Sum of values in cells A11 through F11 divided by the total number of calibrations completed =					

Additional Notes:

TANK EQUIPMENT CALIBRATION

(Using a Full Tank Load)

Name:_____ Date:_____

Perform the following operations to calibrate the tank equipment:

- ✓ Determine the maximum capacity of the tank equipment from the manufacturer's maintenance manual or the owners manual for the equipment.
- ✓ Fill the tank and reduce the volume of the tank by the appropriate amount if the tank is not filled to its maximum capacity. Normally a tank spreader is only filled to about 80 percent of its maximum capacity and therefore the maximum rated capacity of the tank should be multiplied by 0.8 to reflect the volume of the loaded tank during the calibration exercise.
- ✓ Spread the loaded tank on the field using consistent speed and settings to cover the field uniformly. Try to spread in a rectangular pattern so the area calculation will be simple. Record engine rpm and gear settings used.

Data and Calculations:

Steps	ID of Calibration Test				
	A	**B**	**C**	**D**	**E**
1. Date of calibration test-					
2. Engine RPM during spreading-					
3. Gear selected during spreading-					
4. Maximum rated capacity of tank (gallons) =					
5. Volume of filled tank (gallons)- Line 4 x ____ % of tank filled ÷ 100% =					
6. Length of spreading area (ft) =					
7. Width of spreading area (ft) =					
8. Area spread (sq ft)- line 6 x line 7 =					
9. Waste applied (gal/sq ft)- line 5 ÷ line 8 =					
10. Convert to gallons per acre - Line 9 x 43,560 =					
11. Average Application Rate (gallons per acre) – Sum of values in cells A10 through F10 divided by the total number of calibrations completed =					

Additional Notes:

TRAVELING BIG GUN SPRINKLER CALIBRATION

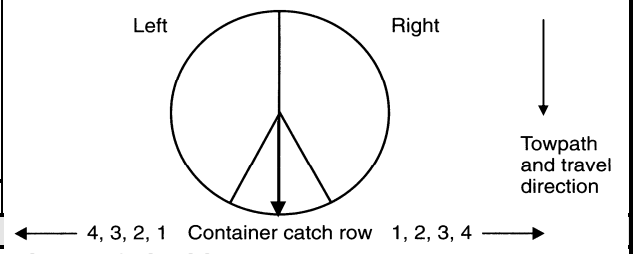
Name:_____ Date:_____

Perform the following operations to calibrate the traveling big gun sprinkler:

- ✓ Use 5 to 10 catch cans to collect the sprinkler-irrigated waste. Use straight-sided buckets for catch cans. Two pound coffee cans work well. Make sure all of the catch cans have the same diameter.
- ✓ Place one of the catch cans on a level surface and fill it with water to a known depth (1-3 inches). Pour the water from the catch can into a large measuring cup. Determine how many measuring cups of water are equal to an inch of water in the catch can.
- ✓ Place at least five catch cans across the towpath of the big gun sprinkler. Try to space the catch cans uniformly from the center of the towpath to the outer edge of the wetted area of the sprinkler. Stake the catch can in place or put a rock in the bottom of the catch can to keep it upright. Allow the traveling big gun sprinkler to completely pass over the catch cans. Use the measuring cup previously used to calibrate the catch cans to measure the amount of liquid collected in each can and convert the volume to inches. Be sure to add together the amount measured from the catch cans that would receive overlap from the adjacent towpath. For example, if catch can #4 will receive liquids from the adjacent towpaths, add the amount from container #4 on the left to container #4 on the right side to compute the total amount applied at the location of container #4 on the right and left sides of the towpath.

Catch Can Calibration:

Example:	1 inch =	5	Cups
	1 cup =	0.2	Inches
Your Catch Cans:	1 inch =		Cups
	1 cup =		Inches



Travel Rate Setting During Test:

Data and Calculations:

Catch Can ID	Volume of Liquid							
	Cups	Inches	**Cups**	Inches	**Cups**	Inches	**Cups**	Inches
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
Average =								

APPLICATIONS

Always perform the following tasks annually to make applications of wastewater and solids containing manure and inorganic fertilizer:

- Review the Planned Crops and Fertilizer Recommendations table on page 82 and make adjustments as needed to determine how much manure to apply. Nutrient applications must be based on soil and/or tissue tests and a nutrient budget prepared before application begins. Credit must be taken for nutrients supplied by previous legume crops, manure applications and sludge applications. Nitrogen (N) applications must be based on OSU recommendations or N nutrient uptake in harvested portion of crop. Phosphorus (P) applications must be based on OSU recommendations or P uptake in harvested portion of crop if the P Index is high or very high.
- Fields that are subsurface (TILE) drained require additional precautions when manure is applied. Manure applied to these fields can follow soil macropores directly to the tile drains creating a surface water pollution hazard from direct tile discharge. Tillage prior to manure application that can disrupt/close (using horizontal fracturing) the preferential flow paths (worm holes, cracks, root channels) in the soil will reduce the risk of a manure discharge to surface waters. Any pre-application tillage should leave as much residue as possible on the soil surface. Water control structures installed in subsurface drainage systems should be managed to prevent discharge of manure and wastewater during periods of application.
- Inspect and repair manure hauling and application equipment to minimize potential of accidental spillage.
- Avoid unnecessary exposure to wastewater and solids containing manure and wear protective clothing when necessary.
- Be aware of the location of sensitive areas, concerns of neighbors or concerns of the public, which require special application procedures. To reduce odor problems, apply wastewater and solids containing manure in mid morning when temperatures are warming and air is rising rather than in the afternoon or evening when air is cooling and settling. Avoid applications during periods of fog.
- Calibrate application equipment to insure uniform distribution and accurate application rates in accordance with guidance given in the nutrient budget for the field applying wastewater and solids containing manure to. Refer to the previous pages for calibration worksheets and make copies as necessary to document the calibration of application equipment.
- Use the worksheets on the following pages to determine how much wastewater and solids containing manure to apply based on the current nutrient budget. Use copies of the worksheets or other tools to document calculations made to determine application rates based on current nutrient budgets and calibrations of application equipment.
- Apply wastewater and solids containing manure in a manner that will cover no more than 25 percent of the leaf surface with solids unless clean water applications are planned immediately after wastewater or solids containing manure is applied. For pasture/hay land it is best to apply manure 7 days after harvesting forage by haying or grazing.
- Maintain a **35 foot** setback on vegetated areas or **100 foot** setback on nonvegetated areas from down-gradient surface waters, open tile line intake structures, sinkholes, well heads or other sensitive areas when applying wastewater and solids containing manure to prevent a prohibited discharge.

- Record applications, transfers or exports of wastewater and solids containing manure and maintain them for at least 5 years. There are forms in Section 9 that may be used to record this information.
- Record date, amount and form of inorganic fertilizer applications and maintain them for at least 5 years. There are forms in Section 9 that may be used to record this information.
- Clean up residual materials from equipment and dispose of them properly.

March 15th – August 30th: Apply wastewater and solids containing manure and inorganic fertilizer at agronomic rates shown on the Planned Crops and Fertilizer Recommendations table on page 82 using the following guidelines:

- Apply to land being prepared for crops. Till manure into soil within 3 days of application if possible or apply to actively growing crops such as grass, clover or alfalfa after cutting.
- *Do not apply* within **35 feet** of vegetated areas or **100 feet** of nonvegetated areas next to open water courses, seeps, ditches, tile inlets or wetlands.
- *Do not apply* wastewater and solids containing manure within the setback areas shown on the Land Treatment Area Map in Section 4.3 and described on page 114 and in Section 6.2 of the Nutrient Management Section.
- Record applications, transfers or exports of wastewater and solids containing manure and maintain them for at least 5 years. There are forms in Section 9 that may be used to record this information.
- Record date, amount and form of inorganic fertilizer applications and maintain them for at least 5 years. There are forms in Section 9 that may be used to record this information.

September 1st – October 31st: Apply wastewater and solids containing manure and inorganic fertilizer at minimum rates, using the following guidelines:

- Apply to land being prepared for crops. Till manure into soil within 3 days of application if possible or apply to actively growing crops such as grass, clover or alfalfa after cutting.
- *Do not apply* within **35 feet** of vegetated areas or **100 feet** of nonvegetated areas next to open water courses, seeps, ditches, tile inlets or wetlands.
- *Do not apply* within the setback areas shown on the Land Treatment Area Map in Section 4.3 and described on page 114 and in Section 6.2 of the Nutrient Management Section.
- Record applications, transfers or exports of wastewater and solids containing manure and maintain them for at least 5 years. There are forms in Section 9 that may be used to record this information.
- Record date, amount and form of inorganic fertilizer applications and maintain them for at least 5 years. There are forms in Section 9 that may be used to record this information.

November 1st – March 15th: Avoid application of manure. If manure application is needed because of an emergency situation during this period, use the following guidelines- ***NOTE: THE FOLLOWING GUIDELINES ARE GOOD IDEAS, BUT SPREADING MANURE DURING THIS PERIOD MAY STILL VIOLATE STATE AND FEDERAL LAW:***

- Call the ODA CAFO Program at (503) 986-4700 and report why an application is needed and the field where the application will be made. Refer to the Land Treatment Area Map in Section 4.3 to identify the field where the application will be made.
- Apply wastewater or solids containing manure only to actively growing crops such as grass, clover or alfalfa.
- Minimize application rates by using the maximum travel rates for the application equipment.
- *Do not apply* within **35 feet** of vegetated areas or **100 feet** of nonvegetated areas next to open water courses, seeps, ditches, tile inlets or wetlands.
- *Do not apply* within the setback areas shown on the Land Treatment Area Map in Section 4.3 and described on page 114 and in Section 6.2 of the Nutrient Management Section.
- *Do not apply* during rainfall events.
- *Do not apply* to saturated or flooded soils. See the Water Features Report, Flood Boundary Map and Flood Frequency Class Report for Allen Ranch in Section 5. Soil and Risk Assessment Analysis. It is recommended that emergency application(s) be limited to soils (areas) where the flooding frequency class rating is None, Very Rare or Rare.
- *Do not apply* to slopes greater than 5%. See the Soil Map for Allen Ranch in Section 5. Soil and Risk Assessment Analysis for the location of soil map units that have slopes less than 5%..
- *Applications of wastewater or solids containing manure to frozen soils should be avoided*. Do the following if an application of wastewater, slurry or solids containing manure is to be made to frozen soils:
    - Apply only enough wastewater, slurry or solids containing manure to address storage limitations until suitable soil conditions for application are available.
    - Minimize applications to 5 wet tons per acre or less of solids containing manure and 6,788 gallons per acre or less of wastewater.
    - Apply to alternating strips to reduce the risk of contaminated runoff reaching surface water sources.
    - Apply to fields of established hay, pasture or fields containing at least 90% cover and are the furthest from open water sources.
    - Do not apply wastewater, slurry or solids containing manure within 200 feet of surface water sources, drainageways, wells, or inlets to subsurface drainage systems.
    - Runoff control systems such as earthen dikes must be in place where applications will be made to fields with slopes greater than 5%.
- Record applications, transfers or exports of wastewater and solids containing manure and maintain them for at least 5 years. There are forms in Section 9 that may be used to record this information.
- *Do not apply* manure or inorganic fertilizer to fields receiving emergency applications unless soil tests indicate to do so.

The timing and frequency of applications of wastewater and solids containing manure for utilization by crops shown in the Planned Crops and Fertilizer Recommendations table on page 82 are based on information provided in Oregon State University Extension publications located in Appendix H.

The following table shows the potential crops that may be grown on this farm. The formulas for determining the total nutrient application rate per unit yield for each crop shown in following table are as follows:

Total N to apply in pounds = N in pounds per ton (lb/t) from the table for the crop grown X percent (%) dry matter (DM) of harvested crop/100 X planned or measured yield in tons

Total P_2O_5 to apply in pounds = P in pounds per ton (lb/t) from the table for the crop grown X 2.291 P_2O_5/P X percent (%) dry matter (DM) of harvested crop/100 X planned or measured yield in tons

Nitrogen, phosphorus and potassium removal of common perennial and annual forage crops.

Crop*	Cuttings (no.)	DM[1] (%)	CP[1] (%)	N (lb/t)	P (lb/t)	K (lb/t)	AH[1] (t/a)
Red clover	1	100	18	58	8	48	16
Alfalfa hay	3	100	20	64	8	42	16
Perennial grass (low intensity)	1-2	100	10	32	6	38	13
Perennial grass (medium to low intensity	2-3	100	12	38	6	38	15
Perennial grass (medium intensity)	4-5	100	15	48	7	38	17
Perennial grass (medium to high intensity)	5-6	100	18	58	8	40	20
Perennial grass (high intensity)	6-8	100	20	64	8	40	23
Annual ryegrass	1	100	12	38	6	38	13
Annual ryegrass	2	100	15	48	7	40	20
Corn silage	1	100	8	25	4	20	30
Small grains (boot stage)	2	100	12	38	5	32	16
Small grains (soft dough)	1	100	8	25	5	20	13
Sudangrass	1	100	6	40	5	12	16
Triticale	1	100	6	51	7	12	16

*Crop removal information taken from OSU Extension Publications EM 8585-E, PNW 331, and EM 8793.

[1]DM = dry matter; CP = crude protein; AH = as harvested

Since the fields on this farm have received applications of wastewater and solids containing manure in the past they will have a certain amount of nitrogen available in the current year based on the mineralization of the organic matter applied in previous years. The planned applications shown on the following pages assume that the amount of nitrogen unavailable to the plant from the organic fraction of the manure analysis will be supplied by the organic fraction of manure applied in previous years that will mineralize into a plant available form of nitrogen (PAN) for the current year. Some of the nitrogen applied in the manure for the current year will be lost due to environmental conditions (e.g. evaporation, denitrification) so some adjustments to the planned applications of wastewater and solids containing manure have been made to account for these losses.

The following table shows the amount of wastewater and solids containing manure that would have to be applied to supply the given amount of nitrogen and phosphorus based on the manure nutrient analysis and application losses shown in the tables on the next page:

Pounds of Nutrient to be applied-	Application amount is based on 25% of the Nitrogen being lost and no Phosphorus being lost to environmental factors-					
	Wastewater Application from Waste Storage Tank				Dairy Manure Solids Application	
	Nitrogen (N)		Phosphorus (P_2O_5)		Nitrogen (N)	Phosphorus (P_2O_5)
	Inches/Acre	Gallons/Acre	Inches/Acre	Gallons/Acre	Tons/Acre	Tons/Acre
50	0.46	12,579	1.02	27,778	2.82	3.97
100	0.93	25,157	2.05	55,556	5.65	7.94
150	1.39	37,736	3.07	83,333	8.47	11.90
200	1.85	50,314	4.09	111,111	11.30	15.87

The worksheets and charts on pages 115 and 116 can be used to develop other application rates for other analysis values of wastewater and solids containing manure.

Manure Nutrient Analyses

Manure Source	Dry Matter (%)	Total N	NH_4-N	Total P_2O_5	Total K_2O	Avail. P_2O_5	Avail. K_2O	Units	Analysis Source and Date
Tank	14.5	5.3	1.8	1.8	3.3	1.8	3.3	Lb/1000Gal	AgSource Laboratories June 15, 2012
Solids Storage Barn	65.2	23.6	9.9	12.6	25.4	12.6	25.4	Lb/Ton	AgSource Laboratories June 15, 2012
Livestock	12.0	21.3	7.0	13.8	23.2	13.8	23.2	Lb/1000Gal	MMP Estimate June 2012

(1) Entered analysis may be the average of several individual analyses.
(2) Oregon assumes that 100% of manure phosphorus and 100% of manure potassium is crop available. First-year per-acre nitrogen availability for individual manure applications is given in the Planned Nutrient Applications table. For more information about nitrogen availability in Oregon, see Waste Utilization Jobsheet 633 OR-JS, Oregon USDA-NRCS, May 2003 (http://efotg.sc.egov.usda.gov/references/public/OR/633js042707.pdf).

Typical Nutrient Retention After Application Losses

	Percent of original nutrient content of manure retained after application losses		
Application Method	**N**	**P_2O_5**	**K_2O**
Injection	95%	100%	100%
Sprinkling	75%	100%	100%
Broadcast (Incorporated 1 day after application)	90%	100%	100%
Broadcast (Incorporated 4 days after application)	80%	100%	100%
Broadcast (Incorporated 7 or more days after application)	70%	100%	100%

Planned Crops and Fertilizer Recommendations

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
1	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
1	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
1	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
1	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
5	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
5	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
5	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
5	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
6	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
6	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
6	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
6	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
8	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
8	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
8	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
8	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
9	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
9	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
9	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
9	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
11	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
11	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
11	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
11	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
12	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
12	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
12	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
12	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
13	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
13	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
13	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
13	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
14	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
14	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
14	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
14	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
16	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
16	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
16	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
16	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
17	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
17	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
17	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
17	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
18	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
18	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
18	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
18	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
19	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
19	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
19	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
19	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
21	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
21	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
21	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
21	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
22	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
22	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
22	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
22	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
26	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
26	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
26	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
26	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
27	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
27	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
27	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
27	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
CAFO	2013	Other								
CAFO	2014	Other								
CAFO	2015	Other								
CAFO	2016	Other								
Wetland (1)	2013	Other								
Wetland (1)	2014	Other								
Wetland (1)	2015	Other								
Wetland (1)	2016	Other								
Wetland (2)	2013	Other								
Wetland (2)	2014	Other								
Wetland (2)	2015	Other								
Wetland (2)	2016	Other								

* Unharvested cover crop or first crop in double-crop system.
[a] Custom fertilizer recommendation.

Planned Nutrient Applications (Manure-spreadable Area)

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
1	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
2	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
2	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Sep 2016	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	9.9 Lds	66.3 Ton	6.6	165	126	254
3	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	187.5 Lds	3,750 Gal	5.0	11	10	17
3	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	187.5 Lds	3,750 Gal	5.0	11	10	17
3	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	187.5 Lds	3,750 Gal	5.0	11	10	17
3	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
3	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Sep 2016	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	7.5 Lds	50.3 Ton	5.0	165	126	254
4	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	33.8 Lds	676 Gal	0.9	11	10	17
4	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	33.8 Lds	676 Gal	0.9	11	10	17
4	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	33.8 Lds	676 Gal	0.9	11	10	17
4	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
4	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
5	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
5	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
5	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
5	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
5	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
6	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
6	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
6	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
6	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Nov 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
6	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
6	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
7	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
7	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	225 Lds	4,500 Gal	6.0	11	10	17
7	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	225 Lds	4,500 Gal	6.0	11	10	17
7	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	225 Lds	4,500 Gal	6.0	11	10	17
7	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
7	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
7	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
8	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	75 Lds	1,500 Gal	2.0	11	10	17
8	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	75 Lds	1,500 Gal	2.0	11	10	17
8	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	75 Lds	1,500 Gal	2.0	11	10	17
8	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.3 Lds	8.7 Ton	0.9	165	126	254
8	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
8	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
9	Nov 2012	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	123.8 Lds	2,476 Gal	3.3	11	10	17
9	Dec 2012	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	123.8 Lds	2,476 Gal	3.3	11	10	17
9	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	123.8 Lds	2,476 Gal	3.3	11	10	17
9	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
9	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Sep 2015	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	5 Lds	33.5 Ton	3.3	165	126	254
9	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Nov 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Dec 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
10	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	386.4 Lds	7,728 Gal	10.3	11	10	17
10	Jan 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
10	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	386.4 Lds	7,728 Gal	10.3	11	10	17
10	Feb 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
10	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	7.5 Lds	150 Gal	0.2	11	10	17

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
10	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Sep 2015	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	15.6 Lds	104.5 Ton	10.4	165	126	254
10	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
10	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Feb 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
10	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
11	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	259 Lds	5,180 Gal	6.9	11	10	17
11	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	259 Lds	5,180 Gal	6.9	11	10	17
11	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	228.2 Lds	4,564 Gal	6.1	11	10	17
11	Mar 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
11	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Apr 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
11	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
11	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Sep 2015	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.6 Lds	10.7 Ton	1.1	165	126	254
11	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Mar 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
11	Apr 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
11	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
12	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	388.5 Lds	7,770 Gal	10.4	11	10	17
12	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	388.5 Lds	7,770 Gal	10.4	11	10	17
12	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	388.5 Lds	7,770 Gal	10.4	11	10	17
12	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Jan 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
12	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
12	Feb 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
12	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
13	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	425.5 Lds	8,510 Gal	11.3	11	10	17
13	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	425.5 Lds	8,510 Gal	11.3	11	10	17
13	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	425.5 Lds	8,510 Gal	11.3	11	10	17
13	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	452.8 Lds	9,056 Gal	11.3	12	11	19
13	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	452.8 Lds	9,056 Gal	11.3	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
13	Sep 2013	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.5 Lds	10 Ton	1.0	165	126	254
13	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	7.1 Lds	47.6 Ton	4.8	165	126	254
13	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
14	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
14	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	333 Lds	6,660 Gal	8.9	11	10	17
14	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	44.1 Lds	882 Gal	1.2	11	10	17
14	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	296.3 Lds	5,926 Gal	7.9	11	10	17
14	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Sep 2013	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	2.7 Lds	18.1 Ton	1.8	165	126	254
14	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Mar 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
14	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
14	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
14	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
15	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	159.2 Lds	3,184 Gal	4.2	11	10	17
15	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	3.8 Lds	76 Gal	0.1	11	10	17
15	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	161.3 Lds	3,226 Gal	4.3	11	10	17
15	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	6.5 Lds	43.5 Ton	4.3	165	126	254
15	Nov 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
15	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
15	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
16	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	107.4 Lds	2,148 Gal	2.9	11	10	17
16	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	108.8 Lds	2,176 Gal	2.9	11	10	17
16	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	108.8 Lds	2,176 Gal	2.9	11	10	17
16	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	69.3 Lds	1,386 Gal	2.1	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
16	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	108.9 Lds	2,178 Gal	2.7	12	11	19
16	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	108.9 Lds	2,178 Gal	2.7	12	11	19
16	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.8 Lds	12.1 Ton	1.2	165	126	254
16	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
17	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	25.9 Lds	518 Gal	0.7	11	10	17
17	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	468.8 Lds	9,376 Gal	12.5	11	10	17
17	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	468.8 Lds	9,376 Gal	12.5	11	10	17
17	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19
17	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
17	Sep 2013	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	18.7 Lds	125.3 Ton	12.5	165	126	254
17	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	281.6 Lds	5,632 Gal	8.5	10	9	15
17	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19
17	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19
17	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	5.6 Lds	37.5 Ton	3.8	165	126	254
17	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Jan 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
17	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Feb 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
17	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Mar 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
17	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Nov 2015	Grass pasture, maint	Livestock	Solids Spreader, Not incorporated	Custom	660 Gal	30 mph	7,808 Gal	11.8		9	15
17	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
17	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Sep 2016	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	4.8 Lds	32.2 Ton	3.2	165	126	254
18	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
19	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
19	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
20	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
21	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
21	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
22	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
23	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
23	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
23	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
23	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
24	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
24	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
25	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.1 Lds	6,802 Gal	5.2	20	18	30
25	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
26	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1137.5 Lds	22,750 Gal	17.4	20	18	30
26	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
26	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
27	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	520 Lds	10,400 Gal	7.9	20	18	30
27	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30

Manure Application Setback Distances

Setback Requirements: CAFO

Feature	Setback Criteria	Setback Distance (Feet)
Lakes and ponds	Applied upgradient, permanent vegetated setback >=35 feet	35
Impounding reservoirs	Applied upgradient, permanent vegetated setback >=35 feet	35
Wells	Applied upgradient, permanent vegetated setback >=35 feet	35
Rivers and canals	Applied upgradient, permanent vegetated setback >=35 feet	35
Streams and creeks	Applied upgradient, permanent vegetated setback >=35 feet	35
Estuaries	Applied upgradient, permanent vegetated setback >=35 feet	35
Pacific Ocean	Applied upgradient, permanent vegetated setback >=35 feet	35
All other bodies of surface water, natural or artificial	Applied upgradient, permanent vegetated setback >=35 feet	35
Other conduits to surface waters	Applied upgradient, permanent vegetated setback >=35 feet	35
Open tile line intake	Applied upgradient, permanent vegetated setback >=35 feet	35
Sinkholes	Applied upgradient, permanent vegetated setback >=35 feet	35

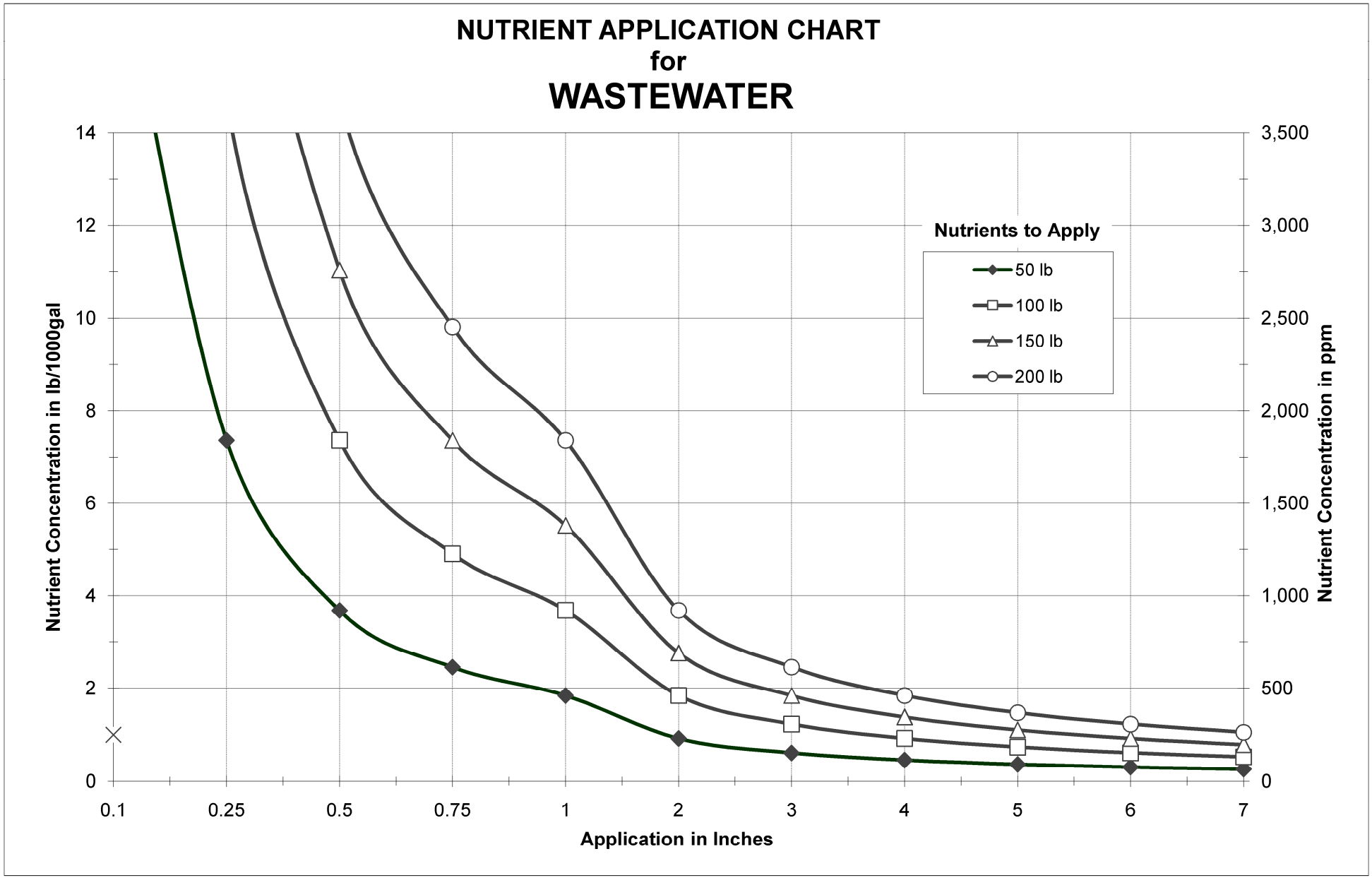
Source: CAFO General Permit #1 (http://oregon.gov/ODA/NRD/docs/pdf/cafo_gnlpmt.pdf)

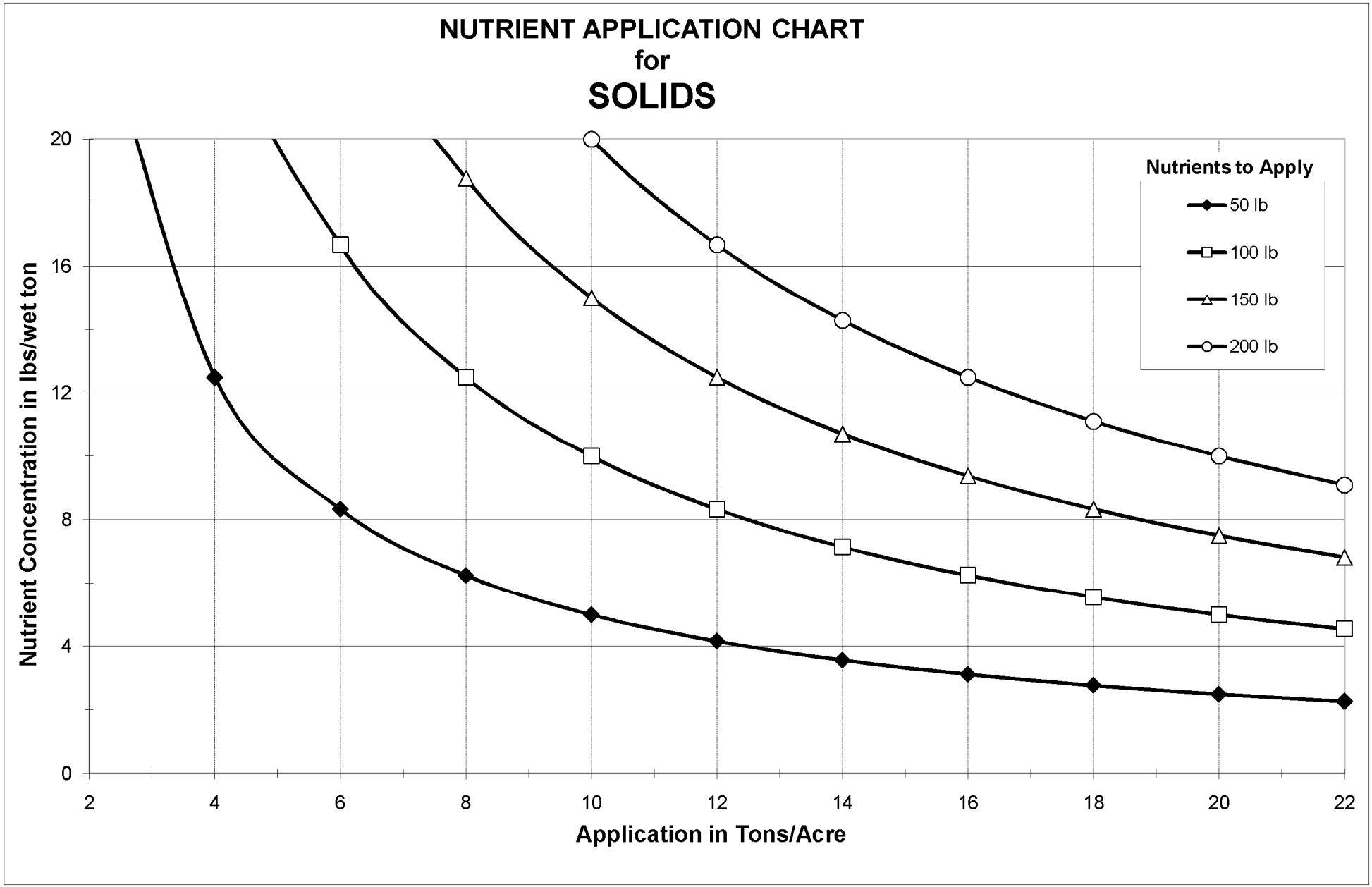
Setback Requirements: NRCS Standard

Feature	Setback Criteria	Setback Distance (Feet)
Open water courses	Application June through September	25
Open water courses	Application October through May	50

Source: Waste Utilization 633 Operation and Maintenance Worksheet (http://efotg.nrcs.usda.gov/references/public/OR/633om.doc)

The worksheets and charts on the following pages can be used to develop other application rates for different manure analyses


NUTRIENT APPLICATION CHART
for
WASTEWATER
Nutrient Concentration in lb/1000gal
Nutrient Concentration in ppm
Application in Inches
Nutrients to Apply
50 lb
100 lb
150 lb
200 lb
0
2
4
6
8
10
12
14
0
500
1,000
1,500
2,000
2,500
3,000
3,500
0.1
0.25
0.5
0.75
1
2
3
4
5
6
7


NUTRIENT APPLICATION CHART
for
SOLIDS
Nutrient Concentration in lbs/wet ton
0
4
8
12
16
20
2
4
6
8
10
12
14
16
18
20
22
Application in Tons/Acre
Nutrients to Apply
50 lb
100 lb
150 lb
200 lb

RECORD KEEPING

- Record keeping forms in Section 9 or other forms may be used document manure and fertilizer applications and exports.
- The following information is to be recorded and maintained for 5 years:
  - ❑ Nutrient and manure application records including soil, water plant and organic nitrogen, phosphorus and potassium test results.
  - ❑ Manure export records including organic nitrogen, phosphorus and potassium test results.
  - ❑ Documentation showing date, crop, amount, rate, form and application method of nutrients applied.
  - ❑ Calibration records for manure application equipment.
  - ❑ Annual review of nutrient management including adjustments made.

4.5 Odors

The major source of odor on Allen Ranch will occur mainly in the spring and fall months when liquids from the collection and storage tank are being applied to the adjacent hay and pasture land fields. Beau Allen maintains good relations with nearby neighbors and consider the impact of odors on nearby neighbors when making applications.

The prevailing winds during the winter months are from the south and southwest and during the summer months from the north and northwest. The closest rural residences that may be impacted negatively by odor from the application of manure are within a few hundred feet of the field boundaries where manure is applied.

Section 5. Soil and Risk Assessment Analysis

5.1 Soils

The predominate soil types located in the fields for the Allen Ranch are shown in the following table.

Table 5.1. Soil Information

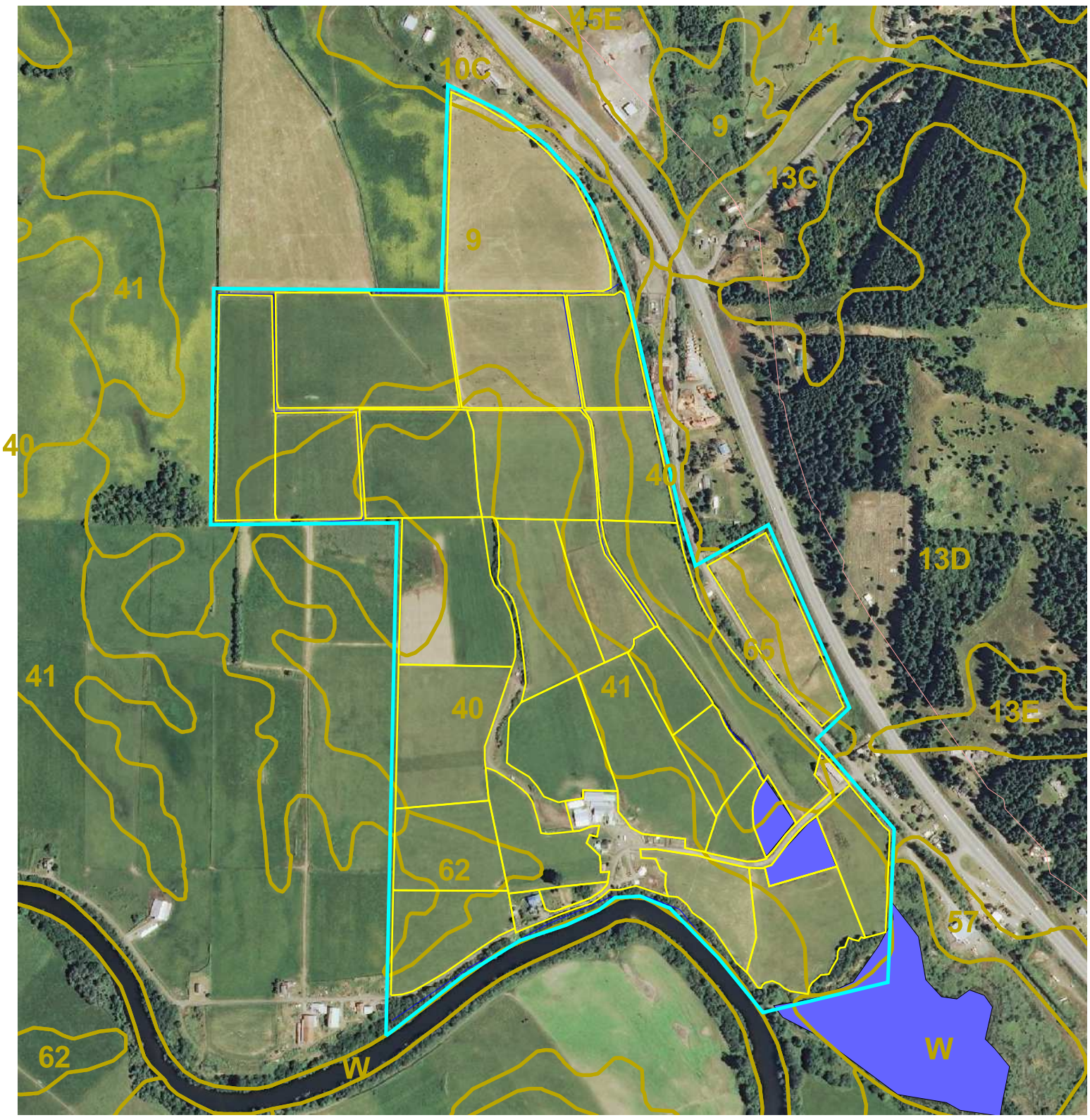
Field	Soil Survey	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)	OM Range (%)	Bedrock Depth (in.)	Drainage	Annual Flooding	Hydro-logic Group
1	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D
2	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D
3	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
4	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
5	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
6	011	62	Willanch	FSL	0-3%	2-5%		Poor	Freq	D
7	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
8	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D
9	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
10	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D
11	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
12	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
13	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
14	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D
15	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
16	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
17	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
18	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
19	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D
20	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
21	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D

Field	Soil Survey	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)	OM Range (%)	Bedrock Depth (in.)	Drainage	Annual Flooding	Hydro-logic Group
22	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
23	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
24	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
25	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
26	011	9	Chetco	SICL	0-3%	5-10%		VPoor	Freq	D
27	011	13D	Dement	SIL	12-30%	5-10%	45	Well	None	B
CAFO	011	40	Nehalem	SIL	0-3%	5-10%		Well	Freq	C
Wetland (1)	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D
Wetland (2)	011	41	Nestucca	SIL	0-3%	4-8%		SPoor	Freq	D

5.2 Soil Map(s)

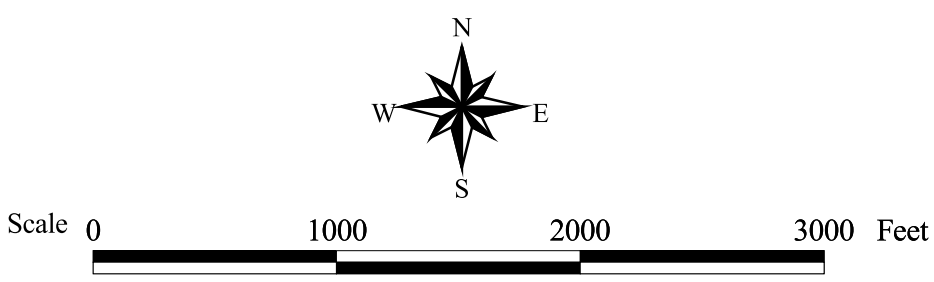
Allen Ranch

Sections 30,31, & 32, Township 28 South, Range 12 West from the Willamette Meridian



Soil Map Units

9- Chetco silty clay loam
10C- Chismore silt loam, 7 to 12 percent slopes
13D- Dement silt loam, 12 to 30 percent slopes
40- Nehalem silt loam
41- Nestucca silt loam
57- Udorthents, level
62- Willanch fine sandy loam
65- Zyzzug silt loam
W- Water



5.3 Soil Reports

Following are descriptions and rating tables for agricultural uses of the soils.

General Description of the Soil Map Units:

Map Unit Description (Brief, Generated)–Coos County, Oregon Allen Ranch

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The Map Unit Description (Brief, Generated) report displays a generated description of the major soils that occur in a map unit. Descriptions of non-soil (miscellaneous areas) and minor map unit components are not included. This description is generated from the underlying soil attribute data.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description (Brief, Generated)

Coos County, Oregon

Map Unit: 9—Chetco silty clay loam

Component: Chetco (75%)

The Chetco component makes up 75 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, deltas. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is high. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, May, October, November, December. Organic matter content in the surface horizon is about 8 percent. Nonirrigated land capability classification is 4w. Irrigated land capability classification is 4w. This soil meets hydric criteria. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Component: Coquille (9%)

Generated brief soil descriptions are created for major components. The Coquille soil is a minor component.

Component: Langlois (8%)

Generated brief soil descriptions are created for major components. The Langlois soil is a minor component.

Map Unit: 10C—Chismore silt loam, 7 to 12 percent slopes

Component: Chismore (80%)

The Chismore component makes up 80 percent of the map unit. Slopes are 7 to 12 percent. This component is on fans, terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is high. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 24 inches during January, February, March, November, December. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map Unit: 13D—Dement silt loam, 12 to 30 percent slopes

Component: Dement (75%)

The Dement component makes up 75 percent of the map unit. Slopes are 12 to 30 percent. This component is on mountain slopes, mountains. The parent material consists of residuum and colluvium derived from sedimentary rock. Depth to a root restrictive layer, bedrock, paralithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 8 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map Unit: 40—Nehalem silt loam

Component: Nehalem (80%)

The Nehalem component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 54 inches during January, February, March, April, December. Organic matter content in the surface horizon is about 8 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria.

Component: Coquille (7%)

Generated brief soil descriptions are created for major components. The Coquille soil is a minor component.

Component: Langlois (6%)

Generated brief soil descriptions are created for major components. The Langlois soil is a minor component.

Map Unit: 41—Nestucca silt loam

Component: Nestucca (80%)

The Nestucca component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement

in the most restrictive layer is very low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 15 inches during January, February, March, April, December. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria.

Component: Chetco (4%)

Generated brief soil descriptions are created for major components. The Chetco soil is a minor component.

Component: Coquille (4%)

Generated brief soil descriptions are created for major components. The Coquille soil is a minor component.

Component: Langlois (4%)

Generated brief soil descriptions are created for major components. The Langlois soil is a minor component.

Map Unit: 57—Udorthents, level

Component: Udorthents (100%)

The Udorthents component makes up 100 percent of the map unit. Slopes are 0 to 1 percent. This component is on marshes, flood plains, tidal flats. The parent material consists of alluvium, dredging spoil, dune sand, and wood chips. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches.

Map Unit: 62—Willanch fine sandy loam

Component: Willanch (75%)

The Willanch component makes up 75 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 0 inches during January, February, March, November, December. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil meets hydric criteria.

Map Unit: 65—Zyzzug silt loam

Component: Zyzzug (80%)

The Zyzzug component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on stream terraces. The parent material consists of mixed alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is rarely flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, November, December. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil meets hydric criteria.

Map Unit: W—Water

Component: Water (100%)

Generated brief soil descriptions are created for major soil components. The Water is a miscellaneous area.

Data Source Information

Soil Survey Area: Coos County, Oregon
Survey Area Data: Version 6, Feb 8, 2010

Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge Ratings:

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

This table shows the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of this table, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the table are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include Ksat, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Report—Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge– Coos County, Oregon					
Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste		Application of sewage sludge	
		Rating class and limiting features	Value	Rating class and limiting features	Value
10C—Chismore silt loam, 7 to 12 percent slopes					
Chismore	80	Very limited			
		Slow water movement	1.00		
		Depth to saturated zone	0.99		
		Too acid	0.50		
		Runoff	0.40		
		Slope	0.16		
13D—Dement silt loam, 12 to 30 percent slopes					
Dement	75	Very limited			
		Too steep	1.00		
		Slow water movement	0.30		
		Too acid	0.22		
40—Nehalem silt loam					
Nehalem	80	Very limited			
		Flooding	1.00		
		Too acid	0.32		
41—Nestucca silt loam					
Nestucca	80	Very limited			
		Depth to saturated zone	1.00		
		Flooding	1.00		
		Slow water movement	0.89		
		Too acid	0.50		
		Runoff	0.40		
57—Udorthents, level					
Udorthents	100	Not rated			

Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge– Coos County, Oregon					
Map symbol and soil name	Pct. of map unit	Application of manure and food-processing waste		Application of sewage sludge	
		Rating class and limiting features	Value	Rating class and limiting features	Value
62—Willanch fine sandy loam					
Willanch	75	Very limited			
		Depth to saturated zone	1.00		
		Flooding	1.00		
		Ponding	1.00		
		Runoff	0.40		
		Too acid	0.03		
65—Zyzzug silt loam					
Zyzzug	80	Very limited			
		Depth to saturated zone	1.00		
		Runoff	0.40		
		Too acid	0.32		
		Slow water movement	0.30		
9—Chetco silty clay loam					
Chetco	75	Very limited			
		Slow water movement	1.00		
		Depth to saturated zone	1.00		
		Flooding	1.00		
		Runoff	0.40		
		Too acid	0.11		
W—Water					
Water	100	Not rated			

Data Source Information

Soil Survey Area: Coos County, Oregon
Survey Area Data: Version 6, Feb 8, 2010

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.
Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is

reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service.
National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Report—Physical Soil Properties

Physical Soil Properties– Coos County, Oregon														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
9—Chetco silty clay loam														
Chetco	0-10	-20-	-49-	27-31- 35	1.10-1.25	4.00-14.00	0.19-0.21	3.0-5.9	5.0-10.0	.28	.28	5	7	38
	10-24	- 8-	-53-	27-39- 50	1.20-1.35	0.42-1.40	0.17-0.21	3.0-5.9	1.0-5.0	.37	.37			
	24-60	-28-	-29-	35-43- 50	1.30-1.35	0.01-0.42	0.14-0.20	6.0-8.9	0.0-0.5	.37	.37			
10C—Chismore silt loam, 7 to 12 percent slopes														
Chismore	0-14	-25-	-53-	18-23- 27	1.10-1.25	1.40-4.00	0.19-0.21	3.0-5.9	4.0-8.0	.32	.32	5	6	48
	14-60	- 7-	-54-	35-39- 45	1.20-1.45	0.42-1.40	0.15-0.18	6.0-8.9	1.0-4.0	.32	.32			
13D—Dement silt loam, 12 to 30 percent slopes														
Dement	0-7	-25-	-53-	18-23- 27	0.95-1.10	4.00-14.00	0.19-0.21	0.0-2.9	5.0-10.0	.32	.32	4	6	48
	7-45	- 7-	-54-	25-39- 45	1.00-1.20	1.40-4.00	0.16-0.19	0.0-2.9	0.5-5.0	.37	.37			
	45-55	—	—	—	—	—	—	—	—					
40—Nehalem silt loam														
Nehalem	0-12	-11-	-69-	15-20- 25	1.10-1.20	4.00-14.00	0.19-0.21	0.0-2.9	5.0-10.0	.32	.32	5	6	48
	12-29	- 9-	-66-	20-25- 35	1.20-1.30	4.00-14.00	0.19-0.21	3.0-5.9	1.0-4.0	.37	.37			
	29-60	- 7-	-65-	20-28- 35	1.25-1.35	4.00-14.00	0.19-0.21	0.0-2.9	0.1-1.0	.37	.37			

Physical Soil Properties– Coos County, Oregon														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
41—Nestucca silt loam														
Nestucca	0-14	-10-	-68-	18-23- 27	1.10-1.25	4.00-14.00	0.19-0.21	0.0-2.9	4.0-8.0	.28	.28	5	6	48
	14-40	- 7-	-63-	25-30- 35	1.25-1.40	1.40-4.00	0.19-0.21	3.0-5.9	1.0-2.0	.32	.32			
	40-60	- 8-	-51-	20-41- 45	1.35-1.45	0.00-4.00	0.15-0.17	3.0-5.9	0.0-0.5	.28	.28			
57—Udorthents, level														
Udorthents	—	—	—	—	—	—	—	—	—					
62—Willanch fine sandy loam														
Willanch	0-13	-65-	-27-	5- 8- 10	1.30-1.40	14.00-42.00	0.13-0.15	0.0-2.9	2.0-5.0	.15	.15	5	4	86
	13-35	-69-	-24-	5- 8- 10	1.30-1.40	14.00-42.00	0.12-0.14	0.0-2.9	0.5-2.0	.15	.17			
	35-60	-81-	-16-	0- 3- 5	1.40-1.45	14.00-42.00	0.09-0.12	0.0-2.9	0.0-0.5	.20	.20			
65—Zyzzug silt loam														
Zyzzug	0-12	- 9-	-67-	20-24- 27	1.10-1.25	4.00-14.00	0.19-0.21	0.0-2.9	4.0-8.0	.32	.32	5	6	48
	12-30	- 7-	-63-	25-30- 35	1.20-1.30	4.00-14.00	0.17-0.20	3.0-5.9	1.0-4.0	.32	.32			
	30-45	- 8-	-54-	30-38- 45	1.25-1.45	1.40-4.00	0.15-0.21	6.0-8.9	0.5-1.0	.37	.37			
	45-60	- 8-	-59-	25-33- 40	1.30-1.40	1.40-4.00	0.19-0.21	3.0-5.9	0.0-0.5	.37	.37			
W—Water														
Water	—	—	—	—	—	—	—	—	—					

Data Source Information

Soil Survey Area: Coos County, Oregon
Survey Area Data: Version 6, Feb 8, 2010

Soil Water Features:

The following table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (upper limit) and base (lower limit) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates surface water depth and the duration and frequency of ponding. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. None means that ponding is not probable; rare that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); occasional that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and frequent that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and frequency are estimated. Duration is expressed as extremely brief if
0.1 hour to 4 hours, very brief if 4 hours to 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent:

None means that flooding is not probable; very rare that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year).

Rare means that flooding is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year).

Occasional means that flooding occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year).

Frequent means that flooding is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year).

Very frequent means that flooding is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Report—Water Features

Water Features– Coos County, Oregon										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
9—Chetco silty clay loam										
Chetco	D	—	January	0.0-1.5	>6.0	—	—	None	Long	Frequent
	D	—	February	0.0-1.5	>6.0	—	—	None	Long	Frequent
	D	—	March	0.0-1.5	>6.0	—	—	None	Long	Frequent
	D	—	April	0.0-1.5	>6.0	—	—	None	Long	Frequent
	D	—	May	0.0-1.5	>6.0	—	—	None	Long	Frequent
	D	—	October	0.0-1.5	>6.0	—	—	None	Long	Frequent
	D	—	November	0.0-1.5	>6.0	—	—	None	Long	Frequent
	D	—	December	0.0-1.5	>6.0	—	—	None	Long	Frequent
10C—Chismore silt loam, 7 to 12 percent slopes										
Chismore	D	—	January	1.5-2.5	>6.0	—	—	None	—	None
	D	—	February	1.5-2.5	>6.0	—	—	None	—	None
	D	—	March	1.5-2.5	>6.0	—	—	None	—	None
	D	—	November	1.5-2.5	>6.0	—	—	None	—	None
	D	—	December	1.5-2.5	>6.0	—	—	None	—	None
13D—Dement silt loam, 12 to 30 percent slopes										
Dement	B	—	Jan-Dec	—	—	—	—	None	—	—

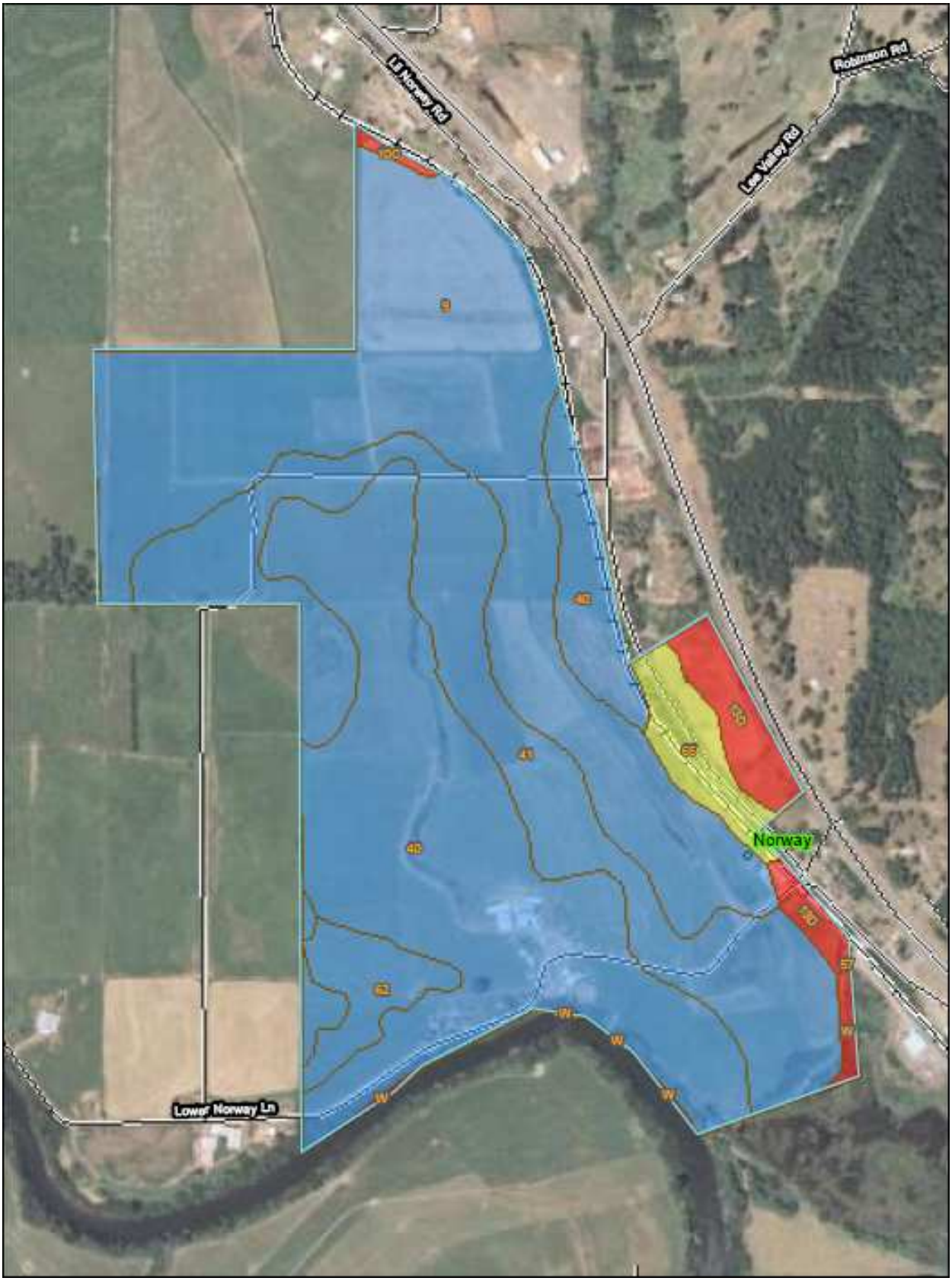
Water Features– Coos County, Oregon										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
40—Nehalem silt loam										
Nehalem	C	—	January	3.0-6.0	>6.0	—	—	None	Brief	Frequent
	C	—	February	3.0-6.0	>6.0	—	—	None	Brief	Frequent
	C	—	March	3.0-6.0	>6.0	—	—	None	Brief	Frequent
	C	—	April	3.0-6.0	>6.0	—	—	None	Brief	Frequent
	C	—	December	3.0-6.0	>6.0	—	—	None	Brief	Frequent
41—Nestucca silt loam										
Nestucca	D	—	January	1.0-1.5	>6.0	—	—	None	Brief	Frequent
	D	—	February	1.0-1.5	>6.0	—	—	None	Brief	Frequent
	D	—	March	1.0-1.5	>6.0	—	—	None	Brief	Frequent
	D	—	April	1.0-1.5	>6.0	—	—	None	Brief	Frequent
	D	—	November	—	—	—	—	None	Brief	Frequent
	D	—	December	1.0-1.5	>6.0	—	—	None	Brief	Frequent
57—Udorthents, level										
Udorthents	—	—	Jan-Dec	—	—	—	—	None	—	—
62—Willanch fine sandy loam										
Willanch	D	—	January	0.0	>6.0	0.0-0.5	Long	Frequent	Brief	Frequent
	D	—	February	0.0	>6.0	0.0-0.5	Long	Frequent	Brief	Frequent
	D	—	March	0.0	>6.0	0.0-0.5	Long	Frequent	Brief	Frequent
	D	—	November	0.0	>6.0	0.0-0.5	Long	Frequent	Brief	Frequent
	D	—	December	0.0	>6.0	0.0-0.5	Long	Frequent	Brief	Frequent

Water Features– Coos County, Oregon										
Map unit symbol and soil name	Hydrologic group	Surface runoff	Month	Water table		Ponding			Flooding	
				Upper limit	Lower limit	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*	*Ft*				
65—Zyzzug silt loam										
Zyzzug	D	—	January	0.0-1.5	>6.0	—	—	None	—	Rare
	D	—	February	0.0-1.5	>6.0	—	—	None	—	Rare
	D	—	March	0.0-1.5	>6.0	—	—	None	—	Rare
	D	—	April	0.0-1.5	>6.0	—	—	None	—	Rare
	D	—	May	—	—	—	—	None	—	Rare
	D	—	November	0.0-1.5	>6.0	—	—	None	—	Rare
	D	—	December	0.0-1.5	>6.0	—	—	None	—	Rare
W—Water										
Water	—	—	Jan-Dec	—	—	—	—	None	—	—

Data Source Information

Soil Survey Area: Coos County, Oregon
Survey Area Data: Version 6, Feb 8, 2010

Flood Boundary Map for the Allen Ranch



Flood Boundary Map Legend and Information

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent

Political Features

Municipalities

- Cities
- Urban Areas

Water Features

- Water
- Oceans
- Streams and Canals

Transportation

- Rails

Roads

- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Date(s) aerial images were photographed: 5/23/1994; 6/20/1994

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Irrigated and Nonirrigated Yields by Map Unit Component:

The average yields per acre that can be expected of the principal crops under a high level of management are shown in this table. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

If yields of irrigated crops are given, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

Pasture yields are expressed in terms of animal unit months. An animal unit month (AUM) is the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

The land capability classification of map units in the survey area is shown in this table. This classification shows, in a general way, the suitability of soils for most kinds of field crops (United States Department of Agriculture, Soil Conservation Service, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, 2e. The letter e shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage);
s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by w, s, or c because the soils in class 5 are subject to little or no erosion.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

Reference:

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

Report—Irrigated and Nonirrigated Yields by Map Unit Component

Irrigated and Nonirrigated Yields by Map Unit Component– Coos County, Oregon								
Map symbol and soil name	Land capability		Grass hay		Green chop		Pasture	
	Irrigated	Nonirrigated	Irrigated	Nonirrigated	Irrigated	Nonirrigated	Irrigated	Nonirrigated
			Tons		*Tons*		*AUM*	
9—Chetco silty clay loam								
Chetco	4w	4w	3.50	2.00	—	—	6.0	1.5
10C—Chismore silt loam, 7 to 12 percent slopes								
Chismore	4e	4e	—	—	—	—	—	6.0
13D—Dement silt loam, 12 to 30 percent slopes								
Dement	—	4e	—	—	—	—	—	6.0
40—Nehalem silt loam								
Nehalem	3w	3w	—	—	—	—	15.0	12.0
41—Nestucca silt loam								
Nestucca	3w	3w	—	—	16.50	12.00	15.0	8.0
57—Udorthents, level								
Udorthents	—	—	—	—	—	—	—	—
62—Willanch fine sandy loam								
Willanch	3w	3w	—	—	—	—	8.0	6.0
65—Zyzzug silt loam								
Zyzzug	3w	3w	—	—	—	—	30.0	15.0
W—Water								
Water	—	—	—	—	—	—	—	—

Data Source Information

Soil Survey Area: Coos County, Oregon
Survey Area Data: Version 6, Feb 8, 2010

5.4 Soil Loss

Table 5-2 Predicted Soil Erosion

Average water, wind, irrigation, gully and ephemeral soil loss

Field	Predominant Soil Type	Slope (%)	Water (Ton/A/Yr)	Wind (Ton/A/Yr)	Irrigation (Ton/A/Yr)	Gully (Ton/A/Yr)	Ephemeral (Ton/A/Yr)	Total (Ton/A/Yr)	T Factor (Ton/A/Yr)
1	41 (Nestucca SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
2	41 (Nestucca SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
3	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
4	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
5	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
6	62 (Willanch FSL)	3.0	0.1	0.0	0.0	0.0	0.0	0.1	5
7	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
8	41 (Nestucca SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
9	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
10	41 (Nestucca SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
11	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
12	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
13	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
14	41 (Nestucca SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
15	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
16	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
17	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
18	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
19	41 (Nestucca SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
20	40 (Nehalem SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
21	41 (Nestucca SIL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
22	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
23	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
24	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
25	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
26	9 (Chetco SICL)	3.0	0.2	0.0	0.0	0.0	0.0	0.2	5
27	13D (Dement SIL)	21.0	1.9	0.0	0.0	0.0	0.0	1.9	4

Field	Predominant Soil Type	Slope (%)	Water (Ton/A/Yr)	Wind (Ton/A/Yr)	Irrigation (Ton/A/Yr)	Gully (Ton/A/Yr)	Ephemeral (Ton/A/Yr)	Total (Ton/A/Yr)	T Factor (Ton/A/Yr)
CAFO	40 (Nehalem SIL)	3.0	0.0	0.0	0.0	0.0	0.0	0.0	5
Wetland (1)	41 (Nestucca SIL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5
Wetland (2)	41 (Nestucca SIL)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5

5.5 Highly Erodible Lands

The following table shows the highly erodible land (HEL) class for each field:

HEL Soil Class

Field	Soil Survey	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)	OM Range (%)	Hydro-logic Group	HEL Class
1	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
2	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
3	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
4	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
5	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
6	011	62	Willanch	FSL	0-3%	2-5%	D	3-NHEL
7	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
8	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
9	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
10	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
11	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
12	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
13	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
14	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
15	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
16	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
17	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
18	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
19	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
20	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
21	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
22	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
23	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
24	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
25	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
26	011	9	Chetco	SICL	0-3%	5-10%	D	3-NHEL
27	011	13D	Dement	SIL	12-30%	5-10%	B	1-HEL
CAFO	011	40	Nehalem	SIL	0-3%	5-10%	C	3-NHEL
Wetland (1)	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL
Wetland (2)	011	41	Nestucca	SIL	0-3%	4-8%	D	3-NHEL

* 1-HEL- Highly Erodible Land
2-PHEL- Potentially Highly Erodible Land
3-NHEL- Not Highly Erodible Land

Field 27 is classified as Highly Erodible Land (HEL) due to steep slopes and soil type and the rest of the hay and pasture land fields owned by Allen Ranch are classified as Not Highly Erodible Land (NHEL) due to flat slopes and soil texture. Since all hay and pasture fields will be in 5 to 10 years of grass hay all fields will be kept well within the tolerable annual soil loss limits. Still care should be taken when planting fields to not disturb the whole field when replanting to minimize erosion potential.

The Revised Universal Soil Loss Equation ver. 2.0 (RUSLE2) calculations located in Appendix D indicate the most severe erosion will occur when fields are planted as shown in Table 5-2. Even though more erosion will occur during planting the average annual soil loss is still less than the annual tolerable soil loss.

5.6 Risk Assessment-Phosphorus Index

The CLEANmp West program, the Oregon Department of Agriculure Confined Animal Feeding Program, and the Oregon Natural Resources Conservation Service (NRCS) Nutrient Management conservation practice standard 590 all require that a phosphorus (P) index be prepared to determine the potential for phosphorus transport off of the fields used for manure application. Soil concentrations of phosphorus on the hay and pasture land fields the Allen Ranch applies manure to are very low.

The P index ratings for all fields are show in Table 5-3 and are based on the western Oregon phosphorus index described in Appendix E. The P index ratings indicate that there is currently a low risk of phosphorus transport from all fields if no additional manure is applied over the next 4 years. Based on the application plan for manure over the next 4 years, the P index ratings indicate that there is currently a low to medium risk of phosphorus transport from the hay and pasture land fields.

The RUSLE2 calculations indicate that the erosion in the fields where manure will be applied is within the average annual soil loss tolerance (T) therefore erosion will not contribute significantly to phosphorus transport.

According to the Oregon NRCS Nutrient Management conservation practice standard 590, fields ranked in the low or medium risk category may receive organic (manure) or inorganic (commercial fertilizer) applications at nitrogen-based rates. Fields ranked in the high risk category may receive organic (manure) applications at phosphorus-based rates and no inorganic (commercial fertilizer) phosphorus shall be applied.

Table 5-3. Oregon Phosphorus Index (West)

Field	Crop Year	Transport Factor Sum	Source Factor Sum	P Index w/o P Apps	P Index w/ P Apps	P Loss Risk
1	2013	5.00	3.68	5.00	8.68	Low
1	2014	5.00	3.68	5.00	8.68	Low
1	2015	5.00	3.68	5.00	8.68	Low
1	2016	5.00	3.68	5.00	8.68	Low
2	2013	5.00	3.68	5.00	8.68	Low
2	2014	5.00	3.68	5.00	8.68	Low
2	2015	5.00	3.68	5.00	8.68	Low
2	2016	5.00	7.87	5.00	12.87	Low
3	2013	5.00	9.22	5.00	14.22	Medium
3	2014	5.00	9.34	5.00	14.34	Medium
3	2015	5.00	9.16	5.00	14.16	Medium
3	2016	5.00	11.68	5.00	16.68	Medium
4	2013	5.00	9.22	5.00	14.22	Medium
4	2014	5.00	8.98	5.00	13.98	Medium
4	2015	5.00	9.16	5.00	14.16	Medium
4	2016	5.00	9.16	5.00	14.16	Medium
5	2013	5.00	9.22	5.00	14.22	Medium
5	2014	5.00	9.16	5.00	14.16	Medium
5	2015	5.00	9.16	5.00	14.16	Medium
5	2016	5.00	9.16	5.00	14.16	Medium
6	2013	5.75	9.22	5.75	14.97	Medium
6	2014	5.75	9.34	5.75	15.09	Medium
6	2015	5.75	9.16	5.75	14.91	Medium
6	2016	5.75	9.16	5.75	14.91	Medium
7	2013	5.75	9.22	5.75	14.97	Medium
7	2014	5.75	9.16	5.75	14.91	Medium
7	2015	5.75	9.33	5.75	15.08	Medium
7	2016	5.75	9.16	5.75	14.91	Medium
8	2013	5.00	9.22	5.00	14.22	Medium
8	2014	5.00	10.29	5.00	15.29	Medium
8	2015	5.00	9.16	5.00	14.16	Medium
8	2016	5.00	9.16	5.00	14.16	Medium
9	2013	5.75	9.60	5.75	15.35	Medium
9	2014	5.75	9.16	5.75	14.91	Medium
9	2015	5.75	11.68	5.75	17.43	Medium
9	2016	5.75	9.54	5.75	15.29	Medium
10	2013	5.75	9.14	5.75	14.89	Medium
10	2014	5.75	9.16	5.75	14.91	Medium
10	2015	5.75	11.68	5.75	17.43	Medium
10	2016	5.75	9.28	5.75	15.03	Medium
11	2013	5.75	9.48	5.75	15.23	Medium

Field	Crop Year	Transport Factor Sum	Source Factor Sum	P Index w/o P Apps	P Index w/ P Apps	P Loss Risk
11	2014	5.75	9.16	5.75	14.91	Medium
11	2015	5.75	9.56	5.75	15.31	Medium
11	2016	5.75	9.45	5.75	15.20	Medium
12	2013	5.75	9.21	5.75	14.96	Medium
12	2014	5.75	9.28	5.75	15.03	Medium
12	2015	5.75	9.16	5.75	14.91	Medium
12	2016	5.75	9.16	5.75	14.91	Medium
13	2013	5.00	9.42	5.00	14.42	Medium
13	2014	5.00	10.21	5.00	15.21	Medium
13	2015	5.00	9.16	5.00	14.16	Medium
13	2016	5.00	9.16	5.00	14.16	Medium
14	2013	5.75	9.52	5.75	15.27	Medium
14	2014	5.75	9.39	5.75	15.14	Medium
14	2015	5.75	9.16	5.75	14.91	Medium
14	2016	5.75	9.16	5.75	14.91	Medium
15	2013	5.75	9.02	5.75	14.77	Medium
15	2014	5.75	11.68	5.75	17.43	Medium
15	2015	5.75	9.45	5.75	15.20	Medium
15	2016	5.75	9.16	5.75	14.91	Medium
16	2013	5.00	9.22	5.00	14.22	Medium
16	2014	5.00	10.12	5.00	15.12	Medium
16	2015	5.00	9.16	5.00	14.16	Medium
16	2016	5.00	9.16	5.00	14.16	Medium
17	2013	5.75	11.54	5.75	17.29	Medium
17	2014	5.75	9.84	5.75	15.59	Medium
17	2015	5.75	9.30	5.75	15.05	Medium
17	2016	5.75	9.76	5.75	15.51	Medium
18	2013	5.00	3.68	5.00	8.68	Low
18	2014	5.00	3.68	5.00	8.68	Low
18	2015	5.00	3.68	5.00	8.68	Low
18	2016	5.00	3.68	5.00	8.68	Low
19	2013	5.00	3.68	5.00	8.68	Low
19	2014	5.00	3.68	5.00	8.68	Low
19	2015	5.00	3.68	5.00	8.68	Low
19	2016	5.00	3.68	5.00	8.68	Low
20	2013	5.00	3.68	5.00	8.68	Low
20	2014	5.00	3.68	5.00	8.68	Low
20	2015	5.00	3.68	5.00	8.68	Low
20	2016	5.00	3.68	5.00	8.68	Low
21	2013	5.00	3.49	5.00	8.49	Low
21	2014	5.00	3.49	5.00	8.49	Low
21	2015	5.00	3.49	5.00	8.49	Low

Field	Crop Year	Transport Factor Sum	Source Factor Sum	P Index w/o P Apps	P Index w/ P Apps	P Loss Risk
21	2016	5.00	3.49	5.00	8.49	Low
22	2013	5.00	5.08	5.00	10.08	Low
22	2014	5.00	5.08	5.00	10.08	Low
22	2015	5.00	5.08	5.00	10.08	Low
22	2016	5.00	4.72	5.00	9.72	Low
23	2013	5.00	5.08	5.00	10.08	Low
23	2014	5.00	5.08	5.00	10.08	Low
23	2015	5.00	5.08	5.00	10.08	Low
23	2016	5.00	4.72	5.00	9.72	Low
24	2013	5.00	5.08	5.00	10.08	Low
24	2014	5.00	5.08	5.00	10.08	Low
24	2015	5.00	5.08	5.00	10.08	Low
24	2016	5.00	4.72	5.00	9.72	Low
25	2013	5.00	5.08	5.00	10.08	Low
25	2014	5.00	5.08	5.00	10.08	Low
25	2015	5.00	5.08	5.00	10.08	Low
25	2016	5.00	4.72	5.00	9.72	Low
26	2013	5.00	5.08	5.00	10.08	Low
26	2014	5.00	5.08	5.00	10.08	Low
26	2015	5.00	5.08	5.00	10.08	Low
26	2016	5.00	4.72	5.00	9.72	Low
27	2013	5.50	5.05	5.50	10.55	Low
27	2014	5.50	5.05	5.50	10.55	Low
27	2015	5.50	5.05	5.50	10.55	Low
27	2016	5.50	4.70	5.50	10.20	Low
CAFO	2013	*Unable to calculate P Index. See notes for details.*				
CAFO	2014	*Unable to calculate P Index. See notes for details.*				
CAFO	2015	*Unable to calculate P Index. See notes for details.*				
CAFO	2016	*Unable to calculate P Index. See notes for details.*				
Wetland (1)	2013	*Unable to calculate P Index. See notes for details.*				
Wetland (1)	2014	*Unable to calculate P Index. See notes for details.*				
Wetland (1)	2015	*Unable to calculate P Index. See notes for details.*				
Wetland (1)	2016	*Unable to calculate P Index. See notes for details.*				
Wetland (2)	2013	*Unable to calculate P Index. See notes for details.*				
Wetland (2)	2014	*Unable to calculate P Index. See notes for details.*				
Wetland (2)	2015	*Unable to calculate P Index. See notes for details.*				
Wetland (2)	2016	*Unable to calculate P Index. See notes for details.*				

Notes:
Field 1:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 2:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 3:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).

Field 4:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 5:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 6:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 7:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 8:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 9:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 10:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 11:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 12:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 13:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 14:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 15:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 16:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 17:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 18:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 19:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 20:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 21:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 22:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 23:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 24:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 25:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 26:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field 27:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Field CAFO:
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Error: Soil test P not entered; cannot calculate P Index.
Field Wetland (1):
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Error: Soil test P not entered; cannot calculate P Index.
Field Wetland (2):
Warning: RUSLE2 soil loss not available (RUSLE2 climate not selected.).
Error: Soil test P not entered; cannot calculate P Index.

Oregon Phosphorus Index (West) Risk Interpretation

P Index rating	Interpretation	Recommended Nutrient Limitation
PI Score<13	Low potential for P movement from this site given current management practices and site characteristics. There is a low probability of an adverse impact to surface waters from P losses on this site. Soil test P and P losses are likely to increase in future due to N-based nutrient management from animal manure.	Nitrogen
PI Score 13-25	Medium potential for P movement from this site given current management practices and site characteristics. Practices should be introduced to reduce P losses by surface runoff, subsurface flow, and erosion. Soil test P and P losses are likely to increase in future due to N-based nutrient management from animal manure.	Nitrogen
PI Score >25-50	High potential for P movement from this site given current management practices and site characteristics. All practicable management practices to reduce P losses through surface runoff, subsurface flow, or erosion should be implemented.	Phosphorus
PI Score >50	Very high potential for P movement from this site given current management practices and site characteristics. Active remediation techniques should be implemented in an effort to reduce the P loss potential from this site.	No manure

5.7 Leaching Index

Water that moves through soils can contain soluble nutrients that can degrade groundwater sources. The leaching index provides a way to determine if soils in a management area or field are susceptible to leaching nutrients to groundwater sources. The methodology for the Oregon leaching index was base on research done by J.R. Williams and D.E. Kissel which is published in the book "Managing Nitrogen for Groundwater Quality and Farm Profitability" edited by R.F. Follet. Appropriate management considerations and land treatment practices should be established based on the leaching index rating to limit the amount of soluble nutrients that could be leached to groundwater in a management area or field.

The leaching index ratings shown in Table 5.4 are taken from Leaching Index Interpretations Table and indicate the soils in the fields where manure will be applied from the Allen Ranch have a high potential for leaching soluble nutrients. To minimize the leaching potential of soluble nutrients intensive nutrient and irrigation water management should be practiced on these fields.

Table 5.4. Soil Leaching Index

Field	Soil Survey	Map Unit	Soil Component Name	Surface Texture	Slope Range (%)	Bedrock Depth (in.)	Drainage	Hydro-logic Group	Leaching Index
1	011	41	Nestucca	SIL	0-3%		SPoor	D	20
2	011	41	Nestucca	SIL	0-3%		SPoor	D	20
3	011	40	Nehalem	SIL	0-3%		Well	C	20
4	011	40	Nehalem	SIL	0-3%		Well	C	20
5	011	40	Nehalem	SIL	0-3%		Well	C	20
6	011	62	Willanch	FSL	0-3%		Poor	D	20
7	011	40	Nehalem	SIL	0-3%		Well	C	20
8	011	41	Nestucca	SIL	0-3%		SPoor	D	20
9	011	9	Chetco	SICL	0-3%		VPoor	D	20
10	011	41	Nestucca	SIL	0-3%		SPoor	D	20
11	011	40	Nehalem	SIL	0-3%		Well	C	20
12	011	40	Nehalem	SIL	0-3%		Well	C	20
13	011	40	Nehalem	SIL	0-3%		Well	C	20
14	011	41	Nestucca	SIL	0-3%		SPoor	D	20
15	011	9	Chetco	SICL	0-3%		VPoor	D	20
16	011	9	Chetco	SICL	0-3%		VPoor	D	20
17	011	9	Chetco	SICL	0-3%		VPoor	D	20
18	011	40	Nehalem	SIL	0-3%		Well	C	20
19	011	41	Nestucca	SIL	0-3%		SPoor	D	20
20	011	40	Nehalem	SIL	0-3%		Well	C	20
21	011	41	Nestucca	SIL	0-3%		SPoor	D	20
22	011	9	Chetco	SICL	0-3%		VPoor	D	20
23	011	9	Chetco	SICL	0-3%		VPoor	D	20
24	011	9	Chetco	SICL	0-3%		VPoor	D	20
25	011	9	Chetco	SICL	0-3%		VPoor	D	20
26	011	9	Chetco	SICL	0-3%		VPoor	D	20
27	011	13D	Dement	SIL	12-30%	45	Well	B	32.5
CAFO	011	40	Nehalem	SIL	0-3%		Well	C	20
Wetland (1)	011	41	Nestucca	SIL	0-3%		SPoor	D	20
Wetland (2)	011	41	Nestucca	SIL	0-3%		SPoor	D	20

Leaching Index Interpretations

Rating	Interpretation
Low (<2)	Soils have a low potential to leach mobile nutrients below the root zone unless irrigation applications are not managed properly.
Medium (2 to 10)	Soils may leach mobile nutrients below the root zone. Irrigation water management should be practiced on these soils if crops are irrigated and land treatments to minimize the potential for leaching losses should be considered.
High (>10)	Soils have a high potential to leach mobile nutrients below the root zone. Intensive irrigation water management should be practiced on these soils if crops are irrigated. Intensive nutrient management should also be practiced on these soils with special considerations for the method, rate, and timing of nutrient applications to reduce the potential of nutrient losses to ground water. Land treatments to minimize the potential for leaching losses should also be considered.

Section 6. Nutrient Management

6.1 Soil Tests

Soil sampling shall be done in accordance with Pacific Northwest Land Grant University (PNLGU) guidance or industry practice if recognized by the PNLGU to monitor phosphorus, potassium, calcium, magnesium, pH, organic matter and the cation exchange capacity (CEC) levels. Guidance for soil sampling can be found in Pacific Northwest (PNW) Extension publication 570-E, "Monitoring Soil Nutrients Using a Management Unit Approach" which is located in Appendix H. If no significant changes have occurred in the manure and wastewater production, storage, collection, transport, or utilization systems for the farm, current soil tests are those that are less than 5 years old. The Oregon State University Extension publication EC1478, "Soil Test Interpretation Guide" located in Appendix H provides guidance on how to determine soil nutrient concentrations levels and how to adjust soil pH to improve nutrient availability.

Soil test analyses should be performed by laboratories that meet the requirements and and performance standards of the North American Proficiency Testing Program (NAPT) Proficiency Assessment Program (PAP); http://www.naptprogram.org/pap/.

Dates of when soil samples were taken and analytical results are shown in Table 6-1. The original laboratory soil test reports are located in Appendix F.

A map showing soil pH levels in all fields is located on page 163 and show that pH levels are very low to low. Fields with very low pH levels should have soil samples taken and analyzed for pH levels every other year to insure adequate nutrient availability from applied nutrients.

A map showing soil concentrations of phosphorus for all fields is located on page 164 and show that soil concentrations of phosphorus are very low on all fields. Soil samples should be taken and analyzed for soil concentrations of phosphorus every 4 years on all fields to insure soil phosphorus concentrations do not increase and restrict manure applications.

A map showing soil concentrations of potassium for all fields is located on page 165 and show that soil concentrations of potassium are medium to very high in the hay and pasture land fields. Soil samples should be taken and analyzed for soil concentrations of potassium every 4 years on all fields and applications of potassium should be limited or reduced to try and reduce soil concentrations in fields with very high soil concentrations of potassium.

Unless otherwise specified refer to the Nutrient Management Specification in Section 4.4 on page 66 for guidance on when to take soil samples and what to have the samples analyzed for. The Nutrient Management Specification in Section 4.4 on page 66 also provides guidance on taking soil tests at specific times of the year to address if additional nutrient applications are needed for the crop being grown and if nutrient applications made did not supply enough or too much nutrients for the targeted crop yields.

6.2 Manure Nutrient Content

Dates, source of manure samples and analytical results are shown in Table 6-2 which are for manure samples taken annually in 2012. The original laboratory manure test reports are located in Appendix G.

Normally manure tests are taken in early fall and spring to provide a representative assessment of nutrient concentrations in the manure to be used in determining the amount of manure to be applied. Refer to the Nutrient Management Specification in Section 4.4 on page 66 for guidance on when to take manure samples and what to have the samples analyzed for.

Table 6-1. Soil Test Data

Field	Test Year	OM (%)	P Test Used	P	K	Mg	Ca	Na	Units	Soil pH	Buffer pH	CEC (meq/ 100g)	NO_3-N (ppm)	EC (mmhos/ cm)
1	2012		Bray P1	7	270	641	1,380		ppm	5.7	6.3	21.3		
2	2012		Bray P1	4	402	920	1,640		ppm	5.4	5.9	30.1		
3	2012		Bray P1	7	195	1,222	2,100		ppm	5.5	5.9	34.4		
4	2012		Bray P1	4	186	980	2,100		ppm	5.6	6.1	29.9		
5	2012		Bray P1	4	186	960	2,100		ppm	5.6	6.1	29.8		
6	2012		Bray P1	4	186	980	2,100		ppm	5.6	6.1	29.9		
7	2012		Bray P1	7	195	1,222	2,100		ppm	5.5	5.9	34.4		
8	2012		Bray P1	4	402	944	1,640		ppm	5.4	5.9	30.3		
9	2012		Bray P1	4	402	944	1,640		ppm	5.4	5.9	30.3		
10	2012		Bray P1	4	402	944	1,640		ppm	5.4	5.9	30.3		
11	2012		Bray P1	7	195	1,222	2,100		ppm	5.5	5.9	34.4		
12	2012		Bray P1	4	186	980	2,100		ppm	5.6	6.1	29.9		
13	2012		Bray P1	4	186	980	2,100		ppm	5.6	6.1	29.9		
14	2012		Bray P1	7	195	1,222	2,100		ppm	5.5	5.9	34.4		
15	2012		Bray P1	4	402	944	1,640		ppm	5.4	5.9	30.3		
16	2012		Bray P1	4	402	944	1,640		ppm	5.4	5.9	30.3		
17	2012		Bray P1	7	270	641	1,380		ppm	5.7	6.3	21.3		
18	2012		Bray P1	7	270	641	1,380		ppm	5.7	6.3	21.3		
19	2012		Bray P1	4	402	944	1,640		ppm	5.4	5.9	30.3		
20	2012		Bray P1	7	195	1,222	2,100		ppm	5.5	5.9	34.4		
21	2012		Bray P1	4	186	980	2,100		ppm	5.6	6.1	29.9		
22	2012		Bray P1	4	186	980	2,100		ppm	5.6	6.1	29.9		
23	2012		Bray P1	7	195	1,222	2,100		ppm	5.5	5.9	34.4		
24	2012		Bray P1	4	402	944	1,640		ppm	5.4	5.9	30.3		
25	2012		Bray P1	7	270	641	1,380		ppm	5.7	6.3	21.3		
26	2012		Bray P1	7	270	641	1,380		ppm	5.7	6.3	21.3		
27	2012		Bray P1	7	270	641	1,380		ppm	5.7	6.3	21.3		
CAFO									ppm					

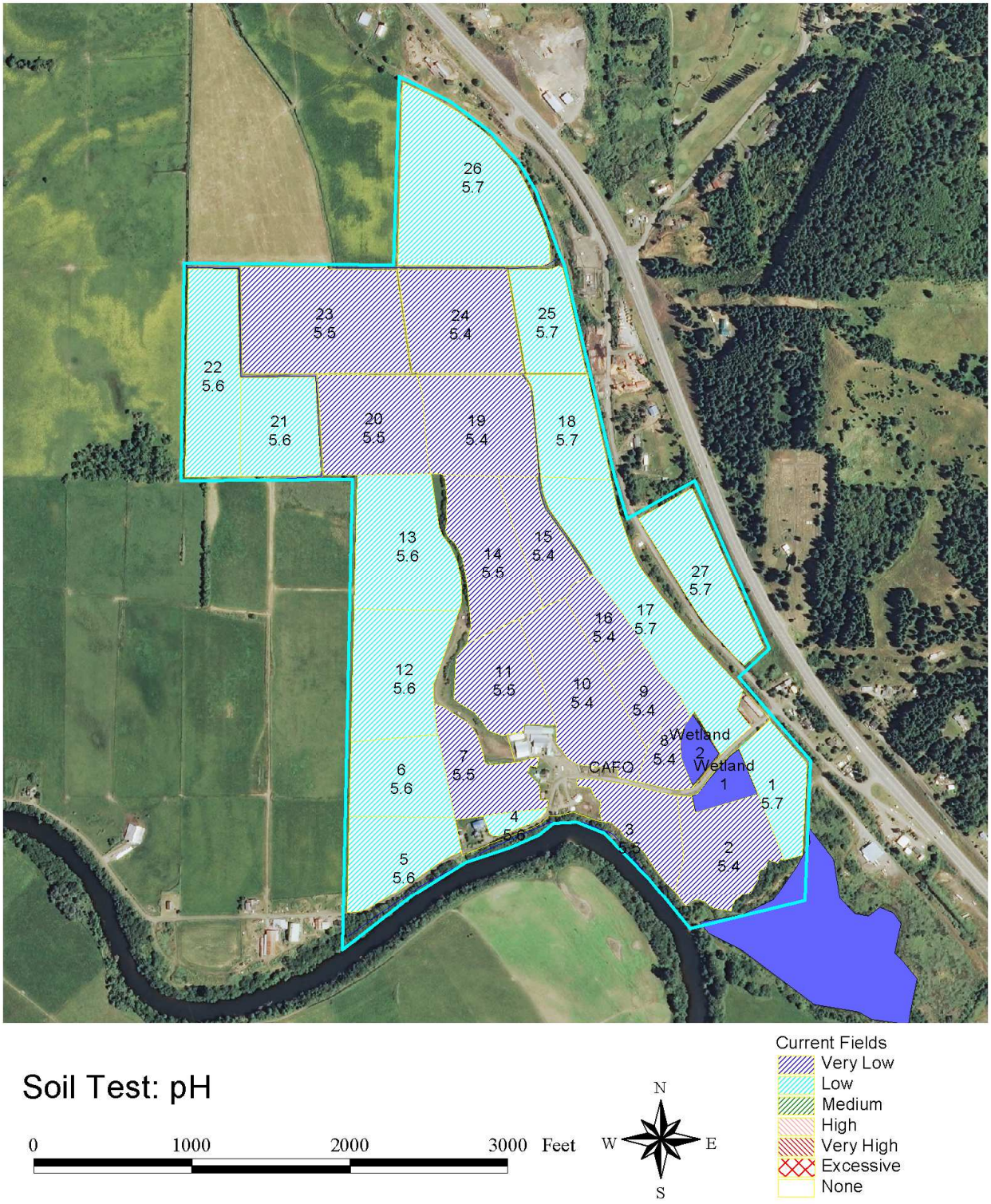
Field	Test Year	OM (%)	P Test Used	P	K	Mg	Ca	Na	Units	Soil pH	Buffer pH	CEC (meq/ 100g)	NO_3-N (ppm)	EC (mmhos/ cm)
Wetland (1)									ppm					
Wetland (2)									ppm					

Table 6-2. Manure Nutrient Analyses

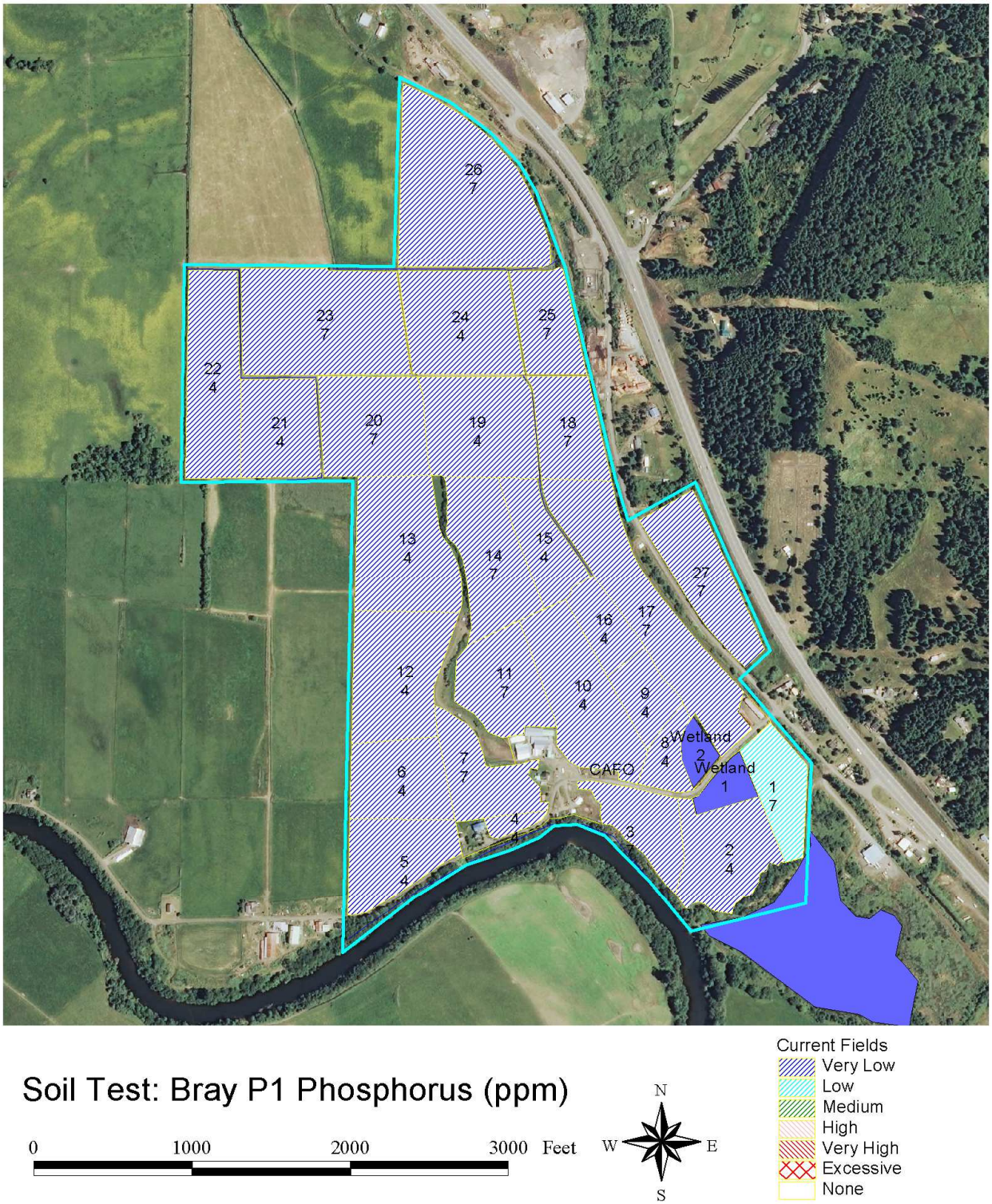
Manure Source	Dry Matter (%)	Total N	NH_4-N	Total P_2O_5	Total K_2O	Avail. P_2O_5	Avail. K_2O	Units	Analysis Source and Date
Tank	14.5	5.3	1.8	1.8	3.3	1.8	3.3	Lb/1000Gal	AgSource Laboratories June 15, 2012
Solids Storage Barn	65.2	23.6	9.9	12.6	25.4	12.6	25.4	Lb/Ton	AgSource Laboratories June 15, 2012
Livestock	12.0	21.3	7.0	13.8	23.2	13.8	23.2	Lb/1000Gal	MMP Estimate June 2012

(1) Entered analysis may be the average of several individual analyses.
(2) Oregon assumes that 100% of manure phosphorus and 100% of manure potassium is crop available. First-year per-acre nitrogen availability for individual manure applications is given in the Planned Nutrient Applications table. For more information about nitrogen availability in Oregon, see Waste Utilization Jobsheet 633 OR-JS, Oregon USDA-NRCS, May 2003 (http://efotg.sc.egov.usda.gov/references/public/OR/633js042707.pdf).

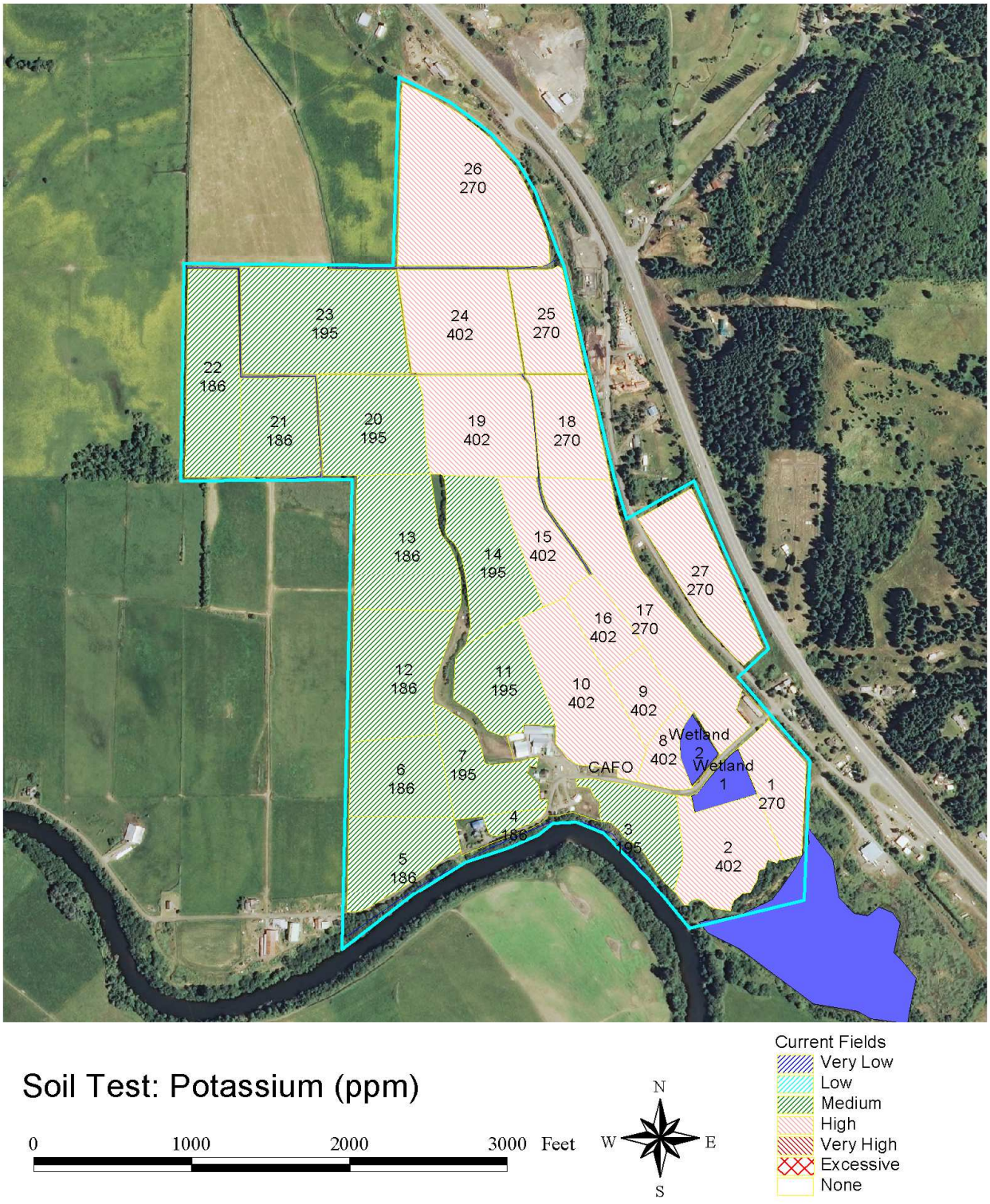
6.3 Allen Ranch Soil Test pH (Water) Map



6.4 Allen Ranch Soil Test P (ppm) Map



6.5 Allen Ranch Soil Test K (ppm) Map



6.6 Cropping System

Fields are planted to permanent grass for hay and pasture. The fields are renovated every 5 to 7 years to maintain productivity.

6.7 Realistic Yield Goals

The Allen Ranch field 27 is nonirrigated and estimated to yield 3.0 tons/acre/year of grass hay and pasture at 85% dry matter. All the other fields on Allen Ranch are irrigated and estimated to yield 6 tons/acre/year of grass hay and pasture at 85% dry matter.

The crop yields used in developing this plan seem reasonable based on yield estimates for the Allen Ranch and yields indicated in the Coos County Area soil survey located in Section 5.

6.8 Nutrient Application Plans

Where appropriate, the Oregon State University Extension fertilizer guides for the crops grown were used in conjunction with the nutrient analysis of the manure to determine the recommended application rates of the manure. Where the fertilizer guides were not appropriate to use, nutrient uptake guidelines taken from Oregon State University Extension publications or chapter 6 of the Natural Resource Conservation Service Agricultural Waste Management Field Handbook were used to determine the recommended application rates of manure. It is anticipated that additional commercial fertilizer will be needed to meet the nutrient requirements of the crops grown based on the estimated amounts of nutrients that the manure will supply. Additional commercial fertilizer should be applied based on soil tests and recommendations in fertilizer guides. The recommended manure application rates for the Allen Ranch are given in Nutrient Management Specification located in Section 4.4 on page 66.

The following sections of this plan described the nutrient requirements, additional amendments and timing of manure applications to meet the yield expectations for the crops being grown. Tables 6-5 through 6-7 summarize the manure application recommendations by field and crop year for the four-year planning cycle.

6.9 Land Application Strategy

Use the information in Tables 6-3, 6-4, 6-5 and 6-6 and the guidance in the Nutrient Management practice located in Section 4.4 on page 65 for making applications of manure generated by the Allen Ranch.

6.10 Nutrient Balance

The low and medium site vulnerability class for the Allen Ranch hay and pasture land fields are based on the Western Oregon Phosphorus Index which allows manure, bedding and runoff collected in the waste storage facility to be applied on nitrogen based rates. Soil tests will be used to monitor phosphorus levels in the soils where manure is applied. If the soil tests show significant increases in soil phosphorus concentrations, on farm manure applications may have to be reduced which may require some manure to be exported off farm. See Table 6-7 for the planned field nutrient balance based on recommended manure applications and Table 6-8 for projected soil concentration values of phosphorus and potassium at the end of the planning period. See Table 6-6 for planned manure applications.

Table 6-3. Planned Crops and Fertilizer Recommendations

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
1	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
1	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
1	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
1	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
2	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
3	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
4	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
5	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
5	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
5	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
5	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
6	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
6	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
6	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
6	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
7	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
8	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
8	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
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9	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
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9	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
10	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
11	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
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13	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
13	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
13	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
13	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
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14	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
15	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
16	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
16	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
16	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
16	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
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17	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
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18	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
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19	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
19	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
20	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
21	2013	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
21	2014	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
21	2015	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
21	2016	Grass pasture, maint	6.0 Ton	245[a]	82	234[a]	236	55	288	OSU Extension Publication EM 8585-E
22	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
22	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
22	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
22	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
23	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
24	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
25	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
26	2013	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
26	2014	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
26	2015	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E

Field	Crop Year	Planned Crop	Yield Goal (per Acre)	N Rec (Lbs/A)	P_2O_5 Rec (Lbs/A)	K_2O Rec (Lbs/A)	N Removed (Lbs/A)	P_2O_5 Removed (Lbs/A)	K_2O Removed (Lbs/A)	Custom Fert. Rec. Source
26	2016	Grass pasture, maint	3.0 Ton	122[a]	41	117[a]	118	28	144	OSU Extension Publication EM 8585-E
27	2013	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
27	2014	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
27	2015	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
27	2016	Grass pasture, maint	6.0 Ton	245[a]	82[a]	234[a]	236	55	288	OSU Extension Publication EM 8585-E
CAFO	2013	Other								
CAFO	2014	Other								
CAFO	2015	Other								
CAFO	2016	Other								
Wetland (1)	2013	Other								
Wetland (1)	2014	Other								
Wetland (1)	2015	Other								
Wetland (1)	2016	Other								
Wetland (2)	2013	Other								
Wetland (2)	2014	Other								
Wetland (2)	2015	Other								
Wetland (2)	2016	Other								

* Unharvested cover crop or first crop in double-crop system.
[a] Custom fertilizer recommendation.

Table 6-4. Manure Application Setback Distances

Setback Requirements: CAFO

Feature	Setback Criteria	Setback Distance (Feet)
Lakes and ponds	Applied upgradient, permanent vegetated setback >=35 feet	35
Impounding reservoirs	Applied upgradient, permanent vegetated setback >=35 feet	35
Wells	Applied upgradient, permanent vegetated setback >=35 feet	35
Rivers and canals	Applied upgradient, permanent vegetated setback >=35 feet	35
Streams and creeks	Applied upgradient, permanent vegetated setback >=35 feet	35
Estuaries	Applied upgradient, permanent vegetated setback >=35 feet	35
Pacific Ocean	Applied upgradient, permanent vegetated setback >=35 feet	35
All other bodies of surface water, natural or artificial	Applied upgradient, permanent vegetated setback >=35 feet	35
Other conduits to surface waters	Applied upgradient, permanent vegetated setback >=35 feet	35
Open tile line intake	Applied upgradient, permanent vegetated setback >=35 feet	35
Sinkholes	Applied upgradient, permanent vegetated setback >=35 feet	35

Source: CAFO General Permit #1 (http://oregon.gov/ODA/NRD/docs/pdf/cafo_gnlpmt.pdf)

Setback Requirements: NRCS Standard

Feature	Setback Criteria	Setback Distance (Feet)
Open water courses	Application June through September	25
Open water courses	Application October through May	50

Source: Waste Utilization 633 Operation and Maintenance Worksheet (http://efotg.nrcs.usda.gov/references/public/OR/633om.doc)

Table 6-5. Manure Application Planning Calendar – October 2012 through September 2013

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2013 Crop (Prev. Primary Crop)	Oct '12	Nov '12	Dec '12	Jan '13	Feb '13	Mar '13	Apr '13	May '13	Jun '13	Jul '13	Aug '13	Sep '13
1	5.0	4.7	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								470.0	470.0	470.0		
2	8.0	7.6	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								760.0	760.0	760.0		
3	5.0	5.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		165.0	187.5	187.5	187.5	200.0	200.0					
4	0.9	0.9	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		29.7	33.8	33.8	33.8	36.0	36.0					
5	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	262.5	262.5	262.5	280.0	280.0					
6	7.0	7.0	Willanch FSL (62 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	262.5	262.5	262.5	280.0	280.0					
7	6.0	6.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		198.0	225.0	225.0	225.0	240.0	240.0					
8	2.5	2.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		66.0	75.0	75.0	75.0	80.0	80.0					
9	3.5	3.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		108.9 X	123.8 X	123.8	123.8	132.0	132.0					
10	10.5	10.4	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		343.2	386.4	386.4 X	7.5 X	416.0	416.0					
11	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	259.0	259.0	228.2	280.0 X	280.0 X					
12	10.5	10.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		346.5	388.5	388.5	388.5	420.0	420.0					
13	11.5	11.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		379.5	425.5	425.5	425.5	452.8	452.8					1.5
14	9.0	9.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		297.0	333.0	44.1	296.3	360.0	360.0					2.7
15	5.0	4.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		142.0	159.2	3.8	161.3	172.1	172.1					
16	3.5	2.9	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		95.8	107.4	108.8	108.8	116.1	116.1					
17	14.0	12.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		390.4	25.9	468.8	468.8	500.0	500.0					18.7
18	6.0	5.6	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								560.0	560.0	560.0		
19	10.0	9.5	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								950.0	950.0	950.0		

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2013 Crop (Prev. Primary Crop)	Oct '12	Nov '12	Dec '12	Jan '13	Feb '13	Mar '13	Apr '13	May '13	Jun '13	Jul '13	Aug '13	Sep '13
20	9.5	9.2	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								920.0	920.0	920.0		
21	7.0	6.1	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								545.0	545.0	545.0		
22	10.0	9.4	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)											615.7	615.7
23	15.5	14.8	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)											969.4	971.4
24	10.5	9.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)											622.3	622.3
25	5.5	5.2	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)											340.6	340.6
26	18.0	17.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)											1,146.3	1,146.3
27	8.0	8.0	Dement SIL (13D 12-30%)	Grass pasture, maint (Grass pasture, maint)											510.7	510.7
CAFO	7.1	0.0	Nehalem SIL (40 0-3%)	Other (Other)												
Wetland (1)	2.0	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Wetland (2)	1.6	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Total	*226.6*	*206.4*				*3,255.0 X*	*3,255.0 X*	*3,255.0 X*	*3,255.0 X*	*3,965.0 X*	*3,965.0 X*	*4,205.0*	*4,205.0*	*4,205.0*	*4,205.0*	*4,229.9*

Crop in field	No. indicates total loads "X" indicates other manure apps

Manure Application Planning Calendar – October 2013 through September 2014

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2014 Crop (Prev. Primary Crop)	Oct '13	Nov '13	Dec '13	Jan '14	Feb '14	Mar '14	Apr '14	May '14	Jun '14	Jul '14	Aug '14	Sep '14
1	5.0	4.7	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								470.0	470.0	470.0		
2	8.0	7.6	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								760.0	760.0	760.0		
3	5.0	5.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		165.0	165.0	165.0	330.0	200.0	200.0					
4	0.9	0.9	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		29.7	29.7	29.7		36.0	36.0					
5	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0	280.0					
6	7.0	7.0	Willanch FSL (62 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0 X	231.0 X	231.0	231.0	280.0	280.0					
7	6.0	6.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		198.0	198.0	198.0	198.0	240.0	240.0					
8	2.5	2.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		66.0	66.0	66.0	66.0	80.0	80.0					1.3
9	3.5	3.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		108.9	108.9	108.9	108.9	132.0	132.0					
10	10.5	10.4	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		343.2	343.2	343.2	343.2	416.0	416.0					
11	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0	280.0					
12	10.5	10.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		346.5	346.5	346.5 X	346.5 X	420.0	420.0					
13	11.5	11.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		379.5	379.5	379.5	379.5	460.0	460.0					7.1
14	9.0	9.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		297.0	297.0	297.0	297.0	360.0 X	360.0 X					
15	5.0	4.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		142.0	142.0	142.0	142.0	172.1	172.1					6.5
16	3.5	2.9	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		95.8	95.8	95.8	69.3	108.9	108.9					1.8
17	14.0	12.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		390.4	390.4	390.4	281.6	500.0	500.0					5.6
18	6.0	5.6	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								560.0	560.0	560.0		
19	10.0	9.5	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								950.0	950.0	950.0		

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2014 Crop (Prev. Primary Crop)	Oct '13	Nov '13	Dec '13	Jan '14	Feb '14	Mar '14	Apr '14	May '14	Jun '14	Jul '14	Aug '14	Sep '14
20	9.5	9.2	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								920.0	920.0	920.0		
21	7.0	6.1	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								545.0	545.0	545.0		
22	10.0	9.4	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	615.7										615.7	615.7
23	15.5	14.8	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	969.4										969.4	971.4
24	10.5	9.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	622.3										622.3	622.3
25	5.5	5.2	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	340.6										340.6	340.6
26	18.0	17.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	1,146.3										1,146.3	1,146.3
27	8.0	8.0	Dement SIL (13D 12-30%)	Grass pasture, maint (Grass pasture, maint)	510.7										510.7	510.7
CAFO	7.1	0.0	Nehalem SIL (40 0-3%)	Other (Other)												
Wetland (1)	2.0	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Wetland (2)	1.6	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Total	*226.6*	*206.4*			*4,205.0*	*3,255.0 X*	*3,255.0 X*	*3,255.0 X*	*3,255.0 X*	*3,965.0 X*	*3,965.0 X*	*4,205.0*	*4,205.0*	*4,205.0*	*4,205.0*	*4,229.3*

Crop in field	No. indicates total loads "X" indicates other manure apps

Manure Application Planning Calendar – October 2014 through September 2015

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2015 Crop (Prev. Primary Crop)	Oct '14	Nov '14	Dec '14	Jan '15	Feb '15	Mar '15	Apr '15	May '15	Jun '15	Jul '15	Aug '15	Sep '15
1	5.0	4.7	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								470.0	470.0	470.0		
2	8.0	7.6	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								760.0	760.0	760.0		
3	5.0	5.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		165.0	165.0	165.0	165.0	200.0	200.0					
4	0.9	0.9	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		29.7	29.7	29.7	29.7	36.0	36.0					
5	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0	280.0					
6	7.0	7.0	Willanch FSL (62 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0	280.0					
7	6.0	6.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		198.0	198.0	198.0	198.0	240.0	240.0 X					
8	2.5	2.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		66.0	66.0	66.0	66.0	80.0	80.0					
9	3.5	3.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		108.9	108.9	108.9	108.9	132.0	132.0					5.0
10	10.5	10.4	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		343.2	343.2	343.2	343.2	416.0	416.0					15.6
11	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0	280.0					1.6
12	10.5	10.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		346.5	346.5	346.5	346.5	420.0	420.0					
13	11.5	11.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		379.5	379.5	379.5	379.5	460.0	460.0					
14	9.0	9.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		297.0	297.0	297.0	297.0	360.0	360.0					
15	5.0	4.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		142.0 X	142.0 X	142.0	142.0	172.1	172.1					
16	3.5	2.9	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		95.8	95.8	95.8	95.8	116.1	116.1					
17	14.0	12.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		390.4	390.4	390.4 X	390.4 X	492.8 X	492.8					
18	6.0	5.6	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								560.0	560.0	560.0		
19	10.0	9.5	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								950.0	950.0	950.0		

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2015 Crop (Prev. Primary Crop)	Oct '14	Nov '14	Dec '14	Jan '15	Feb '15	Mar '15	Apr '15	May '15	Jun '15	Jul '15	Aug '15	Sep '15
20	9.5	9.2	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								920.0	920.0	920.0		
21	7.0	6.1	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								545.0	545.0	545.0		
22	10.0	9.4	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	615.7										615.7	615.7
23	15.5	14.8	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	969.4										969.4	971.4
24	10.5	9.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	622.3										622.3	622.3
25	5.5	5.2	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	340.6										340.6	340.6
26	18.0	17.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	1,146.3										1,146.3	1,146.3
27	8.0	8.0	Dement SIL (13D 12-30%)	Grass pasture, maint (Grass pasture, maint)	510.7										510.7	510.7
CAFO	7.1	0.0	Nehalem SIL (40 0-3%)	Other (Other)												
Wetland (1)	2.0	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Wetland (2)	1.6	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Total	*226.6*	*206.4*			*4,205.0*	*3,255.0 X*	*3,255.0 X*	*3,255.0 X*	*3,255.0 X*	*3,965.0 X*	*3,965.0 X*	*4,205.0*	*4,205.0*	*4,205.0*	*4,205.0*	*4,229.2*

Crop in field	No. indicates total loads "X" indicates other manure apps

Manure Application Planning Calendar – October 2015 through September 2016

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2016 Crop (Prev. Primary Crop)	Oct '15	Nov '15	Dec '15	Jan '16	Feb '16	Mar '16	Apr '16	May '16	Jun '16	Jul '16	Aug '16	Sep '16
1	5.0	4.7	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								470.0	470.0	470.0		
2	8.0	7.6	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								760.0	760.0	760.0		9.9
3	5.0	5.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		165.0	165.0	165.0	165.0	200.0	200.0					7.5
4	0.9	0.9	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		29.7	29.7	29.7	29.7	36.0	36.0					
5	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0	280.0					
6	7.0	7.0	Willanch FSL (62 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0	280.0					
7	6.0	6.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		198.0	198.0	198.0	198.0	240.0	240.0					
8	2.5	2.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		66.0	66.0	66.0	66.0	80.0	80.0					
9	3.5	3.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		108.9 X	108.9 X	108.9	108.9	132.0	132.0					
10	10.5	10.4	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		343.2	343.2	343.2 X	343.2 X	416.0	416.0					
11	7.0	7.0	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		231.0	231.0	231.0	231.0	280.0 X	280.0 X					
12	10.5	10.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		346.5	346.5	346.5	346.5	420.0	420.0					
13	11.5	11.5	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)		379.5	379.5	379.5	379.5	460.0	460.0					
14	9.0	9.0	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)		297.0	297.0	297.0	297.0	360.0	360.0					
15	5.0	4.3	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		142.0	142.0	142.0	142.0	172.1	172.1					
16	3.5	2.9	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		95.8	95.8	95.8	95.8	116.1	116.1					
17	14.0	12.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)		X	390.4	390.4	390.4	492.8	492.8					4.8
18	6.0	5.6	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								560.0	560.0	560.0		
19	10.0	9.5	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								950.0	950.0	950.0		

Field	Total Acres	Spread. Acres	Predominant Soil Type	Primary 2016 Crop (Prev. Primary Crop)	Oct '15	Nov '15	Dec '15	Jan '16	Feb '16	Mar '16	Apr '16	May '16	Jun '16	Jul '16	Aug '16	Sep '16
20	9.5	9.2	Nehalem SIL (40 0-3%)	Grass pasture, maint (Grass pasture, maint)								920.0	920.0	920.0		
21	7.0	6.1	Nestucca SIL (41 0-3%)	Grass pasture, maint (Grass pasture, maint)								545.0	545.0	545.0		
22	10.0	9.4	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	615.7										615.7	615.7
23	15.5	14.8	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	969.4										969.4	971.4
24	10.5	9.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	622.3										622.3	622.3
25	5.5	5.2	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	340.6										340.6	340.6
26	18.0	17.5	Chetco SICL (9 0-3%)	Grass pasture, maint (Grass pasture, maint)	1,146.3										1,146.3	1,146.3
27	8.0	8.0	Dement SIL (13D 12-30%)	Grass pasture, maint (Grass pasture, maint)	510.7										510.7	510.7
CAFO	7.1	0.0	Nehalem SIL (40 0-3%)	Other (Other)												
Wetland (1)	2.0	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Wetland (2)	1.6	0.0	Nestucca SIL (41 0-3%)	Other (Other)												
Total	*226.6*	*206.4*			*4,205.0*	*2,864.6 X*	*3,255.0 X*	*3,255.0 X*	*3,255.0 X*	*3,965.0 X*	*3,965.0 X*	*4,205.0*	*4,205.0*	*4,205.0*	*4,205.0*	*4,229.2*

Crop in field	No. indicates total loads "X" indicates other manure apps

Table 6-6. Planned Nutrient Applications (Manure-spreadable Area)

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
1	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
1	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	470 Lds	9,400 Gal	4.7	30	28	46
2	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
2	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	760 Lds	15,200 Gal	7.6	30	28	46
2	Sep 2016	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	9.9 Lds	66.3 Ton	6.6	165	126	254
3	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	187.5 Lds	3,750 Gal	5.0	11	10	17
3	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	187.5 Lds	3,750 Gal	5.0	11	10	17
3	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	187.5 Lds	3,750 Gal	5.0	11	10	17
3	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
3	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	165 Lds	3,300 Gal	5.0	10	9	15
3	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	200 Lds	4,000 Gal	5.0	12	11	19
3	Sep 2016	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	7.5 Lds	50.3 Ton	5.0	165	126	254
4	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	33.8 Lds	676 Gal	0.9	11	10	17
4	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	33.8 Lds	676 Gal	0.9	11	10	17
4	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	33.8 Lds	676 Gal	0.9	11	10	17
4	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
4	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	29.7 Lds	594 Gal	0.9	10	9	15
4	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
4	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	36 Lds	720 Gal	0.9	12	11	19
5	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
5	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
5	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
5	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
5	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
5	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
5	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
6	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
6	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	262.5 Lds	5,250 Gal	7.0	11	10	17
6	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
6	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Nov 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
6	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
6	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
6	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
6	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
7	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
7	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	225 Lds	4,500 Gal	6.0	11	10	17
7	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	225 Lds	4,500 Gal	6.0	11	10	17
7	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	225 Lds	4,500 Gal	6.0	11	10	17
7	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
7	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
7	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	198 Lds	3,960 Gal	6.0	10	9	15
7	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
7	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	240 Lds	4,800 Gal	6.0	12	11	19
8	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	75 Lds	1,500 Gal	2.0	11	10	17
8	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	75 Lds	1,500 Gal	2.0	11	10	17
8	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	75 Lds	1,500 Gal	2.0	11	10	17
8	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.3 Lds	8.7 Ton	0.9	165	126	254
8	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
8	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	66 Lds	1,320 Gal	2.0	10	9	15
8	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
8	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	80 Lds	1,600 Gal	2.0	12	11	19
9	Nov 2012	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	123.8 Lds	2,476 Gal	3.3	11	10	17
9	Dec 2012	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	123.8 Lds	2,476 Gal	3.3	11	10	17
9	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	123.8 Lds	2,476 Gal	3.3	11	10	17
9	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
9	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Sep 2015	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	5 Lds	33.5 Ton	3.3	165	126	254
9	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Nov 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Dec 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
9	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	108.9 Lds	2,178 Gal	3.3	10	9	15
9	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
9	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	132 Lds	2,640 Gal	3.3	12	11	19
10	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	386.4 Lds	7,728 Gal	10.3	11	10	17
10	Jan 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
10	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	386.4 Lds	7,728 Gal	10.3	11	10	17
10	Feb 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
10	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	7.5 Lds	150 Gal	0.2	11	10	17

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
10	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Sep 2015	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	15.6 Lds	104.5 Ton	10.4	165	126	254
10	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Jan 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
10	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	343.2 Lds	6,864 Gal	10.4	10	9	15
10	Feb 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
10	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
10	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	416 Lds	8,320 Gal	10.4	12	11	19
11	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	259 Lds	5,180 Gal	6.9	11	10	17
11	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	259 Lds	5,180 Gal	6.9	11	10	17
11	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	228.2 Lds	4,564 Gal	6.1	11	10	17
11	Mar 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
11	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Apr 2013	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
11	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
11	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Sep 2015	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.6 Lds	10.7 Ton	1.1	165	126	254
11	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	231 Lds	4,620 Gal	7.0	10	9	15
11	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
11	Mar 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
11	Apr 2016	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
11	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	280 Lds	5,600 Gal	7.0	12	11	19
12	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	388.5 Lds	7,770 Gal	10.4	11	10	17
12	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	388.5 Lds	7,770 Gal	10.4	11	10	17
12	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	388.5 Lds	7,770 Gal	10.4	11	10	17
12	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Jan 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
12	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
12	Feb 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
12	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	346.5 Lds	6,930 Gal	10.5	10	9	15
12	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
12	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	420 Lds	8,400 Gal	10.5	12	11	19
13	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	425.5 Lds	8,510 Gal	11.3	11	10	17
13	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	425.5 Lds	8,510 Gal	11.3	11	10	17
13	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	425.5 Lds	8,510 Gal	11.3	11	10	17
13	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	452.8 Lds	9,056 Gal	11.3	12	11	19
13	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	452.8 Lds	9,056 Gal	11.3	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
13	Sep 2013	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.5 Lds	10 Ton	1.0	165	126	254
13	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	7.1 Lds	47.6 Ton	4.8	165	126	254
13	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	379.5 Lds	7,590 Gal	11.5	10	9	15
13	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
13	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	460 Lds	9,200 Gal	11.5	12	11	19
14	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
14	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	333 Lds	6,660 Gal	8.9	11	10	17
14	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	44.1 Lds	882 Gal	1.2	11	10	17
14	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	296.3 Lds	5,926 Gal	7.9	11	10	17
14	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Sep 2013	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	2.7 Lds	18.1 Ton	1.8	165	126	254
14	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Mar 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
14	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	28,600 Gal	2.1	54	24	45
14	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
14	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	297 Lds	5,940 Gal	9.0	10	9	15
14	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
14	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	360 Lds	7,200 Gal	9.0	12	11	19
15	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	159.2 Lds	3,184 Gal	4.2	11	10	17
15	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	3.8 Lds	76 Gal	0.1	11	10	17
15	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	161.3 Lds	3,226 Gal	4.3	11	10	17
15	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	6.5 Lds	43.5 Ton	4.3	165	126	254
15	Nov 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
15	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2014	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
15	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	142 Lds	2,840 Gal	4.3	10	9	15
15	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
15	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	172.1 Lds	3,442 Gal	4.3	12	11	19
16	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	107.4 Lds	2,148 Gal	2.9	11	10	17
16	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	108.8 Lds	2,176 Gal	2.9	11	10	17
16	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	108.8 Lds	2,176 Gal	2.9	11	10	17
16	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	69.3 Lds	1,386 Gal	2.1	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
16	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	108.9 Lds	2,178 Gal	2.7	12	11	19
16	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	108.9 Lds	2,178 Gal	2.7	12	11	19
16	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	1.8 Lds	12.1 Ton	1.2	165	126	254
16	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Nov 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	95.8 Lds	1,916 Gal	2.9	10	9	15
16	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
16	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	116.1 Lds	2,322 Gal	2.9	12	11	19
17	Nov 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Dec 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	25.9 Lds	518 Gal	0.7	11	10	17
17	Jan 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	468.8 Lds	9,376 Gal	12.5	11	10	17
17	Feb 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	750 Gal	468.8 Lds	9,376 Gal	12.5	11	10	17
17	Mar 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19
17	Apr 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
17	Sep 2013	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	18.7 Lds	125.3 Ton	12.5	165	126	254
17	Nov 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Dec 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Jan 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Feb 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	281.6 Lds	5,632 Gal	8.5	10	9	15
17	Mar 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19
17	Apr 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	500 Lds	10,000 Gal	12.5	12	11	19
17	Sep 2014	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	5.6 Lds	37.5 Ton	3.8	165	126	254
17	Nov 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Dec 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Jan 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
17	Jan 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Feb 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	18,000 Gal	1.3	54	24	45
17	Feb 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Mar 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Mar 2015	Grass pasture, maint	Tank	Big Gun Sprinkler	Custom	13,576 Gal	230 Ft/Hr	29,200 Gal	2.2	54	24	45
17	Apr 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Nov 2015	Grass pasture, maint	Livestock	Solids Spreader, Not incorporated	Custom	660 Gal	30 mph	7,808 Gal	11.8		9	15
17	Dec 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Jan 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15
17	Feb 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	660 Gal	390.4 Lds	7,808 Gal	11.8	10	9	15

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
17	Mar 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Apr 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	800 Gal	492.8 Lds	9,856 Gal	12.3	12	11	19
17	Sep 2016	Grass pasture, maint	Solids Storage Barn	Solids Spreader, Not incorporated	Custom	10 Ton	4.8 Lds	32.2 Ton	3.2	165	126	254
18	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
18	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	560 Lds	11,200 Gal	5.6	30	28	46
19	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
19	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
19	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	950 Lds	19,000 Gal	9.5	30	28	46
20	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
20	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	920 Lds	18,400 Gal	9.2	30	28	46
21	May 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
21	May 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	May 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	May 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jun 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
21	Jul 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	2,000 Gal	545 Lds	10,900 Gal	5.4	30	28	46
22	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30
22	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	615.7 Lds	12,314 Gal	9.4	20	18	30

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
23	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
23	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
23	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
23	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	969.4 Lds	19,388 Gal	14.8	20	18	30
23	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	971.4 Lds	19,428 Gal	14.8	20	18	30
24	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
24	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
24	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	622.3 Lds	12,446 Gal	9.5	20	18	30
25	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.1 Lds	6,802 Gal	5.2	20	18	30
25	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
25	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	340.6 Lds	6,812 Gal	5.2	20	18	30
26	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1137.5 Lds	22,750 Gal	17.4	20	18	30
26	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30

Field	App. Month	Target Crop	Nutrient Source	Application Method	Rate Basis	Rate/Acre	Loads, Speed or Time	Total Amount Applied	Acres Cov.	Avail N (Lbs/A)	Avail P_2O_5 (Lbs/A)	Avail K_2O (Lbs/A)
26	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
26	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	1146.3 Lds	22,926 Gal	17.5	20	18	30
27	Oct 2012	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	520 Lds	10,400 Gal	7.9	20	18	30
27	Aug 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Oct 2013	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Aug 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Oct 2014	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Aug 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Oct 2015	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Aug 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30
27	Sep 2016	Grass pasture, maint	Livestock	Grazing Livestock, Not incorporated	Custom	1,310 Gal	510.7 Lds	10,214 Gal	7.8	20	18	30

Table 6-7. Field Nutrient Balance (Manure-spreadable Area)

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2013	1	4.7	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	2	-96	29	-150
2014	1	4.7	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	4	-96	58	-150
2015	1	4.7	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	6	-96	87	-150
2016	1	4.7	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	8	-96	116	-150
Total	**1**				**980**	**328**	**936**	**360**	**336**	**552**					
2013	2	7.6	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	2	-96	29	-150
2014	2	7.6	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	4	-96	58	-150
2015	2	7.6	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	6	-96	87	-150
2016	2	7.6	Grass pasture, maint	6	245¤	82¤	234¤	233	194	359	-12	118	125	226	71
Total	**2**				**980**	**328**	**936**	**503**	**446**	**773**					
2013	3	5.0	Grass pasture, maint	6	245¤	82¤	234¤	67	61	104	-178	-21	-130	6	-184
2014	3	5.0	Grass pasture, maint	6	245¤	82¤	234¤	74	67	113	-171	-15	-121	18	-175
2015	3	5.0	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	21	-190
2016	3	5.0	Grass pasture, maint	6	245¤	82¤	234¤	229	184	352	-16	102	118	150	64
Total	**3**				**980**	**328**	**936**	**434**	**370**	**667**					
2013	4	0.9	Grass pasture, maint	6	245¤	82¤	234¤	68	61	102	-177	-21	-132	6	-186
2014	4	0.9	Grass pasture, maint	6	245¤	82¤	234¤	54	49	81	-191	-33	-153	0	-207
2015	4	0.9	Grass pasture, maint	6	245¤	82¤	234¤	64	58	96	-181	-24	-138	3	-192
2016	4	0.9	Grass pasture, maint	6	245¤	82¤	234¤	64	58	96	-181	-24	-138	6	-192
Total	**4**				**980**	**328**	**936**	**250**	**226**	**375**					
2013	5	7.0	Grass pasture, maint	3	122¤	41¤	117¤	67	61	104	-55	20	-13	33	-40
2014	5	7.0	Grass pasture, maint	3	122¤	41¤	117¤	64	58	98	-58	37	-19	63	-46
2015	5	7.0	Grass pasture, maint	3	122¤	41¤	117¤	64	58	98	-58	54	-19	93	-46
2016	5	7.0	Grass pasture, maint	3	122¤	41¤	117¤	64	58	98	-58	71	-19	123	-46
Total	**5**				**488**	**164**	**468**	**259**	**235**	**398**					
2013	6	7.0	Grass pasture, maint	3	122¤	41¤	117¤	67	61	104	-55	20	-13	33	-40
2014	6	7.0	Grass pasture, maint	3	122¤	41¤	117¤	84	67	115	-38	46	-2	72	-29
2015	6	7.0	Grass pasture, maint	3	122¤	41¤	117¤	64	58	98	-58	63	-19	102	-46

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2016	6	7.0	Grass pasture, maint	3	122¤	41¤	117¤	64	58	98	-58	80	-19	132	-46
Total	**6**				**488**	**164**	**468**	**279**	**244**	**415**					
2013	7	6.0	Grass pasture, maint	3	122¤	41¤	117¤	67	61	104	-55	20	-13	33	-40
2014	7	6.0	Grass pasture, maint	3	122¤	41¤	117¤	64	58	98	-58	37	-19	63	-46
2015	7	6.0	Grass pasture, maint	3	122¤	41¤	117¤	83	66	114	-39	62	-3	101	-30
2016	7	6.0	Grass pasture, maint	3	122¤	41¤	117¤	64	58	98	-58	79	-19	131	-46
Total	**7**				**488**	**164**	**468**	**278**	**243**	**414**					
2013	8	2.0	Grass pasture, maint	6	245¤	82¤	234¤	67	61	104	-178	-21	-130	6	-184
2014	8	2.0	Grass pasture, maint	6	245¤	82¤	234¤	138	114	212	-107	32	-22	65	-76
2015	8	2.0	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	8	-136	68	-190
2016	8	2.0	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-16	-136	71	-190
Total	**8**				**980**	**328**	**936**	**333**	**291**	**512**					
2013	9	3.3	Grass pasture, maint	6	245¤	82¤	234¤	109	80	139	-136	-2	-95	25	-149
2014	9	3.3	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	28	-190
2015	9	3.3	Grass pasture, maint	6	245¤	82¤	234¤	229	184	352	-16	102	118	157	64
2016	9	3.3	Grass pasture, maint	6	245¤	82¤	234¤	107	77	133	-138	97	17	179	-91
Total	**9**				**980**	**328**	**936**	**509**	**399**	**722**					
2013	10	10.4	Grass pasture, maint	6	245¤	82¤	234¤	69	57	98	-176	-25	-136	2	-190
2014	10	10.4	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	5	-190
2015	10	10.4	Grass pasture, maint	6	245¤	82¤	234¤	229	184	352	-16	102	118	134	64
2016	10	10.4	Grass pasture, maint	6	245¤	82¤	234¤	78	64	109	-167	84	-7	143	-115
Total	**10**				**980**	**328**	**936**	**440**	**363**	**657**					
2013	11	7.0	Grass pasture, maint	6	245¤	82¤	234¤	98	74	129	-147	-8	-105	19	-159
2014	11	7.0	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	22	-190
2015	11	7.0	Grass pasture, maint	6	245¤	82¤	234¤	90	78	138	-155	-4	-96	45	-150
2016	11	7.0	Grass pasture, maint	6	245¤	82¤	234¤	97	73	126	-148	-9	-108	63	-162
Total	**11**				**980**	**328**	**936**	**349**	**283**	**491**					
2013	12	10.5	Grass pasture, maint	6	245¤	82¤	234¤	67	61	104	-178	-21	-130	6	-184
2014	12	10.5	Grass pasture, maint	6	245¤	82¤	234¤	77	64	109	-168	-18	-125	15	-179

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2015	12	10.5	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	18	-190
2016	12	10.5	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	21	-190
Total	**12**				**980**	**328**	**936**	**272**	**241**	**409**					
2013	13	11.5	Grass pasture, maint	6	245¤	82¤	234¤	80	71	125	-165	-11	-109	16	-163
2014	13	11.5	Grass pasture, maint	6	245¤	82¤	234¤	133	111	204	-112	29	-30	72	-84
2015	13	11.5	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	5	-136	75	-190
2016	13	11.5	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-19	-136	78	-190
Total	**13**				**980**	**328**	**936**	**341**	**298**	**525**					
2013	14	9.0	Grass pasture, maint	6	245¤	82¤	234¤	89	76	138	-156	-6	-96	21	-150
2014	14	9.0	Grass pasture, maint	6	245¤	82¤	234¤	90	69	119	-155	-13	-115	35	-169
2015	14	9.0	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	38	-190
2016	14	9.0	Grass pasture, maint	6	245¤	82¤	234¤	64	58	98	-181	-24	-136	41	-190
Total	**14**				**980**	**328**	**936**	**307**	**261**	**453**					
2013	15	4.3	Grass pasture, maint	6	245¤	82¤	234¤	56	51	87	-189	-31	-147	-4	-201
2014	15	4.3	Grass pasture, maint	6	245¤	82¤	234¤	229	184	353	-16	102	119	129	65
2015	15	4.3	Grass pasture, maint	6	245¤	82¤	234¤	97	73	126	-148	93	11	147	-97
2016	15	4.3	Grass pasture, maint	6	245¤	82¤	234¤	64	58	99	-181	69	-124	150	-189
Total	**15**				**980**	**328**	**936**	**446**	**366**	**665**					
2013	16	2.9	Grass pasture, maint	6	245¤	82¤	234¤	67	61	104	-178	-21	-130	6	-184
2014	16	2.9	Grass pasture, maint	6	245¤	82¤	234¤	128	106	197	-117	24	-37	57	-91
2015	16	2.9	Grass pasture, maint	6	245¤	82¤	234¤	64	58	99	-181	0	-135	60	-189
2016	16	2.9	Grass pasture, maint	6	245¤	82¤	234¤	64	58	99	-181	-24	-135	63	-189
Total	**16**				**980**	**328**	**936**	**323**	**283**	**499**					
2013	17	12.5	Grass pasture, maint	6	245¤	82¤	234¤	221	177	341	-24	95	107	122	53
2014	17	12.5	Grass pasture, maint	6	245¤	82¤	234¤	109	92	168	-136	105	41	159	-67
2015	17	12.5	Grass pasture, maint	6	245¤	82¤	234¤	82	65	111	-163	88	-82	169	-177
2016	17	12.5	Grass pasture, maint	6	245¤	82¤	234¤	94	88	159	-151	94	-75	202	-129
Total	**17**				**980**	**328**	**936**	**506**	**422**	**779**					
2013	18	5.6	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	2	-96	29	-150

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2014	18	5.6	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	4	-96	58	-150
2015	18	5.6	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	6	-96	87	-150
2016	18	5.6	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	8	-96	116	-150
Total	**18**				**980**	**328**	**936**	**360**	**336**	**552**					
2013	19	9.5	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	2	-96	29	-150
2014	19	9.5	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	4	-96	58	-150
2015	19	9.5	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	6	-96	87	-150
2016	19	9.5	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	8	-96	116	-150
Total	**19**				**980**	**328**	**936**	**360**	**336**	**552**					
2013	20	9.2	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	2	-96	29	-150
2014	20	9.2	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	4	-96	58	-150
2015	20	9.2	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	6	-96	87	-150
2016	20	9.2	Grass pasture, maint	6	245¤	82¤	234¤	90	84	138	-155	8	-96	116	-150
Total	**20**				**980**	**328**	**936**	**360**	**336**	**552**					
2013	21	6.1	Grass pasture, maint	6	245¤	82¤	234¤	80	74	122	-165	-8	-112	19	-166
2014	21	6.1	Grass pasture, maint	6	245¤	82¤	234¤	80	74	122	-165	-8	-112	38	-166
2015	21	6.1	Grass pasture, maint	6	245¤	82¤	234¤	80	74	122	-165	-8	-112	57	-166
2016	21	6.1	Grass pasture, maint	6	245¤	82¤	234¤	80	74	122	-165	-8	-112	76	-166
Total	**21**				**980**	**328**	**936**	**320**	**296**	**488**					
2013	22	9.4	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	13	-27	26	-54
2014	22	9.4	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	26	-27	52	-54
2015	22	9.4	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	39	-27	78	-54
2016	22	9.4	Grass pasture, maint	3	122¤	41¤	117¤	40	36	60	-82	34	-57	86	-84
Total	**22**				**488**	**164**	**468**	**220**	**198**	**330**					
2013	23	14.8	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	13	-27	26	-54
2014	23	14.8	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	26	-27	52	-54
2015	23	14.8	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	39	-27	78	-54
2016	23	14.8	Grass pasture, maint	3	122¤	41¤	117¤	40	36	60	-82	34	-57	86	-84
Total	**23**				**488**	**164**	**468**	**220**	**198**	**330**					

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2013	24	9.5	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	13	-27	26	-54
2014	24	9.5	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	26	-27	52	-54
2015	24	9.5	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	39	-27	78	-54
2016	24	9.5	Grass pasture, maint	3	122¤	41¤	117¤	40	36	60	-82	34	-57	86	-84
Total	**24**				**488**	**164**	**468**	**220**	**198**	**330**					
2013	25	5.2	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	13	-27	26	-54
2014	25	5.2	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	26	-27	52	-54
2015	25	5.2	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	39	-27	78	-54
2016	25	5.2	Grass pasture, maint	3	122¤	41¤	117¤	40	36	60	-82	34	-57	86	-84
Total	**25**				**488**	**164**	**468**	**220**	**198**	**330**					
2013	26	17.5	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	13	-27	26	-54
2014	26	17.5	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	26	-27	52	-54
2015	26	17.5	Grass pasture, maint	3	122¤	41¤	117¤	60	54	90	-62	39	-27	78	-54
2016	26	17.5	Grass pasture, maint	3	122¤	41¤	117¤	40	36	60	-82	34	-57	86	-84
Total	**26**				**488**	**164**	**468**	**220**	**198**	**330**					
2013	27	8.0	Grass pasture, maint	6	245¤	82¤	234¤	58	52	88	-187	-30	-146	-3	-200
2014	27	8.0	Grass pasture, maint	6	245¤	82¤	234¤	58	52	88	-187	-30	-146	-3	-200
2015	27	8.0	Grass pasture, maint	6	245¤	82¤	234¤	58	52	88	-187	-30	-146	-3	-200
2016	27	8.0	Grass pasture, maint	6	245¤	82¤	234¤	39	35	58	-206	-47	-176	-20	-230
Total	**27**				**980**	**328**	**936**	**213**	**191**	**322**					

Field Nutrient Balance (Non-manure-spreadable Area)

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2013	1	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	1	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	1	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	1	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**1**				**980**	**328**	**936**	**0**	**0**	**0**					

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2013	2	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	2	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	2	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	2	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**2**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	8	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	8	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	8	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	8	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**8**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	9	0.2	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	9	0.2	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	9	0.2	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	9	0.2	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**9**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	10	0.1	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	10	0.1	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	10	0.1	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	10	0.1	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**10**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	15	0.7	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	15	0.7	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	15	0.7	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	15	0.7	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**15**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	16	0.6	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	16	0.6	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	16	0.6	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	16	0.6	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
Total	**16**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	17	1.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	17	1.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	17	1.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	17	1.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**17**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	18	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	18	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	18	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	18	0.4	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**18**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	19	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	19	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	19	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	19	0.5	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**19**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	20	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	20	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	20	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	20	0.3	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**20**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	21	0.9	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2014	21	0.9	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2015	21	0.9	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
2016	21	0.9	Grass pasture, maint	6	245¤	82¤	234¤	0	0	0	-245	-82	-234	-55	-288
Total	**21**				**980**	**328**	**936**	**0**	**0**	**0**					
2013	22	0.6	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2014	22	0.6	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2015	22	0.6	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2016	22	0.6	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
Total	**22**				**488**	**164**	**468**	**0**	**0**	**0**					
2013	23	0.7	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2014	23	0.7	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2015	23	0.7	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2016	23	0.7	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
Total	**23**				**488**	**164**	**468**	**0**	**0**	**0**					
2013	24	1.0	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2014	24	1.0	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2015	24	1.0	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2016	24	1.0	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
Total	**24**				**488**	**164**	**468**	**0**	**0**	**0**					
2013	25	0.3	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2014	25	0.3	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2015	25	0.3	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2016	25	0.3	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
Total	**25**				**488**	**164**	**468**	**0**	**0**	**0**					
2013	26	0.5	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2014	26	0.5	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2015	26	0.5	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
2016	26	0.5	Grass pasture, maint	3	122¤	41¤	117¤	0	0	0	-122	-41	-117	-28	-144
Total	**26**				**488**	**164**	**468**	**0**	**0**	**0**					
2013	CAFO	7.1	Other					0	0	0					
2014	CAFO	7.1	Other					0	0	0					
2015	CAFO	7.1	Other					0	0	0					
2016	CAFO	7.1	Other					0	0	0					
Total	**CAFO**				**0**	**0**	**0**	**0**	**0**	**0**					
2013	Wetland (1)	2.0	Other					0	0	0					
2014	Wetland (1)	2.0	Other					0	0	0					

Year	Field	Size	Crop	Yield Goal	Fertilizer Recs[1]			Nutrients Applied[2]			Balance After Recs[3]			Balance After Removal[4]	
		Acres		/Acre	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	N Lb/A	P_2O_5 Lb/A	K_2O Lb/A	P_2O_5 Lb/A	K_2O Lb/A
2015	Wetland (1)	2.0	Other					0	0	0					
2016	Wetland (1)	2.0	Other					0	0	0					
Total	**Wetland (1)**				**0**	**0**	**0**	**0**	**0**	**0**					
2013	Wetland (2)	1.6	Other					0	0	0					
2014	Wetland (2)	1.6	Other					0	0	0					
2015	Wetland (2)	1.6	Other					0	0	0					
2016	Wetland (2)	1.6	Other					0	0	0					
Total	**Wetland (2)**				**0**	**0**	**0**	**0**	**0**	**0**					

[1] Fertilizer Recs are the crop fertilizer recommendations. The N rec accounts for any N credit from previous legume crop.

[2] Nutrients Applied are the nutrients expected to be available to the crop from that year's manure applications plus nutrients from that year's commercial fertilizer applications and nitrates from irrigation water. With a double-crop year, the total nutrients applied for both crops and the year's balances are listed on the second crop's line.

[3] For N, Nutrients Applied minus Fertilizer Recs for indicated crop year. Also includes amount of residual N expected to become available that year from prior years' manure applications. For P_2O_5 and K_2O, Nutrients Applied minus Fertilizer Recs *through* the indicated crop year, with positive balances carried forward to subsequent years. Negative values indicate a potential need to apply additional nutrients.

[4] Nutrients Applied minus amount removed by harvested portion of crop through the indicated year. Positive balances are carried forward to subsequent years.

[¤] Indicates a custom fertilizer recommendation in the Fertilizer Recs column.

[a] Indicates in the Balance After Recs N column that the legume crop is assumed to utilize some or all of the supplied N.

[†] Indicates in the Balance After Recs N column that the value includes residual N expected to become available that year from prior years' manure applications.

Table 6-8. Projected P and K Levels*

Field ID	P Level at Start of Plan (ppm)	Excess P_2O_5 Applied (lbs)	P Level at End of Plan (ppm)	K Level at Start of Plan (ppm)	Excess K_2O Applied (lbs)	K Level at End of Plan (ppm)
1	7	8	7	270	-96	258
2	4	118	10	402	125	418
3	7	102	12	195	118	210
4	4	-24	3	186	-138	169
5	4	71	8	186	-19	184
6	4	80	8	186	-19	184
7	7	79	11	195	-19	193
8	4	-16	3	402	-136	385
9	4	97	9	402	17	404
10	4	84	8	402	-7	401
11	7	-9	7	195	-108	182
12	4	-24	3	186	-136	169
13	4	-19	3	186	-136	169
14	7	-24	6	195	-136	178
15	4	69	7	402	-124	387
16	4	-24	3	402	-135	385
17	7	94	12	270	-75	261
18	7	8	7	270	-96	258
19	4	8	4	402	-96	390
20	7	8	7	195	-96	183
21	4	-8	4	186	-112	172
22	4	34	6	186	-57	179
23	7	34	9	195	-57	188
24	4	34	6	402	-57	395
25	7	34	9	270	-57	263
26	7	34	9	270	-57	263
27	7	-47	5	270	-176	248
CAFO	NA	NA	NA	NA	NA	NA
Wetland (1)	NA	NA	NA	NA	NA	NA
Wetland (2)	NA	NA	NA	NA	NA	NA

*Projected levels include only planned manure applications.

Table 6-9. Plan Nutrient Balance (Manure-spreadable Area)

	N (Lbs)	P_2O_5 (Lbs)	K_2O (Lbs)
Total Manure Nutrients on Hand at Start of Plan[1]	118	63	127
Total Manure Nutrients Collected[2]	95,606	59,479	102,667
Total Manure Nutrients Imported[3]	0	0	0
Total Manure Nutrients Exported[4]	0	0	0
Total Manure Nutrients on Hand at End of Plan[5]	111	59	119
Total Manure Nutrients Applied[6]	95,705	59,300	101,938
Available Manure Nutrients Applied[7]	67,542	59,300	101,938
Commercial Fertilizer Nutrients Applied[8]	0	0	0
Available Nutrients Applied[9]	67,542	59,300	101,938
Nutrient Utilization Potential[10]	164,683	55,170	193,766
Nutrient Balance of Spreadable Acres[11*]	-97,141	4,130	-91,828
Average Nutrient Balance per Spreadable Acre per Year[12*]	-118	5	-111

1. Values indicate total manure nutrients present in storage(s) at the beginning of the plan.
2. Values indicate total manure nutrients collected on the farm.
3. Values indicate total manure nutrients imported onto the farm.
4. Values indicate total manure nutrients exported from the farm to an external operation.
5. Values indicate total manure nutrients present in storage(s) at the end of plan.
6. Values indicate total nutrients present in land-applied manure. Losses due to rate, timing and method of application are not included in these values.
7. Values indicate available manure nutrients applied on the farm based on rate, time and method of application. These values are based on the total manure nutrients applied (row 6) after accounting for state-specific nutrient losses due to rate, time and method of application.
8. Values indicate nutrients applied as commercial fertilizers and nitrates contained in irrigation water.
9. Values are the sum of available manure nutrients applied (row 7) and commercial fertilizer nutrients applied (row 8).
10. Values indicate nutrient utilization potential of crops grown. For N the value generally is based on crop N recommendation for non-legume crops and crop N uptake or other state-imposed limit for N application rates for legumes. P_2O_5 and K_2O values generally are based on fertilizer recommendations or crop removal (whichever is greatest).
11. Values indicate available nutrients applied (row 9) minus crop nutrient utilization potential (row 10). Negative values indicate additional nutrient utilization potential and positive values indicate over-application.
12. Values indicate average per acre nutrient balance. Values are calculated by dividing nutrient balance of spreadable acres (row 11) by the number of spreadable acres in plan and by the length of the plan in years. Negative values indicate additional average per acre nutrient utilization potential and positive values indicate average per acre over-application.

* Non-trivial, positive values for N indicate that the plan was not properly developed. Negative values for N indicate additional nutrient utilization potential which may or may not be intentional. For example, plans that include legume crops often will not utilize the full N utilization potential for legume crops if manure can be applied to non-legume crops that require N for optimum yield. Positive values for P_2O_5 and/or K_2O do not necessarily indicate that the plan was not developed properly. For example, producers may be allowed to apply N-based application rates of manure to fields with low soil test P values or fields with a low potential P-loss risk based on the risk assessment tool used by the state. Negative values for P_2O_5 and K_2O indicate that planned applications to some fields are less than crop removal rates.

Plan Nutrient Balance (Non-manure-spreadable Area)

	N (Lbs)	P_2O_5 (Lbs)	K_2O (Lbs)
Commercial Fertilizer Nutrients Applied[1]	0	0	0
Nutrient Utilization Potential[2]	7,785	2,608	7,441
Nutrient Balance of Non-spreadable Acres[3*]	-7,785	-2,608	-7,441
Average Nutrient Balance per Non-spreadable Acre per Year[4*]	-96	-32	-92

1. Values indicate nutrients applied as commercial fertilizers and nitrates contained in irrigation water.
2. Values indicate nutrient utilization potential of crops grown based on crop fertilizer recommendations.
3. Values indicate commercial fertilizer nutrients applied (row 1) minus crop nutrient utilization potential (row 2). Negative values indicate additional nutrient utilization potential and positive values indicate over-application.
4. Values indicate average per acre nutrient balance. Values are calculated by dividing nutrient balance of non-spreadable acres (row 3) by number of non-spreadable acres in plan. Negative values indicate additional average per acre nutrient utilization potential and positive values indicate average per acre over-application.

* Non-trivial, positive values for N indicate that the plan was not properly developed. Negative values for N indicate additional nutrient utilization potential which may or may not be intentional. Positive values for P_2O_5 and/or K_2O do not necessarily indicate that the plan was not developed properly. For example, multiple year applications may have been planned during the final plan year(s) and these nutrients will not be utilized by crops in the current plan. Negative values for P_2O_5 and K_2O indicate that applications to some fields may have been delayed to allow the producer to apply the nutrients in accordance with their fertilization schedule.

Table 6-10. Manure Inventory Annual Summary

Manure Source	Plan Period	On Hand at Start of Period	Total Generated	Total Imported	Total Trans-ferred In	Total Applied	Total Exported	Total Trans-ferred Out	On Hand at End of Period	Units
Tank	Oct '12 - Sep '13	0	129,800	0	0	129,800	0	0	0	Gal
Solids Storage Barn	Oct '12 - Sep '13	5	150	0	0	153	0	0	2	Ton
Livestock	Oct '12 - Sep '13	0	923,640	0	0	923,640	0	0	0	Gal
All Sources (liquid)	**Oct '12 - Sep '13**	**0**	**1,053,440**	**0**	**0**	**1,053,440**	**0**	**0**	**0**	**Gal**
All Sources (solid)	**Oct '12 - Sep '13**	**5**	**150**	**0**	**0**	**153**	**0**	**0**	**2**	**Ton**
Tank	Oct '13 - Sep '14	0	129,800	0	0	129,800	0	0	0	Gal
Solids Storage Barn	Oct '13 - Sep '14	2	150	0	0	149	0	0	2	Ton
Livestock	Oct '13 - Sep '14	0	923,640	0	0	923,640	0	0	0	Gal
All Sources (liquid)	**Oct '13 - Sep '14**	**0**	**1,053,440**	**0**	**0**	**1,053,440**	**0**	**0**	**0**	**Gal**
All Sources (solid)	**Oct '13 - Sep '14**	**2**	**150**	**0**	**0**	**149**	**0**	**0**	**2**	**Ton**
Tank	Oct '14 - Sep '15	0	129,800	0	0	129,800	0	0	0	Gal
Solids Storage Barn	Oct '14 - Sep '15	2	150	0	0	149	0	0	4	Ton
Livestock	Oct '14 - Sep '15	0	923,640	0	0	923,640	0	0	0	Gal
All Sources (liquid)	**Oct '14 - Sep '15**	**0**	**1,053,440**	**0**	**0**	**1,053,440**	**0**	**0**	**0**	**Gal**
All Sources (solid)	**Oct '14 - Sep '15**	**2**	**150**	**0**	**0**	**149**	**0**	**0**	**4**	**Ton**
Tank	Oct '15 - Sep '16	0	129,800	0	0	129,800	0	0	0	Gal
Solids Storage Barn	Oct '15 - Sep '16	4	150	0	0	149	0	0	5	Ton
Livestock	Oct '15 - Sep '16	0	923,640	0	0	923,640	0	0	0	Gal
All Sources (liquid)	**Oct '15 - Sep '16**	**0**	**1,053,440**	**0**	**0**	**1,053,440**	**0**	**0**	**0**	**Gal**
All Sources (solid)	**Oct '15 - Sep '16**	**4**	**150**	**0**	**0**	**149**	**0**	**0**	**5**	**Ton**

Section 7. Feed Management

An imbalance of a whole-farm nutrient balance can lead to a lack of nutrients to meet production goals or an excess of nutrients that can contribute to a degradation of water and air resources. Developing a good feed management program can help to minimize the effects from a lack or excess of nutrients being available to meet production goals.

Usually animal diets are formulated to feed enough nutrients to meet the animal's needs with a little extra thrown in just to make sure their needs are met. Adjusting the diets of animals to more closely meet their needs can reduce nitrogen and phosphorus excreted from the animal by 5 to 30%. One ways to adjust animal diets is to group animals by age class and weight so diets can be formulated for each animal group rather than using one formulation for all age and weight classes which can lead to excess nutrients being excreted from most of the animals. Other ways to reduce excess nutrients from being excreted from animals is to adjust dietary formulations for climatic conditions, minimize feed waste and process feeds so the animal can absorb and retain more of the nutrients being fed.

A competent feed management specialist should be consulted before any changes to dietary formulations are made. A feed management specialist can help analyze the nutrient content of dietary formulations and suggest ways to minimize over feeding nutrients and assess the effects of any changes made to dietary formulations.

Contact your local Oregon State University (OSU) Extension office for help in locating a feed management specialist to consult with in determining what changes can be made to dietary formulations for your farm.

Section 8. Other Utilization Options

This nutrient management plan was developed based on the maximum number of animals Allen Ranch plans to have on farm over the next 4 to 5 years. No other utilization options are needed for the maximum number of animals planned for the ranch.

Section 9. Operation, Maintenance, and Recordkeeping

This plan should be review annually to insure it accurately describes the Allen Ranch operation and will need revision if any of the following conditions occur:

1. Additions or changes to land application areas not described in this plan,
2. Any changes to maximum annual manure application rates,
3. Any changes to the maximum amount of nitrogen and phosphorus applied to the crop land fields,
4. Any changes in the crops grown on the fields where manure applied,
5. Any changes to the manure handling system not described in this plan,
6. Any changes that are likely to increase the risk of nitrogen and phosphorus transport to surface or ground waters.

Soil sampling of all fields shall be conducted a minimum of once every four years according to this state's guidance. Any laboratory certified by the state shall be used to analyze the soil samples. Nutrient values of manure shall be determined annually by laboratory testing prior to land application.

Whenever the manure storage capacity is less than the required amount, manure removal and land application shall be initiated and conducted on all days suitable for land application. Manure shall not be applied to saturated, frozen, or snow-covered ground unless the potential risk for runoff is minimized as described above. Liquid manure shall not be applied at rates that exceed the infiltration rate of the soil, and the amount being applied shall not exceed the moisture-holding capacity of the soil profile at the time of application.

Records will be maintained by documenting the actual rate at which nutrients were applied compared to the recommended and planned rates. The records will indicate the reasons for difference in application rates. Records will include:

- Soil test results and recommendations for nutrient applications.
- Quantities, analysis and sources of all nutrients applied.
- Dates and methods of nutrient applications.
- Crops planted, planting and harvest dates, yields, and crop residues removed.
- Results of water, plant, and organic by-product analysis.
- Dates of review and person performing review, and recommendations that resulted from review.

Prior to transferring manure, litter or process wastewater to other persons, the livestock or poultry operation shall provide the recipient of the manure, litter or process wastewater with the most current nutrient analysis. The operators shall analyze their manure at least annually. Records of transfers shall include the date, recipient name and address, and approximate amount of manure, litter or process wastewater that is transferred to another person. Records shall be maintained for five years. Example record-keeping forms for land application can be found at the end of this section.

Equipment for application of nutrients will be calibrated on an annual basis. Manure and fertilizer will be uniformly applied to soils. Manure and fertilizer application equipment will be calibrated to deliver within 10 percent of the planned rate. Calibration of the solid manure box spreader should follow the procedures outlined in applicable state of federal guidance. To determine the application rate, the producer must divide the weight of the manure collected on a tarp by the area covered.

Fertilizer and organic by-product storage facilities shall be protected from weather and accidental leakage or spillage. Workers shall be protected from and avoid unnecessary contact with chemical fertilizer and organic by-products. Protection should include the use of personal protective equipment

when working with nutrients. Extra caution must be taken when handling ammonia sources of nutrients, or when dealing with organic wastes stored in unventilated enclosures.

The proper disposal of material generated by cleaning nutrient application equipment shall be accomplished. Excess material should be collected and stored or field-applied in an appropriate manner. Excess material should not be applied on areas of high potential risk for runoff or leaching.

See Section 2.3, Operation Area Practices starting on page 15 and Section 4.4, Land Treatment Area Practices starting on page 47 for Operation and Maintenance guidance for individual practices.

CAFO RECORDKEEPING CALENDAR

2012

SMALL AND MEDIUM CAFOs

Name of Operation Allen Ranch

JANUARY 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
8 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

15 Location_____ Type _____ Meth- od_____ Vol- ume_____ Total N_____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
22 Location_____ Type _____ Meth- od_____ Vol- ume_____ Total N_____ Total P_____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
29 Location_____ Type _____ Meth- od_____ Vol- ume_____ Total N_____ Total P_____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**31** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____				

REMINDER

All manure applications must be done in accordance with your Animal Waste Management Plan. Review your farm's approved AWMP to determine appropriate manure application areas and buffer widths for this time of year.

NOTE: When calculating the amount of nutrients applied CAFOs may use book values. Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

FEBRUARY 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
REMINDER All liquid manure storage facilities must be operated in a manner to maintain the designed freeboard. Consult your Animal Waste Management Plan to determine the appropriate freeboard for your manure storage facility.			**1** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
5 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

12 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
19 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
26 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**29** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____			

REMINDER

Complete the Annual Report and return to ODA by

March 15, 2012.

NOTE: When calculating the amount of nutrients applied CAFOs may use book values. Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

MARCH 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
REMINDER Annual Report is due **March 15th**! Manure application to saturated soil is prohibited. Determine soil saturation status before application.				**1** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
4 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

11 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** ANNUAL REPORT DUE Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
18 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
25 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**29** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**31** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

NOTE: When calculating the amount of nutrients applied CAFOs may use book values.
Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

APRIL 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
8 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

15 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
22 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
29 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____					

REMINDER

All manure applications must be done in accordance with your Animal Waste Management Plan. Review your farm's approved AWMP to determine appropriate manure application areas and buffer widths for this time of year.

NOTE: When calculating the amount of nutrients applied CAFOs may use book values. Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

MAY 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
6 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

13 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
20 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
27 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**29** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**31** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**REMINDER** Changes made to your operation may require changes to be made to your Animal Waste Management Plan. Contact your local Livestock Water Quality Specialist with questions.	

NOTE: When calculating the amount of nutrients applied CAFOs may use book values.
Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

JUNE 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
REMINDER All manure application equipment must be calibrated. Consult your Animal Waste Management Plan for more information about calibrating manure application equipment. CAFO fees are due June 30th, 2012.					**1** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
3 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

10 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
17 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
24 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**29** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

NOTE: When calculating the amount of nutrients applied CAFOs may use book values.
Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

JULY 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
8 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

15 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
22 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
29 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**31** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____				

REMINDER

Manage liquid manure storage facilities to ensure these facilities are operating at design capacity. Woody vegetation growing on top of a liquid manure storage facility is unacceptable.

NOTE: When calculating the amount of nutrients applied CAFOs may use book values. Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

AUGUST 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
REMINDER Wet weather is a few months away. Prepare manure equipment for manure application.			**1** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
5 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

12 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
19 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
26 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**29** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**31** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	

NOTE: When calculating the amount of nutrients applied CAFOs may use book values.
Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

SEPTEMBER 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**1** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume_____ **8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume_____
9 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

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30 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____						

REMINDER

Soil samples for the entire farm must be completed every five years.
It is recommended that 20 percent of your farm be sampled each year.

Check your Animal Waste Management Plan for more information about soil sampling.

NOTE: When calculating the amount of nutrients applied CAFOs may use book values.
Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

OCTOBER 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
7 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

14 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
21 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**25** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
28 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**29** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**31** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____			

REMINDER

Empty and prepare your manure storage facilities for winter.
In addition, make sure all gutters and downspouts are functional.

NOTE: When calculating the amount of nutrients applied CAFOs may use book values.
Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

NOVEMBER 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
REMINDER All manure applications must be done in accordance with your Animal Waste Management Plan. Review your farm's AWMP to determine manure application areas and buffer widths.				**1** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**2** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
4 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**9** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

11 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**16** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
18 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**23** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**24** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
25 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**26** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**27** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**28** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**29** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**30** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	

NOTE: When calculating the amount of nutrients applied CAFOs may use book values.
Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

DECEMBER 2012

In the event of a discharge, contact your local Livestock Water Quality Specialist or ODA at (503)986-4699 within 24 hours.

INSPECTIONS

- ❑ Waterlines
- ❑ Stormwater diversion devices
- ❑ Liquid manure storage facility depth
- ❑ Manure application equipment

MANURE APPLICATION AND MANURE EXPORTATION RECORDS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**3** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**4** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**5** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**6** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**7** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**1** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume_____ **8** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume_____
9 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**10** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**11** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**12** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**13** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**14** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**15** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____

16 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**17** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**18** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**19** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**20** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**21** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**22** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____
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30 Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____	**31** Location_____ Type _____ Method_____ Volume_____ Total N_____ Total P_____ Exported volume _____					

REMINDER

All records must be retained for five years.

NOTE: When calculating the amount of nutrients applied CAFOs may use book values. Book values can be found in your Animal Waste Management Plan or at the back of the calendar.

ESTIMATION OF NITROGEN AND PHOSPHOURS FOUND IN ANIMAL MANURE

	TOTAL NITROGEN	TOTAL P_2O_5
BEEF[1]		
Dry lot *(lb/ton of manure)*	14	9
POULTRY[1]		
Layer (liquid) *(lb/1,000 gallons)*	*57*	51
Layer (solid) *(lb/ton of manure)*	*37*	*55*
Broiler *(lb/ton of manure)*	*75*	*27*
SWINE[1]		
Liquid *(lb/1,000 gallons)*	39	34
Solid *(lb/ton of manure)*	17	20
DAIRY[2]		
Dry stack *(lbs/ton of manure)*	10	10
Separated solids *(lb/ton of manure)*	*5*	2
Reception tank *(lb/1,000 gallons)*	20	*7*
Storage pond *(lb/acre-inch)*	135	30
EQUINE[3]		
Solid *(lb/ton of manure)*	9	6

[1] Values for manure are based on "Determining Crop Available Nutrients from Manure" (G1335).
[2] Values for dairy manure are based on "Dairy Manure as a Fertilizer Source" (EM8586).
[3] Values for manure are based on "Fertilizing with Manure" (PNW 0533).

This page is to assist you locating specific information about your farm in your Animal Waste Management Plan. Information for this page must come directly from your approved AWMP.

Buffer Width/Setback

Date	Buffer Width	Field
Date	Buffer Width	Field

Exceptions/Notes:

Winter Application Area

_____
Location/Field

Typical Manure Application Period _____
Time frame

Date manure storage facilities will be prepared for winter storage

Liquid storage facilities _____ Solid storage facilities _____
Date Date

Last time manure application equipment was calibrated

Liquid manure application equipment_____ Solid manure application equipment_____
Date Date

NOTES:

Allen Ranch

This calendar has been designed to help document information that is required by the CAFO permit. This calendar is not a replacement of the CAFO permit. A copy of the CAFO permit can be found online at: http://www.oregon.gov/ODA/NRD/docs/pdf/2009cafopermit.pdf

SUMMARY OF REQUIRED INSPECTIONS:

ITEMS	FREQUENCY
Storm water diversion devices, run-off diversion structures, animal waste storage structures and devices channeling contaminated storm water to waste water and manure storage and containment structures.	Periodically
Water lines, including drinking water or cooling water lines.	Periodically
Equipment used for land application of manure, litter or process waste water.	Periodically when equipment is in use
Liquid impoundments for manure and process waste water.	Periodically

SUMMARY OF RECORDKEEPING REQUIREMENTS:

- Date, amount and nutrient loading of manure, litter or process waste water applied to each field.
- Method of manure application.
- Total Nitrogen and Phosphorus applied to each field.
- Total amount of manure or waste water transferred or exported to other persons.

If you have any questions about the CAFO Program, please contact your local Livestock Water Quality Specialist or CAFO Program Manager, Wym Matthews, at (503) 986-4792.

AREA	LIVESTOCK WATER QUALITY SPECIALIST	PHONE NUMBER
1	Armando Macias	(503) 842-6278
2	Charlene Troost	(503) 986-4780
3	Ken Vial	(503) 986-6468
4	Chris Anderson	(541) 660-9611
5	Maria Snodgress	(541) 969-6679
6	Ron Jones	(541) 889-4042

Table 9-1. Crop Records

Field	Crop	Planting Date	Hybrid or Variety	Pop-ulation Planted	Crop Residue (%) (1)	Tillage and Dates	Harvest Date	Yield/ Acre

(1) Percent residue cover left after planting

Table 9-2. Manure Application Records

App. #	Field	Date	Manure Source	Equipment	Days to Incorp.	Rate/A Gal or Ton	Loads	Total Applied Gal or Ton	Acres Cov.
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

Custom Application Records

App. #	Hauler's Name (1)	Ground Cover % (2)	Soil Condition (3)	Air Temp. (4)	Wind Speed (5)	Wind Dir. (6)	Weath-er (7)	Rain Before (8)	Rain After (9)	Notes/Comments
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

(1) Name or initials of the person who applied the manure.
(2) Percent residue or ground cover at time of application.
(3) Soil condition at time of application: Dry, Firm, Wet, Muddy, Snow-Covered, Frozen.
(4) Air temperature at time of application.
(5) Wind speed at time of application: Calm (0-2 mph), Light (2-5 mph), Breezy (5-15 mph), Windy (>15 mph).
(6) Wind direction at time of application: N, NE, E, SE, S, SW, W, NW.
(7) Weather condition at time of application: Sunny, Partly Cloudy, Cloudy, Rain, Snow.
(8) Amount of rainfall during the 24 hours prior to application.
(9) Amount of rainfall during the 24 hours after application.

Table 9-3. Commercial Fertilizer and Irrigation Water Application Records

Field	Date	Analysis (1)	Form Dry or Liquid	Application Method	Material Rate/A Lbs or Gal	Total Applied Lbs or Gal	Acres Cov.	Notes/Comments

(1) With commercial fertilizers, enter the analysis in the form of N-P_2O_5-K_2O (examples: anhydrous ammonia is 82-0-0, diammonium phosphate is 18-46-0). With irrigation water, enter the nitrate concentration in ppm.

Table 9-4. Manure Exports off the Farm

Manure Source	Date	Amount Gal or Ton	Receiving Operation	Address	Contact	Phone

Table 9-5. Manure Imports onto the Farm

Manure's Animal Type and Form	Date	Amount Gal or Ton	Originating Operation	Address	Contact	Phone

Table 9-6. Internal Transfers of Manure

Manure Source	Date	Amount Gal or Ton	Manure Destination	Purpose of Transfer

Table 9-7. Inspection/Monitoring Records

Date	Activity Description	Operator/ Inspector	Activity Data

Section 10. References

10.1 Publications

Crop Fertilizer Recommendations

"Pastures," OSU FG63, Jan 2000 (west); "Irrigated Clover-Grass Pastures," OSU FG21, May 1983 (east)
http://extension.oregonstate.edu/catalog/details.php?sortnum=0134&name=Fertilizer+Guides

Manure Application Setback Features/Distances

CAFO General Permit #1
http://oregon.gov/ODA/NRD/docs/pdf/cafo_gnlpmt.pdf

Waste Utilization 633 Operation and Maintenance Worksheet
http://efotg.nrcs.usda.gov/references/public/OR/633om.doc

Manure Nutrient Availability

Waste Utilization Jobsheet 633 OR-JS, Oregon USDA-NRCS, May 2003
http://efotg.sc.egov.usda.gov/references/public/OR/633js042707.pdf

Phosphorus Assessment

"Agronomy Technical Note No. 26: The Phosphorus Index," Oregon NRCS, June 2008
ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Agronomy/Agronomy26.pdf

Agricultural Phosphorus Management Using the Oregon/Washington Phosphorus Indexes
http://eesc.orst.edu/agcomwebfile/edmat/em8848-e.pdf

Practice Standards

Oregon NRCS Nutrient Management Standard (590), May 2008
http://efotg.nrcs.usda.gov/references/public/OR/590std.doc

Water Quality/Quantity

Oregon NRCS Water Quality Technical Note No. 1: Water Quality Indicator Tools, October 2000
ftp://ftp-fc.sc.egov.usda.gov/OR/Technical_Notes/Water%20Quality/WaterQual01.pdf

10.2 Software and Data Sources

MMP Version	MMP 0.3.1.0
MMP Plan File	AllenRanch.mmp 6/29/2012 1:21:16 PM
MMP Initialization File for Oregon	10/4/2011
MMP Soils File for Oregon	8/29/2011
Phosphorus Assessment Tool	2010.09.30
NRCS Conservation Plan(s)	n/a
RUSLE2 Library	n/a
RUSLE2 Database	n/a

Appendix A

Permits

OREGON CONFINED ANIMAL FEEDING OPERATION
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT NUMBER 01-2009

State of Oregon
Department of Agriculture
Natural Resources Division
and
Department of Environmental Quality
Water Quality Division

In compliance with the provisions of Oregon Revised Statutes (ORS) Chapter 468B,
Oregon Administrative Rules (OAR) Chapter 603, Division 74,
The Federal Water Pollution Control Act as Amended (The Clean Water Act),
Title 33 United States Code, Section 1251 et seq., and
The National Pollutant Discharge Elimination System (NPDES) program.

Until this permit expires, is modified, or revoked, permittees who have properly obtained coverage under this permit are authorized to discharge to waters of the state in accordance with the special and general conditions the follow.

Ray Jaindl
Administrator
Natural Resources Division
Oregon Department of Agriculture

Neil Mullane
Administrator
Water Quality Division
Oregon Department of Environmental Quality

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DEFINITIONS

1. "25-year, 24-hour rainfall event" means an event with a probable recurrence interval of once in twenty-five years as defined by the National Weather Service in Technical Paper Number 40, "Rainfall Frequency Atlas of the United States," May 1961, or equivalent regional or state rainfall probability information developed from this source.
2. "40 CFR means Title 40 of the Code of Federal Regulations (2008).
3. "Animal waste management plan" or "AWMP" means a written document containing the minimum elements necessary to manage manure, litter, and process waste water from operations covered by this permit in accordance with the terms and conditions of this permit. See S3.C, p. 12, for specific plan elements.
4. "CAFO" or "Confined animal feeding operation" as defined in OAR 603-074-0010(3) and OAR 340-051-0010(2) means:
   (a) The concentrated confined feeding or holding of animals or poultry, including but not limited to horse, cattle, sheep, or swine feeding areas, dairy confinement areas, slaughterhouse or shipping terminal holding pens, poultry and egg production facilities and fur farms;
      (i) In buildings or in pens or lots where the surface has been prepared with concrete, rock or fibrous material to support animals in wet weather; or
      (ii) That have wastewater treatment works; or
      (iii) That discharge any wastes into waters of the state; or
   (b) An animal feeding operation that is subject to regulation as a concentrated animal feeding operation pursuant to 40 CFR §122.23.
5. "Director" means the director of the State of Oregon Department of Environmental Quality and the Department of Agriculture or their authorized designee(s).
6. "Discharge" when used without qualification means the "discharge of a pollutant." "Discharge of a pollutant" is defined at 40 CFR §122.2.
7. "Frozen soil" means soil that has a soil temperature of 32^{o} F (or 0^{o} C) or less in 3 continuous inches of the top twelve (12) inches of soil.
8. "Groundwater" means water in a saturated zone or stratum beneath the surface of land or below a surface water body.
9. "Manure" means manure or other material (e.g., bedding, compost, litter, feed waste, silage leachate, raw materials such as feed or silage) that comes into contact with manure.
10. "Medium confined animal feeding operation" means a confined animal feeding operation that meets the animal numbers specified in any of the following categories. A state medium confined animal feeding operation is only required to apply for this permit if it confines for more than four (4) months and has a waste water control facility or disposal system for wet *or* dry wastes. (See *Table 1: CAFOs Requiring Permit Coverage*.)
    (a) 200 to 699 mature dairy cattle, whether milked or dry;
    (b) 300 to 999 veal calves;
    (c) 300 to 999 cattle other than mature dairy cows or veal calves. Cattle includes but is not limited to heifers, steers, bulls and cow/calf pairs;
    (d) 750 to 2,499 swine each weighing 55 pounds or more;
    (e) 3,000 to 9,999 swine each weighing less than 55 pounds;
    (f) 150 to 499 horses;
    (g) 3,000 to 9,999 sheep or lambs;
    (h) 16,500 to 54,999 turkeys;
    (i) 9,000 to 29,999 laying hens or broilers, if the operation uses waste water control facilities for wet waste;
    (j) 37,500 to 124,999 chickens (other than laying hens), if the operation uses waste water control facilities for wet waste;
    (k) 25,000 to 81,999 laying hens, if the operation does not use waste water control facilities for wet waste;
    (l) 10,000 to 29,999 ducks if the operation does not use waste water control facilities for wet waste; or
    (m) 1,500 to 4,999 ducks if the operation uses waste water control facilities for wet waste.
    (n) For other animal types, ODA will determine the appropriate animal numbers by comparing the operation to the most similar animal type listed above.

11. "New source" means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants," the construction of which commenced after April 14, 2003.
12. "Overflow" means the discharge of manure or process waste water resulting from the filling of waste water or manure storage structures beyond the point at which no more manure, process waste water, or storm water can be contained by the structure.
13. "Person" is defined at OAR 603-074-0010(13).
14. "Point source" is defined at 40 CFR §122.2.
15. "Pollutant" is defined in 40 CFR §122.2.
16. "Pollution" or "water pollution" as defined in ORS 468B.005(5).
17. "Process waste water" or "process wastes" as defined at OAR 603-074-0010(17) and OAR 603-051-0010(2) means water directly or indirectly used in the operation of the CAFO for any or all of the following: spillage or overflow from animal or poultry watering systems; washing, cleaning or flushing pens, barns, manure pits, or other CAFO facilities; direct contact swimming, washing, or spray cooling of animals; or dust control. Process waste water or process wastes also includes any water that comes into contact with any raw materials, products, or byproducts including manure, litter, feed, milk, eggs, or bedding.
18. "Production area" as defined at OAR 603-074-0010(18) and OAR 603-051-0010(3) means that part of a CAFO that includes the animal confinement area, the manure storage area, the raw materials storage area, and the waste containment areas. The animal confinement area includes but is not limited to open lots, housed lots, feedlots, confinement houses, stall barns, free stall barns, milkrooms, milking centers, cowyards, barnyards, medication pens, walkers, animal walkways, and stables. The manure storage area includes but is not limited to lagoons, runoff ponds, storage sheds, stockpiles, under house or pit storages, liquid impoundments, static piles, and composting piles. The raw materials storage area includes but is not limited to feed silos, silage bunkers, and bedding materials. The waste containment areas include but are not limited to settling basins, and areas within berms and diversions that separate uncontaminated storm water. Also included in the definition of production area is any egg washing or egg processing facility, and any area used in the storage, handling, treatment, or disposal of animal mortalities.
19. "Saturated soil" means soil with all available pore space filled that has reached its maximum retentive capacity as defined in "Qualitative Description of Soil Wetness" (Brady, N. and Weil, R., p. 201).
20. "Setback" as defined at 40 CFR §412.4(b)(1) means a specified distance from surface waters or potential conduits to surface waters where manure, litter, and process waste water may not be land applied. Examples of conduits to surface waters include but are not limited to: Open tile line intake structures, sinkholes, and agricultural well heads.
21. "State confined animal feeding operation" means a confined animal feeding operation with animal numbers below the medium confined animal feeding operation levels that is not designated as a small concentrated animal feeding operation. A small confined animal feeding operation is only required to apply for this permit if it confines for more than for (4) months and has a waste water control facility or disposal system for wet wastes. (See *Table 1: CAFOs Requiring Permit Coverage*.)
22. "Vegetative buffer" as defined at 40 CFR §412.4(b)(2) means a narrow, permanent strip of dense perennial vegetation established parallel to the contours of and perpendicular to the dominant slope of the field for the purposes of slowing water runoff, enhancing water infiltration, and minimizing the risk of any potential nutrients or pollutants from leaving the field and reaching surface waters.
23. "Wastes" is defined at ORS 468B.005(9).
24. "Waste storage facilities" means the physical system used for the isolation and retention of process wastes on the confined animal feeding operation until their ultimate utilization.
25. "Waste water control facility" means a "disposal system" or "treatment works" is defined at ORS 468B.005(8).
26. "Water" or "waters of the state" is defined at ORS 468B.005(10).
27. "Waters of the U.S." is defined at 40 CFR §122.2.

SPECIAL CONDITIONS

S1. PERMIT COVERAGE

S1.A. When is a Permit Required?

1. Pursuant to ORS 468B.200, it is the policy of the State of Oregon to protect the quality of groundwater and surface waters of Oregon by preventing animal wastes from discharging into waters of the state. To implement this policy, ORS 468B.050(1)(d) requires that any person who owns or operates a *confined animal feeding operation* (CAFO) listed in S1.A.2 below obtain a permit from ODA and DEQ. As a result, there is no state process to certify that a CAFO does not discharge or propose to discharge to waters of the state and permit coverage is required regardless of discharge status. Coverage under this general permit is required for all CAFOs listed in S!.A.2 unless application is made for an individual permit or an individual permit is required by ODA and DEQ.

2. Any person who owns or operates a CAFO defined as follows is required by ORS 468B.050(1)(d) to obtain coverage under this permit (see Table 1 below for more detail):
   (a) *State small confined animal feeding operation* that confines animals for more than four (4) months and has a waste water control facility or disposal system for wet *or* dry wastes.
   (b) *State medium confined animal feeding operation* that confines animals for more than four (4) months and has a waste water control facility or disposal system for wet *or* dry wastes.
   (c) *Small, medium, or large concentrated animal feeding operation* defined in 40 CFR §122.23(b).

Table 1: CAFOs Requiring Permit Coverage

Type of confined animal feeding operation requiring permit coverage	CONFINED		CONCENTRATED		
	• Confines more than one animal for more than 4 months on prepared surface		• Stabled or confined and fed or maintained for total of 45 days or more in any 12-month period • Crops, vegetation, forage growth, or post-harvest residues not sustained in normal growing season in lot or facility		
	Small Confined • Waste water control facility or disposal system for wet wastes	***Medium Confined*** • Waste water control facility or disposal system for wet *or* dry wastes	***Small Concentrated*** • Significant contributor of pollutants to waters of the U.S. • Designated by Director [40 CFR §122.23(b)(9)]	***Medium Concentrated*** • Discharging pollutants to waters of the U.S. [40 CFR §122.23(b)(6)]	***Large Concentrated*** [40 CFR §122.23(b)(4)]
mature dairy cows[1]	<200	200-699	<200	200-699	≥700
veal calves	<300	300-999	<300	300-999	≥1,000
cattle[2]	<300	300-999	<300	300-999	≥1,000
swine ≥ 55 lbs	<750	750-2,499	<750	750-2,499	≥2,500
swine < 55 lbs	<3,000	3,000-9,999	<3,000	3,000-9,999	≥10,000
horses	<150	150-499	<150	150-499	≥500
sheep or lambs	<3,000	3,000-9,999	<3,000	3,000-9,999	≥10,000
turkeys	<16,500	16,500-54,999	<16,500	16,500-54,999	≥55,000
chickens, including laying hens or broilers w/wet waste system	<9,000	9,000-29,999	<9,000	9,000-29,999	≥30,000
laying hens w/dry waste system	NA	25,000-81,999	<25,000	25,000-81,999	≥82,000
Broiler chickens w/dry waste system	NA	37,500-124,999	<37,500	37,500-124,999	≥125,000
ducks w/other than wet waste system	<10,000	10,000-29,999	<10,000	10,000-29,999	≥30,000
ducks w/wet waste system	<1,500	1,500-4,999	<1,500	1,500-4,999	≥5,000
other animal type	As determined by ODA[3]		Designated by director.	NA	NA

[1] Whether milked or dry
[2] Other than mature dairy cows or veal calves, cattle includes but is not limited to heifers, steers, bulls and cow/calf pairs.
[3] To determine the number of animals that require permit coverage, ODA will compare the operation to the most similar animal type in the table.

3. Any person not wishing to be covered by this permit may apply for an individual permit in accordance with OAR 340-045-0030.

Note: Failure to obtain coverage under this permit is a violation of ORS 468B.050 and 468B.215 except as provided in S1.F Individual Permit Coverage, p. 7.

S1.B. Election of Permit Coverage

Any person who owns or operates a CAFO who is not required to obtain coverage under this permit may elect to be covered by this permit. Any person making such an election is subject to all terms and conditions of the permit unless and until permit coverage is terminated.

S1.C. Requirements and Schedule to Obtain Permit Coverage

1. Application for Proposed CAFO
   To obtain permit coverage, any person proposing a new CAFO that is regulated by this permit (see S1.A above) or electing to be covered by this permit must submit an ODA *Application to Register* (ATR) and Animal Waste Management Plan (AWMP) at least 180 days prior to the time that the operation commences. For information on AWMP requirements, see S3, p. 12.

2. Future Renewal of General Permit Coverage
   To renew general permit coverage, the pemittee must submit a renewal application by the date specified by ODA but no later than the expiration date of this permit.

3. ODA will notify the applicant in writing if permit coverage is approved or denied. Permit coverage does not begin until this written notice is provided by ODA to the applicant. Written notification will include a *Notice of Registration* that will include the following:
   (a) The owner or operator's name;
   (b) Facility name and location;
   (c) Contact information including mailing address and telephone number;
   (d) Effective date of permit coverage;
   (e) Maximum number of animals allowed at the facility; and
   (f) Regulatory status of the operation.
      (i) ODA will use the following classifications for regulatory status:
         (1) *Large concentrated animal feeding operation* as defined in 40 CFR §122.23(b)(4);
         (2) *Medium concentrated animal feeding operation* as defined in 40 CFR §122.23(b)(6);
         (3) *Small concentrated animal feeding operation* as defined in 40 CFR §122.23(b)(9) and designated by the director pursuant to ORS 603-074-0012;
         (4) *Medium confined animal feeding operation* as defined in this permit (#10, p. 3); or
         (5) *Small confined animal feeding operation* as defined in this permit (#21, p. 4).
      (ii) A *small or medium confined animal feeding operation* will be categorized as *concentrated* if:
         (1) A discharge to waters of the U.S. occurs that is not allowed by this general permit, and
         (2) The operator does not or cannot make the change(s) necessary to prevent such discharge from recurring to the satisfaction of ODA.

4. Coverage under this permit will be canceled upon the issuance of an individual permit.

S1.D. General Permit Coverage

1. Consistent with ORS 468B.200, ODA and DEQ developed this general permit to prohibit routine discharges of manure, litter, and process waste water from CAFO operations to waters of the state. Discharges of manure, litter, or process waste water to waters of the state are only expected to occur under extreme weather conditions and as limited by the conditions of this general permit. Further, the general permit only authorizes the discharge of pollutants resulting from the processes, wastes, and operations that have been clearly identified in the permittee's AWMP approved by ODA.

2. This permit does not cover disposal of human wastes or waste water control systems that mix human and animal wastes. Any person owning or operating such a system must apply to DEQ for coverage under an individual or general permit issued pursuant to ORS 468B.050. This general permit for CAFOs may be used in addition to an individual or general permit issued by DEQ pursuant to ORS 468B.050.

3. Except for any toxic effluent standards and prohibitions imposed under section 307 of the federal Clean Water Act (CWA) and groundwater protection requirements established under OAR 340-040, a permittee in compliance with this permit during its term is considered to be in compliance, for purposes of enforcement, with state water quality laws and relevant sections of the CWA, as provided in 40 CFR §122.5. The specific effect of permit compliance on enforcement authority is set out in OAR 340-045-0080.

S1.E. Request for Cancellation

1. Any permittee may request in writing to ODA that coverage under this permit be cancelled if:
   (a) Conditions or standards have changed so that the CAFO no longer qualifies for or is required to have coverage under this permit; or
   (b) The CAFO no longer has animals on site and all waste storage and control facilities have been decommissioned in accordance with Natural Resources Conservation Service (NRCS) conservation practice standard, code 360, entitled *Closure of Waste Impoundments (Jan. 2006)*; and
   (c) The permittee certifies that it will not commence operation of a CAFO regulated by this permit at the same location without making a new application for registration under this general permit and is granted coverage or applies for and is issued an individual permit.

2. ODA will respond to the request for cancellation by conducting a site inspection and a review of the permittee's file. ODA will notify the permittee in writing of termination of coverage under this permit or deny the request with an explanation of why the request was denied.

S1.F. Individual Permit Coverage

1. When appropriate, the director may require any person to obtain an individual permit pursuant to OAR 340-0033(10). In such cases, the person will be notified in writing by the director. This written notice will include the reason why an individual permit is being required, an application form, the amount of the permit fee due at application, and application due date.

2. If coverage under this permit has been obtained prior to the requirement for an individual permit, this permit will remain effective until the individual permit is issued provided the application for individual permit was properly made.

S1.G. Request for Confidentiality

The name and address of an NPDES permit applicant or permittee, NPDES permit applications (e.g., *ODA ATRs*) and their attachments (e.g., AWMPs), NPDES permits, and NPDES permit discharge data cannot be kept confidential pursuant to 40 CFR §122.7(b) and (c). For other information, the permittee may request that the director evaluate claims of confidentiality according to the procedures established in ORS 468.095(2).

S1.H. Public Notice and Participation Requirement

1. Prior to approving new permit coverage, renewing permit coverage, or approving proposed substantial changes to an AWMP, ODA will provide public notice and participation in Table 2 below.

2. ODA may batch multiple notices as regionally appropriate.

3. Application and permit documents (e.g., *ODA ATR*, renewal application, AWMP) will be available for public review at ODA headquarters and appropriate field offices. If available, electronic copies of documents will be provided upon request.

4. Public hearings will be scheduled if written requests for public hearing are received during the comment period from at least ten persons or from an organization or organizations representing at least ten persons. If a hearing is scheduled, ODA will provide at least 30 days notice before the hearing is held. The public comment period will remain open for additional comments for at least 7 days after the public hearing.

Table 2: CAFO Public Notice Requirements

	All Operations		Small or Medium Confined	Small, Medium or Large Concentrated
Permit Action	1. Receipt of ODA *ATR* (*Application to Register*) for existing operation not under permit or new proposed operation	1. Receipt of renewal application	2. Receipt of proposed substantial change to *small or medium confined animal feeding operation's* AWMP (see S3.D.1, p. 13)	3. Receipt of proposed substantial change to *small or medium, or large concentrated animal feeding operation's* AWMP (see S3.D.2, p. 14)
Public Participation Process	(i) Public notice of a comment period of at least 35 days provided as follows: • Published in regional newspaper; • Posted on ODA and DEQ websites; and • Emailed to interested parties list maintained by ODA. (ii) Opportunity for public hearing. See S1.H.4, p. 7. (iii) A written response to relevant comments will be developed by ODA and made available to interested parties.	(i) Public notice of a comment period of at least 35 days provided as follows: • Posted on ODA and DEQ websites; and • Emailed to interested parties list maintained by ODA. (ii) Opportunity for public hearing. See S1.H.4, p. 7. (iii) A written response to relevant comments will be developed by ODA and made available to interested parties.	(i) Public notice of a comment period of at least 14 days provided as follows: • Posted on ODA and DEQ websites; and • Emailed to interested parties list maintained by ODA. (ii) Opportunity for public hearing. See S1.H.4, p. 7. (iii) A written response to relevant comments will be developed by ODA and made available to interested parties.	(i) Public notice of a comment period of at least 35 days provided as follows: • Posted on ODA and DEQ websites; and • Emailed to interested parties list maintained by ODA. (ii) Opportunity for public hearing. See S1.H.4, p. 7. (iii) A written response to relevant comments will be developed by ODA and made available to interested parties.
Contents of Public Notice Note: Access to the AWMP will also be provided for public review; however, not all AWMPs will be available electronically.	• Name of operation • Name of operator or owner if different than operator, mailing address, and telephone number • Physical address of operation • Type of operation • Number of animals proposed • Land Use Compatibility Statement (LUCS) • AWMP summary	• Name of operation • City, county, and zip code • Permit registration number • Type of operation	• Name of operation • City, county, and zip code • Permit registration number • Type of operation • Overview of proposed substantial change	• Name of operation • City, county, and zip code • Permit registration number • Type of operation • Overview of proposed substantial change

S2. DISCHARGE LIMITATIONS AND OPERATING REQUIREMENTS

S2.A. Discharge Limitations

The permittee is prohibited from discharging manure, litter, or process wastes to surface waters and groundwaters of the state, except as allowed in S2.B and S2.C and provided these discharges allowed in S2.B and S2.C do not cause or contribute to a violation of state water quality standards. Discharges to surface water due to upset or bypass are authorized only in accordance with applicable requirements in G16 Bypass [40 CFR §122.41(m)], p. 23 and G17 Upset [40 CFR §122.41(n)], p. 24.

Types of discharge that are prohibited include but are not limited to: contaminated runoff from confinement or waste accumulation areas; overflow or discharges from waste storage facilities; discharges due to improper land application activities from surface drainages or field tile outlets, discharges due to equipment failure; or leakage or seepage from facilities in the production area in excess of approved designs.

S2.B. Production Area Limitations

1. For all *small and medium confined animal feeding operations* and *small, medium, and large concentrated animal feeding operations*, except new source swine, poultry, and veal *large concentrated animal feeding operations*:
   The permittee is prohibited from discharging manure, litter, or process waste water to surface waters of the statefrom the production area, except when:
   (a) Rainfall events cause an overflow of waste management and storage facilities designed, constructed, operated, and maintained to contain all manure, litter, and process waste waters including the contaminated runoff and direct precipitation from a 25-year, 24-hour rainfall event; and
   (b) The production area is operated in accordance with the applicable inspection, maintenance, recordkeeping, and reporting requirements of this permit.

2. For new source swine, poultry, and veal *large concentrated feeding operations*:
   The permittee is prohibited from discharging manure, litter, or process waste water to surface waters of the state.

3. The permittee must properly land apply or otherwise handle authorized discharges from the production area in a way that minimizes impacts on surface water or groundwater of the state and complies with state water quality standards.

4. The permittee must not exceed the seepage design rates approved by ODA for waste storage or animal confinement facilities and seepage to groundwater from these facilities must not violate state groundwater quality protection standards.

S2.C. Land Application Limitations

1. When applying manure, litter, and process waste water to lands, the permittee must apply at agronomic rates in accordance with the permittee's ODA-approved AWMP. Land application areas include land under the control of the permittee, whether it is owned, rented, or leased, to which manure, litter, or process waste water from the production area is or may be applied.

2. The permittee's discharges to groundwater due to seepage below the root zone of the crop or by other means must not violate state groundwater quality protection standards.

3. The permittee is allowed to apply manure, litter, or process waste water to frozen soil provided:
   (a) Its AWMP addresses such applications [see S3.C.3(j)];
   (b) Discharge to surface waters and groundwaters of the state will not occur, except as allowed in S2.B and S2.C; and
   (c) Land applications do not cause or contribute to a violation of state water quality standards.

4. The permittee is prohibited from applying manure, litter, or process waste water to saturated soils or during rainfall events that are expected to result in saturated soils or surface runoff. When such a application is a desired alternative to allowing waste storage or waste water control facilities to overflow (e.g., land application to saturated soils to pond waste water onsite provides for greater protection of surface waters than a direct overflow of a waste storage tank to surface waters), the land application will be considered an upset condition and the permittee must comply with the provisions of G17 Upset [40 CFR §122.41(n)], p. 24.

S2.D. Direct Access by Animals to Surface Water in the Production Area Prohibited

The permittee must prevent direct animal contact with surface waters of the state in the production area of its CAFO. Direct animal contact means any situation where animals in the production area have free access and are allowed to loiter or drop waste in surface waters. Direct contact with surface waters by animals on pasture or rangeland is not, by itself, a violation of this permit.

S2.E. Waste Storage Facilities

1. The permittee must provide adequate storage capacity for solid and liquid wastes at all times so that land application occurs only during periods when soil and weather conditions allow for agronomic application and are in compliance with the Land Application Limitations in Condition S2.C, p. 9 of this permit.

2. The permittee must site, design, construct, operate, and maintain all waste storage facilities consistent with the AWMP. New and modified construction of waste facilities must be approved in advance and prior to construction by ODA in conformance with ORS 468B.055 and OARs 340-051 and 603-074.

3. The permittee with a *large concentrated animal feeding operation* must also have depth markers in all surface liquid impoundments (e.g., lagoons, ponds, tanks) designed to clearly indicate the:
   (a) Maximum design volume,
   (b) Minimum capacity necessary to contain the 25-year, 24-hour rainfall event, including additional freeboard requirements, and
   (c) Depth of manure and process waste water.

S2.F. Prevention of System Overloading

1. The permittee may not increase the number of animals over 10% or 25 animals, whichever is greater, of the maximum number assigned by ODA in the *Notice of Registration and General Permit Summary* until an updated plan is approved in writing by ODA (see S3.B AWMP Submittal, p. 12, and S3.D AWMP Changes, p. 13).

2. Animal numbers must not exceed the capacity of the waste storage facilities.

S2.G. Handling of Animal Mortalities

The permittee must not dispose of animal mortalities in liquid manure or waste water control facilities. Animal mortalities must be handled in such a way as to prevent discharge of pollutants to surface water or groundwater.

S2.H. Proper Operation and Maintenance

The permittee must at all times properly operate and maintain all facilities and systems used for process waste water collection, storage and utilization, and correct any deficiencies found as soon as possible.

S2.I. Maintaining Compliance if System Fails

The permittee must control all applications and discharges upon reduction, loss or failure of the waste storage or utilization facilities until the facilities are restored or an alternative method of storage or utilization is provided.

S2.J. Setback Requirement

The permittee must develop a setback for any mechanical application of manure, litter, or process waste water occurring in the land application area(s) adjacent to any surface waters, open tile intake structures, sinkholes, well heads, or other conduits to surface or ground waters where manure, litter, and other process waste waters are prohibited. The setback distances must be included in the permittee's AWMP. For *large concentrated animal feeding operation*, this setback must be 100 feet or as a compliance alternative and if demonstrated to the satisfaction of ODA in the AWMP, the permittee for the *large concentrated animal feeding operation* may:

1. Establish a 35-foot vegetated buffer where manure, litter, and other process waste waters are prohibited; or

2. Demonstrate that a setback or vegetated buffer is not necessary or may be reduced because implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions that would be achieved by the 100 foot setback.

S2.K. Manure, Litter, or Process Waste Water Transfers

1. The permittee retains responsibility of the manure, litter, or process waste water until the transfer or export is completed with the required documentation.

2. The permittee must maintain manure, litter, or process waste water transfer or export records as required by S4.C.2(d), p. 17.

3. Prior to transferring manure, litter, or process waste water to other persons, the permittee with a *large concentrated animal feeding operation* must provide the recipient of manure, letter, or process waste water with the a manure nutrient analysis conducted within the previous 12 months.

S2.L. Proper Disposal of Other Wastes

Chemicals, contaminants, and other wastes may not be disposed of in any treatment or storage system for contaminated storm water from the production area, manure, litter, or process waste water unless the system is designed to treat such chemicals, contaminants, or wastes and the chemical, contaminants, or other wastes are identified in the AWMP. In addition, chemicals, contaminants, and other wastes may not be disposed of in any system designed for diversion of uncontaminated storm water.

S3. ANIMAL WASTE MANAGEMENT PLAN

S3.A. Animal Waste Management Plan (AWMP) Implementation and Compliance

1. Upon registration to this permit, the permittee must implement its current ODA-approved AWMP developed for its CAFO.

2. The permittee's ODA approved AWMP is incorporated into this permit by reference. The permittee must comply with all terms and conditions of its ODA-approved AWMP. Failure to comply with the ODA-approved AWMP constitutes a violation of the terms and conditions of this permit.

3. Absence of a AWMP or absence of ODA approval of an AWMP does not allow the permittee to violate the provisions of S2 Discharge Limitations and Operating Requirements, p. 9 or other permit requirements.

S3.B. AWMP Submittal and Public Notice

1. The applicant proposing a new CAFO or electing coverage under this permit must submit its AWMP with the *ODA ATR* to ODA for review and approval according to the schedule provided in S1.C, p. 6.

2. If necessary to meet the AWMP requirements in this permit, the existing permittee with coverage under the previous version of this general permit must submit a revised or updated AWMP prior to renewing registration under this permit.

3. AWMPs are subject to public notice and participation requirements detailed in condition S1.H, p. 7.

S3.C. AWMP Elements

1. The permittee must ensure that its AWMP is adequate for the proposed or existing population of animals, reflective or the proposed or existing facility operation, and be prepared in accordance with the terms and conditions of this permit, OAR 340-051, and NRCS conservation practice standard guidance 590 for Oregon dated May 2008 entitled *Nutrient Management*.

   Note: In the event of any inconsistency between the conditions of this permit and NRCS 590, the conditions of this permit apply.

2. The AWMP may include a schedule for improvement projects.

3. The AWMP must to the extent applicable include the following:
   (a) Procedures to ensure adequate collection, handling, and storage of contaminated strom water runoff from the production area, manure, litter and process waste water in compliance with the requirements of S2. Discharge Limitation and Operating Requirements. Calculations used to determine that storage capacity exists must be provided, including a demonstration the facilities are at least designed and constructed to contain all manure, litter, process waste water, contaminated storm water runoff from the production area, and direct precipitation from a 25-year, 24-hour rainfall event.
   (b) Procedures to ensure proper operation and maintenance of the storage facilities;
   (c) Procedures to ensure proper management of animal mortalities. Animal mortalities may not be disposed of in any storage or treatment system that is not specifically designed to treat animal mortalities;
   (d) Procedures to ensure that clean water is diverted, as appropriate, from the production area;
   (e) Procedures to prevent direct contact of confined animals with surface waters;
   (f) Identification of appropriate site-specific conservation practices to be implemented, including buffers, setback areas, or equivalent practices, to control runoff of pollutants to surface water and groundwater;
   (g) Protocols to land apply manure, litter or process waste water in accordance with site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure, litter or process waste water. The protocols must include the following:
      (i) The NRCS Phosphorous Index, USDA/NRCS Oregon Agronomy Technical Note #26, revised June 2008, must be completed for all fields that receive manure , litter or process waste water to determine if nitrogen or phosphorous is the most limiting nutrient. The maximum nutrient

application rate must be calculated for the most limiting nutrient (from Technical Note #26) and must account for all other nitrogen and phosphorus sources.

(ii) Expected crop yields.

(iii) Calculations showing the total nitrogen and phosphorus to be applied annually to each field, including sources other than manure, litter, or process waste water.

(iv) Annual manure application rates and an explanation of the basis for determining these rates. For *large concentrated animal feeding operations*, these rates must be based on actual test data. For other operations, data or "book values" from established reference sources (e.g., Oregon Animal Waste Management program) may be used instead of actual testing.

(v) Method(s) used to apply manure, litter, or process waste water.

(h) For *large concentrated animal feeding operations*, protocols for appropriate testing of manure, litter, process waste water, and soil. For other operations, references used instead of actual testing data or test protocols if testing.

(i) If applicable, an Agricultural Compost Management Plan as required by OAR 340-096.

(j) Frozen soil application procedures if applications of manure, litter, or process waste water will be made to frozen soil. At a minimum, the following must be provided:

(i) Description of the potential receiving field(s), estimates of waste amounts and types, and estimated timing of applications.

(ii) Aerial photo(s) identifying all areas and surface water bodies within 1,000 ft. of the boundaries of the receiving field(s).

(iii) Soil map(s) identifying soil types for receiving field(s).

(iv) Topographic map(s) for receiving field(s).

(v) Description of the structural practices in place to ensure that no discharges to surface water occur during application and after the soil thaws.

(vi) Description of the method used to determine when soil is frozen and management practices to be followed when planning an application and during and after an application to frozen soil.

(vii) Description of monitoring and reporting requirements to ensure that the permittee is in compliance with frozen soil application procedures.

(k) Procedures for transfer or export of manure, litter, or process waste water.

(l) Identification of specific records that will be maintained to document the implementation and management of the minimum elements described above.

S3.D. AWMP Changes

1. Requirements for *small or medium confined animal feeding operations* (see Table 3,p. 15, for an overview)

(a) *Substantial changes*. The permittee must submit any proposal to make substantial changes to its AWMP to ODA for approval at least 45 days in advance of the proposed changes. ODA will public notice the proposal as described in S1.H, p. 7. ODA will notify the permittee of its final decision concerning the proposed changes after the public notice period ends. The permittee may not implement a proposed change until ODA has approved it. The following types of changes to an AWMP are considered substantial:

(i) A change in the type of manure system including but not limited to switching from a dry to a liquid manure system, switching from a liquid to a dry manure system, or changing the manure system to accommodate an animal species or type of operation not included in the scope of the current AWMP.

(ii) An increase in maximum allowed animal numbers such that the operation becomes defined as a *large concentrated animal feeding operation*.

(b) *Non-substantial changes*. Public notice of non-substantial changes (described below) to an AWMP is not required; however, the permittee must submit its proposal to make such a change to ODA for approval at least 45 days in advance of the proposed change unless a different timeframe is allowed by ODA. ODA will notify the permittee of its final decision concerning the proposed change after reviewing the proposal. The permittee may not implement a proposed change until ODA has approved it. The following changes to an AWMP are considered non-substantial provided they do not result in a substantial modification listed in paragraph (a) above:

(i) An increase in animal numbers greater than 10% of the registrant's maximum allowed animal numbers provided the increase does not change the operation into a large concentrated animal feeding operation.
(ii) When facility expansions, production increases, or process modifications will result in new or increased generation of waste, litter, or process waste water beyond the scope of the current AWMP.

2. Requirements for *small, medium or large concentrated animal feeding operations* (see Table 3,p. 15, for an overview):
   (a) *Substantial changes*. The permittee must submit any proposal to make substantial changes to its AWMP to ODA for approval at least 60 days in advance of the proposed changes. ODA will public notice the proposal as described in S1.H, p. 7. ODA will notify the permittee of its final decision concerning the proposed changes after the public notice period ends. The permittee may not implement a proposed change until ODA has approved it. The following types of changes to an AWMP are considered substantial:
      (i) Addition of new land application areas not previously included in the AWMP, unless the land application area is covered by an existing AWMP that has already been incorporated into an existing NPDES permit and the application of manure, litter, or process waste water on the newly added land application area is in accordance with that existing NPDES permit.
      (ii) Any changes to the field-specific maximum annual rates for land application.
      (iii) Any changes to the maximum amounts of nitrogen and phosphorus derived from all sources for each crop.
      (iv) Addition of any crop or other uses not included in the AWMP and corresponding field-specific rates of application.
      (v) A change in the type of manure system including but not limited to switching from a dry to a liquid manure system, switching from a liquid to a dry manure system, or changing the manure system to accommodate an animal species or type of operation not included in the scope of the current AWMP.
      (vi) Any changes that are likely to increase the risk of nitrogen and phosphorus transport to surface waters or groundwaters.

   (b) *Non-substantial changes*. Public notice of non-substantial changes (described below) to an AWMP is not required; however, the permittee must submit its proposal to make such a change to ODA for approval at least 60 days in advance of the proposed change unless a different timeframe is allowed by ODA. ODA will notify the permittee of its final decision concerning the proposed change after reviewing the proposal. The permittee may not implement a proposed change until ODA has approved it. The following changes to an AWMP are considered non-substantial provided they do not result in a substantial modification listed in paragraph (a) above:
      (i) An increase in animal numbers greater than 10% of the registrant's maximum allowed animal numbers.
      (ii) When facility expansions, production increases, or process modifications will result in new or increased generation of waste, litter, or process waste water beyond the scope of the current AWMP.

Table 3: Overview of Requirements for Proposed Changes to AWMPs

	SMALL OR MEDIUM CONFINED		SMALL, MEDIUM OR LARGE CONCENTRATED	
	Substantial Change	***Non-Substantial Change***	***Substantial Change***	***Non-Substantial Change***
Description of proposed change	1. A change in the type of manure system including but not limited to switching from a dry to a liquid manure system, switching from a liquid to a dry manure system, or changing the manure system to accommodate an animal species or type of operation not included in the scope of the current AWMP. 2. An increase in maximum allowed animal numbers such that the operation becomes defined as a large concentrated animal feeding operation.	The following are considered non-substantial provided they do not result in a substantial change: 1. An increase in animal numbers greater than 10% of the registrant's maximum allowed animal numbers. 2. When facility expansions, production increases, or process modifications will result in new or increased generation of waste, litter, or process waste water beyond the scope of the current AWMP.	1. Addition of new land application areas not previously included in the AWMP, unless the land application area is covered by an existing AWMP that has already been incorporated into an existing NPDES permit and the application of manure, litter, or process waste water on the newly added land application area is in accordance with that existing NPDES permit. 2. Any changes to the field-specific maximum annual rates for land application. 3. Any changes to the maximum amounts of nitrogen and phosphorus derived from all sources for each crop. 4. Addition of any crop or other uses not included in the AWMP and corresponding field-specific rates of application. 5. A change in the type of manure system including but not limited to switching from a dry to a liquid manure system, switching from a liquid to a dry manure system, or changing the manure system to accommodate an animal species or type of operation not included in the scope of the current AWMP. 6. Any changes that are likely to increase the risk of nitrogen and phosphorus transport to surface waters or groundwaters.	The following are considered non-substantial provided they do not result in a substantial change: 1. An increase in animal numbers greater than 10% of the registrant's maximum allowed animal numbers. 2. When facility expansions, production increases, or process modifications will result in new or increased generation of waste, litter, or process waste water beyond the scope of the current AWMP.
Timeline to submit proposal to ODA	Submit at least 45 days in advance of proposed change(s).	Submit at least 45 days in advance of proposed change(s) unless a different timeframe allowed by ODA.	Submit at least 60 days in advance of proposed change(s).	Submit at least 60 days in advance of proposed change(s) unless a different timeframe allowed by ODA.
Public notice process .	ODA will public notice as described in S1.H, p. 7.	Not required.	ODA will public notice as described in S1.H, p. 7.	Not required.
ODA approval	ODA will notify the permittee of its final decision concerning the proposed change(s) after the public notice period ends.	ODA will notify the permittee of its final decision concerning the proposed change(s) after reviewing the proposal.	ODA will notify the permittee of its final decision concerning the proposed change(s) after the public notice period ends.	ODA will notify the permittee of its final decision concerning the proposed change(s) after reviewing the proposal.

S4. MONITORING, INSPECTION, RECORDKEEPING, AND REPORTING REQUIREMENTS

S4.A. Monitoring Requirements

1. Discharge Monitoring

   If a discharge to surface water or groundwater occurs that is not allowed by S2.B or S2.C, p. 9, the permittee must record the following information:

   (a) A description and cause of the discharge;
   (b) The period of discharge including exact dates, times and duration of discharge;
   (c) An estimate of discharge volume;
   (d) Name or location of receiving water; and
   (e) Corrective steps taken, if appropriate, to reduce, eliminate or prevent reoccurrence of the discharge.

2. Analytical Monitoring

   The permittee must conduct the following sampling and analysis according to the following schedule:

   (a) *Large concentrated animal feeding operations* only

Sample Type	Analytical Parameter	Minimum Frequency	Sample Method
Manure, litter, and process waste water	(i) Total nitrogen (ii) Total phosphorus	Annually	Sample according to guidance contained in NRCS 590 or 633 practice standard.
Exported manure, litter, and process waste water	(i) Total nitrogen (ii) Total phosphorus	Annually	Sample according to guidance contained in NRCS 590 or 633 practice standard.
Soil from land application area(s)	(i) Total nitrogen (ii) Total phosphorus	Once every 5 years from all fields where manure, litter, or process waste water is applied.	Sample according to guidance contained in PNW 570-E, EM 8832-E, or NRCS 590 practice standard.

   (b) Other confined animal feeding operations

Sample Type	Analytical Parameter	Minimum Frequency	Sample Method
Soil from land application area(s)	(i) Total nitrogen (ii) Total phosphorus	Once every 5 years from all fields where manure, litter, or process waste water is applied.	Sample according to guidance contained in PNW 570-E, EM 8832-E, or NRCS 590 practice standard.

   Note: In the event of any inconsistency between the monitoring requirements of this permit and NRCS 590, the monitoring requirements of this permit apply. The permittee should be aware that NRCS 590 monitoring frequencies may need to be followed to access or maintain federal funds.

S4.B. Inspection Requirements

1. The permittee must conduct the following inspections:

Item	Large Concentrated	Other Operations
(a) Stormwater diversion devices, runoff diversion structures, animal waste storage structures, and devices channeling contaminated storm water to the waste water and manure storage and containment structures.	Weekly and record results	Periodically
(b) Water lines, including drinking water or cooling water lines.	Daily and record results	Periodically
(c) Equipment used for land application of manure, litter, or process waste water	Daily when equipment is in use and record results	Periodically when equipment is in use
(d) Liquid impoundments for manure and process waste water	Weekly and record depth of manure and process waste water according to depth marker required by S2.E.3, p. 10	Periodically

2. Any deficiencies found as a result of these inspections must be corrected as soon as possible. The permittee with a *large concentrated animal feeding operation* must record any actions taken to correct these deficiencies and, if deficiencies are not corrected within 30 days, provide an explanation of the factors preventing immediate correction.

S4.C. Recordkeeping and Availability Requirements

1. The permittee must maintain all information required by this permit at the facility for at least five (5) years and make this information available to ODA upon request.
2. Upon obtaining permit coverage, must record the following information. (Note: If any of the following information is provided in the permittee's AWMP, a separate record keeping effort is not required.)

Item	Large Concentrated	Other Operations
(a) Date, amount, and nutrient loading of manure, litter, or process waste water applied to each field.	Required	Required
(b) Weather conditions at the time of application and 24 hours before and after application.	Required	Not required
(c) Total amount of nitrogen and phosphorus actually applied annually to each field, including documentation of calculations of the total amount applied.	Required	Required
(d) Total amount of manure or waste water transferred or exported to other persons.	Required. Also include: (i) Date and amount of each transfer or export (ii) Name and address of each recipient (iii) Copy of the manure nutrient analysis conducted provided to the recipient [see S2.K.3, p. 11	Required
(e) Description of actions taken to correct deficiencies discovered during inspections.	Required (see S4.B.2, p. 17)	Not required

S4.D. Reporting Requirements

1. 24-hour Reporting
   (a) If a discharge to surface water or groundwater occurs that is not allowed by Condition S2.B and S2.C, p. 9, the permittee must notify ODA within 24 hours of the discharge. The permittee must submit a written report within five (5) days to ODA. The information to be submitted is listed in the monitoring requirements (see S4.A, p. 16 above) of this permit.
   (b) The permittee must report to ODA within 24 hours of becoming aware of any significant physical failure at any time of a waste water control facility required under this permit.
   (c) The permittee must notify ODA within 24 hours of any permit noncompliance that may endanger health or the environment as described in G2.6, p. 20.

2. Annual Report
   (a) The permittee must submit an annual report to ODA by March 15 of each year. The annual report must include the following for the previous calendar year:
      (i) Maximum number and type of animals approved by ODA in the permittee's *Notice of Registration*, whether in open confinement or housed under roof (e.g,, beef cattle, broilers, layers, swine weighing 55 pounds or more, swine weighing less than 55 pounds, mature dairy cows, dairy heifers, veal calves, sheep and lambs, horses, ducks, turkeys, other).
      (ii) Actual number of animals by type at the CAFO averaged over the year.
      (iii) Estimated amount of total manure, litter, process waste water and other material that comes into contact with manure generated by the CAFO (tons, gallons, cubic feet, or cubic yards).
      (iv) Estimated amount of total manure, litter, process waste water and other material transferred to other persons by the permittee (tons, gallons, cubic feet, or cubic yards).
      (v) Estimated amount of manure, bedding, litter, process waste water, and other material that comes in contact with manure applied to land by the permittee (tons, gallons, cubic feet, or cubic yards).
      (vi) Total number of acres for land application covered by the AWMP developed in accordance with the terms of this permit.
      (vii) Total number of acres under control of the permittee that were used for land application of manure, litter and process waste water.
      (viii) Summary of all manure, litter and process waste water discharges from the production area that have occurred, including date, time and approximate volume.
      (ix) A statement indicating whether the AWMP was developed or approved by a certified waste management planner.
      (x) As required by 40 CFR §122.42(e)(4)(viii), the concentrated animal feeding operation that discharges or proposes to discharge to waters of the U.S. must also report the following:
         (1) Actual crop(s) planted and actual yield(s) for each field.
         (2) Actual nitrogen and phosphorus content of the manure, litter, and process waste water.
         (3) Data used and results of calculations based on protocol in the ODA-approved AWMP.
         (4) Amount of manure litter, and process waste water applied to each field during the previous 12 months.
         (5) Results of soil testing for nitrogen and phosphorus if testing was performed.
         (6) Amount of any supplemental fertilizer applied.

   (b) The annual report must be signed and certified by the permittee or permittee's authorized representative with the following statement: "*I certify, under penalty of law, that this document and all attachments were prepared under my direct supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.*"

S4.E. Additional Monitoring

1. ODA may establish specific monitoring requirements in addition to those contained in this permit by administrative order. An administrative order is an agency action expressed in writing directed to a named person or named persons (ORS 183.310).

2. If a permittee experiences two or more discharges within a 24-month period that are not associated with a 25-year, 24-hour or greater rainfall event, ODA may require surface water and/or groundwater quality monitoring or transfer the permittee to an individual permit. Monitoring for the following parameters may be required: bacteria, total suspended solids, total Kjeldahl nitrogen, biochemical oxygen demand, and other nutrient indicators. If ODA waives the additional monitoring requirements because such monitoring would be impracticable or not likely to produce useful information, ODA will set out the basis for the decision in writing and make the decision available to interested parties.

GENERAL CONDITIONS

G1. Noncompliance reporting requirements

1. If for any reason, the permittee does not comply with, or will be unable to comply with any of the requirements or conditions specified in the permit, the permittee must, at a minimum, provide ODA with the following information:
   (a) A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;
   (b) The period of noncompliance, including exact dates and times, and the anticipated time when the permittee will return to compliance; and
   (c) The steps taken, or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.
2. In addition, the permittee must take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee must notify ODA by telephone so that an investigation may be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.
3. Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or resulting liability for failure to comply

G2. Additionalreporting requirements [40 CFR §122.41(1)]

1. *Planned changes.* The permittee shall give notice to the director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:
   (a) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in §122.29(b); or
   (b) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under §122.42(a)(1).
   (c) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan;
2. *Anticipated noncompliance.* The permittee shall give advance notice to the director of any planned changes the permitted facility or activity which may result in noncompliance with permit requirements.
3. *Transfers*. This permit is not transferable to any person except after notice to the director. The director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act (See §122.61; in some cases, modification or revocation and reissuance is mandatory.)
4. *Monitoring reports*. Monitoring results must be reported at the intervals specified elsewhere in this permit.
   (a) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the director for reporting results of monitoring of sludge use or disposal practices.
   (b) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136, or another method required for an industry-specific waste stream under 40 CFR subchapters N or O, the results of such monitoring must be included in the calculation and reporting of the data submitted in the CMR or sludge reporting form specified by the director.
   (c) Calculations for all limitations which require averaging of measurements must utilize an arithmetic mean unless otherwise specified by the director in the permit.
5. *Compliance schedules.* Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date.
6. *Twenty-four hour reporting*.
   (a) The permittee shall report any noncompliance which may endanger health or the environment. Any information must be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission must also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been

corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(b) The following must be included as information which must be reported within 24 hours under this paragraph.
   (i) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See §122.41(g) or condition G16, p. 23.)
   (ii) Any upset which exceeds any effluent limitation in the permit. (See §122.41(n) or condition G17, p. 24.)
   (iii) Violation of a maximum daily discharge limitation for any of the pollutants listed by the director in the permit to be reported within 24 hours. (See §122.44(g).)

(c) The director may waive the written report on a case-by-case basis for reports under paragraph G2.6(b) of this section if the oral report has been received within 24 hours.

7. *Other noncompliance.* The permittee shall report all instances of noncompliance not reported under paragraphs G2.4, 5, and 6 of this section, at the time monitoring reports are submitted. The reports must contain the information listed in paragraph G2.6 of this section.
8. *Other information.* Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the director, it shall promptly submit such facts or information.

G3. Duty to comply [40 CFR §122.41(a)]

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

1. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.
2. The Clean Water Act provides that any person who violates section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under section 402, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed $25,000 per day for each violation. The Clean Water Act provides that any person who negligently violates sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, or any requirement imposed in a pretreatment program approved under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than 1 year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than 2 years, or both. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both. Any person who knowingly violates section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the CWA, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.
3. Any person may be assessed an administrative penalty by the Administrator for violating section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act. Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000.

Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

G4. Compliance with other laws and statutes

Nothing in the permit will be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G5. Property rights [40 CFR §122.41(g)]

This permit does not convey any property rights of any sort, or any exclusive privilege.

G6. Duty to reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for a new permit or renewal permit. The application must be submitted at least 180 days before the expiration date of this permit. The director may grant permission in writing to submit an application less than 180 days in advance but no later than the permit expiration date.

G7. Need to halt or reduce activity not a defense [40 CFR §122.41(c)]

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

G8. Duty to mitigate [40 CFR §122.41(d)]

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

G9. Proper operation and maintenance [40 CFR §122.41(e)]

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

G10. Permit actions

1. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. [40 CFR §122.41(f)]
2. After notice, registration under this permit may be modified or revoked as it applies to any person for cause as follows:
   (a) Violation of any terms or conditions of the permit,
   (b) Failure of the permittee to disclose fully all relevant facts, or misrepresentations of any relevant facts by the permittee during the permit issuance process and during the life of the permit;
   (c) Failure to pay permit fees required by Oregon Administrative Rule when due;
   (d) Information indicating that the permitted operation poses a threat to human health or welfare;
   (e) A change in ownership or control of the operation, or
   (f) Other causes listed in 40 CFR §122.62 and 122.63.
3. Modification or revocation of coverage under this permit as it applies to any person may be initiated by ODA.
4. Issuance of coverage under an individual permit may be initiated by ODA in accordance with condition S1.F Individual Permit Coverage, p. 7.

G11. Change of Ownership or Control

The permittee must notify ODA in writing thirty (30) days prior to a change in facility ownership or control.

G12. Duty to provide information [40 CFR §122.41(h)]

The permittee shall furnish to the director, within a reasonable time, any information which the director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine

compliance with this permit. The permittee shall also furnish to the director upon request, copies of records required to be kept by this permit.

G13. Inspection and entry [40 CFR §122.41(i)]

The permittee shall allow the director, or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act or state law, any substances or parameters at any location.

G14. Monitoring and records [40 CFR §122.41(j)]

1. Samples and measurements taken for the purpose of monitoring must be representative of the monitored activity.
2. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which must be retained for a period of at least five years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the director at any time.
3. Records of monitoring information must include:
   (a) The date, exact place, and time of sampling or measurements;
   (b) The individual(s) who performed the sampling or measurements;
   (c) The date(s) analyses were performed;
   (d) The individual(s) who performed the analyses;
   (e) The analytical techniques or methods used; and
   (f) The results of such analyses.
4. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136 unless another method is required under 40 CFR subchapters N or O.
5. The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

G15. Signatory requirement [40 CFR §122.21(k)]

1. All applications, reports, or information submitted to the director shall be signed and certified. (See §122.22)
2. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

G16. Bypass [40 CFR §122.41(m)]

1. *Definitions.*
   (a) *Bypass* means the intentional diversion of waste streams from any portion of a treatment facility.
   (b) *Severe property damage* means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

2. *Bypass not exceeding limitations*. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs G17.3 and 4 of this section.
3. *Notice*
   (a) *Anticipated bypass*. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
   (b) *Unanticipated bypass*. The permittee shall submit notice of an unanticipated bypass as required in paragraph G2.6 of this section (24-hour notice).
4. *Prohibition of bypass*.
   (a) Bypass is prohibited, and the director may take enforcement action against a permittee for bypass, unless:
      (i) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
      (ii) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
      (iii) The permittee submitted notices as required under paragraph G16.3 of this section.
   (b) The director may approve an anticipated bypass, after considering its adverse effects, if the director determines that it will meet the three conditions listed above in G16.4(a) of this section.

G17. Upset [40 CFR §122.41(n)]

1. *Definition.* Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
2. *Effect of an upset*. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph G17.3 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
3. *Conditions necessary for a demonstration of upset*. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
   (a) The upset occurred and that the permittee can identify the cause(s) of the upset;
   (b) The permitted facility was at the time being properly operated; and
   (c) The permittee submitted notice of the upset as required in paragraph G2.6(b)(ii) of this section (24 hour notice).
   (d) The permittee complied with any remedial measures required under paragraph G8 of this section.
4. *Burden of proof.* In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

Appendix B

Facility Engineering Drawings

Appendix C

Lease/Spreading Agreements

Appendix D

RUSLE Calculations

RUSLE2 Worksheet Erosion Calculation Record

Info:

Tract #: NA
Owner name: Allen Ranch
Field name: 1, 2, 8, 10, 14, 19, 21

Location: Oregon\Coos County\OR_Coos_R56-60
Soil: 41 NESTUCCA SILT LOAM\NESTUCCA silt loam 80%
T value: 5.0 t/ac/yr
Slope length (horiz): 900 ft
Avg. slope steepness: 3.0 %

Alternatives:

Management	*Contouring*	*Strips / barriers*	*Diversion/terrace, sediment basin*	*Cons. plan. soil loss*	*Soil conditioning index (SCI)*	*STIR value*
a.Single Year/Single Crop Templates\A_Pasture; fall planted, 5 yrs rotational grazing, manure application, CMZ 71	default	(none)	(none)	0.17	1	30.73

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Worksheet Erosion Calculation Record

Info:

Tract #: NA
Owner name: Allen Ranch
Field name: 3, 4, 5, 7, 11, 12, 13, 18, 20

Location: Oregon\Coos County\OR_Coos_R56-60
Soil: 40 NEHALEM SILT LOAM\NEHALEM silt loam 80%
T value: 5.0 t/ac/yr
Slope length (horiz): 900 ft
Avg. slope steepness: 3.0 %

Alternatives:

Management	*Contouring*	*Strips / barriers*	*Diversion/terrace, sediment basin*	*Cons. plan. soil loss*	*Soil conditioning index (SCI)*	*STIR value*
a.Single Year/Single Crop Templates\A_Pasture; fall planted, 5 yrs rotational grazing, manure application, CMZ 71	default	(none)	(none)	0.20	1	30.73

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Worksheet Erosion Calculation Record

Info:

Tract #: NA
Owner name: Allen Ranch
Field name: 6

Location: Oregon\Coos County\OR_Coos_R56-60
Soil: 62 WILLANCH FINE SANDY LOAM\WILLANCH fine sandy loam 75%
T value: 5.0 t/ac/yr
Slope length (horiz): 900 ft
Avg. slope steepness: 3.0 %

Alternatives:

Management	*Contouring*	*Strips / barriers*	*Diversion/terrace, sediment basin*	*Cons. plan. soil loss*	*Soil conditioning index (SCI)*	*STIR value*
a.Single Year/Single Crop Templates\A_Pasture; fall planted, 5 yrs rotational grazing, manure application, CMZ 71	default	(none)	(none)	0.087	1	30.73

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Worksheet Erosion Calculation Record

Info:

Tract #: NA
Owner name: Allen Ranch
Field name: 9, 15, 16, 17, 22, 23, 24, 25, 26

Location: Oregon\Coos County\OR_Coos_R56-60
Soil: 9 CHETCO SILTY CLAY LOAM\CHETCO silty clay loam 75%
T value: 5.0 t/ac/yr
Slope length (horiz): 900 ft
Avg. slope steepness: 3.0 %

Alternatives:

Management	*Contouring*	*Strips / barriers*	*Diversion/terrace, sediment basin*	*Cons. plan. soil loss*	*Soil conditioning index (SCI)*	*STIR value*
a.Single Year/Single Crop Templates\A_Pasture; fall planted, 5 yrs rotational grazing, manure application, CMZ 71	default	(none)	(none)	0.16	1	30.73

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Worksheet Erosion Calculation Record

Info:

Tract #: NA
Owner name: Allen Ranch
Field name: 27

Location: Oregon\Coos County\OR_Coos_R56-60
Soil: 13D DEMENT SILT LOAM, 12 TO 30 PERCENT SLOPES\DEMENT silt loam 75%
T value: 4.0 t/ac/yr
Slope length (horiz): 490 ft
Avg. slope steepness: 21 %

Alternatives:

Management	*Contouring*	*Strips / barriers*	*Diversion/terrace, sediment basin*	*Cons. plan. soil loss*	*Soil conditioning index (SCI)*	*STIR value*
a.Single Year/Single Crop Templates\A_Pasture; fall planted, 5 yrs rotational grazing, manure application, CMZ 71	default	(none)	(none)	1.9	1	30.73

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

Appendix E

Phosphorus Index Calculations

Phosphorus Index

The Phosphorus Index for Oregon was developed by a nutrient management advisory group comprised of members from the Natural Resources Conservation Service in Oregon and Washington, Oregon State University, Washington State University, and agricultural industry.

The Phosphorus Index is a field-level assessment tool designed to evaluate the relative potential for off-site movement of phosphorus from the landscape. The purpose of the Phosphorus Index is to provide field personnel, watershed planners, and land managers with a tool to assess various soils, landforms, and management practices for potential risk of phosphorus movement into surface waters. Conservation planners can use the Phosphorus Index to develop alternatives that include management and conservation practices that will reduce the potential for phosphorus transport to surface waters.

Phosphorus Movement Factors

The main factors influencing P movement can be separated into two main categories: **transport and source factors.** The following factors are considered in the Phosphorus Index for Oregon.

Transport factors:

- Soil erosion (sheet and rill, wind)
- Irrigation-induced erosion
- Runoff class
- Flooding frequency
- Distance to surface waters / buffer width
- Subsurface drainage

Source Factors:

- Soil test P concentration
- Commercial P fertilizer application rate
- Commercial P fertilizer application method
- Organic P source application rate
- Organic P source application method

Each factor is assigned a ***Phosphorus Loss Rating*** of ***None, Low, Medium, High, or Very High*** based on the relative risk of phosphorus transport to surface waters. In addition, each factor is assigned a ***Factor Weight*** ranging from 0.25 to 1.50, based on the relative contribution of that factor to P transport.

Separate Phosphorus Indices were developed for Western and Eastern Oregon. Differences in cropping systems, tillage practices, irrigation systems, climatic factors, and soil phosphorus testing methods across the state made it necessary to have separate indices.

Descriptions of Phosphorus Index Factors

TRANSPORT FACTORS-

Soil Erosion

Soil Erosion – tons/ac/yr (RUSLE)	tons/ac/yr (Score)	< 1 (0)	1 – 3 (1.5)	4 – 6 (3.0)	7 – 15 (6.0)	> 15 (12.0)

This factor includes both sheet and rill and wind erosion. Irrigation-induced erosion is addressed in other factors. Sheet and rill erosion is the detachment of soil particles by raindrop impact, surface runoff from rainfall, and snowmelt runoff on frozen or thawing soil. Wind erosion is the detachment and transport of soil particles by wind forces. Sheet and rill erosion rates are estimated with the Revised Universal Soil Loss Equation (RUSLE). Wind erosion rates are estimated using the Wind Erosion Equation (WEQ). These soil loss models predict long-term average erosion rates, over the entire crop rotation, in tons of soil loss per acre per year. They do not predict sediment transport and delivery to a water body. The prediction models are used in the Phosphorus Index to quantify the movement of soil, thus potential for sediment and attached phosphorus transport on a slope or unsheltered distance toward a water body.

Soil Erosion from Sprinkler Irrigation

Soil Erosion from Sprinkler Irrigation	Criteria (Score)	No sprinkler irrigation (0)	*Application rate < infiltration rate* OR No visible runoff at field borders (0.75)	Application rate = infiltration rate OR Little to no visible runoff at field borders (1.5)	Application rate > infiltration rate OR Visible runoff at field borders (3.0)	Application rate > infiltration rate OR Excessive runoff visible at field borders. Rills and gullies present. (6.0)

This factor is evaluated by comparing the application rate of the sprinkler irrigation system (inches of water per hour) with the infiltration rate of the soil. A visual assessment of runoff and soil erosion caused by irrigation water is also conducted to assign a *Phosphorus Loss Rating* to this factor.

Runoff Class

Runoff Class	Criteria (Score)	Negligible (0)	Very low or low (1.0)	Medium (2.0)	High (4.0)	(8.0)

The *runoff class* is determined from the *hydrologic group* assigned to the soil map units in a field, and the average slope gradient. *Hydrologic groups* are group of soils having similar runoff potential under similar storm and cover conditions. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. (National Soil Survey Handbook, Part 618.35).

Flooding Frequency Class

Flooding Frequency Class	Criteria (Score)	None or very rare (0)	Rare (0.75)	Occasional (1.5)	Frequent (3.0)	Very Frequent (6.0)

Flooding is the temporary covering of the soil surface by flowing water from any source, such as streams overflowing their banks, runoff from adjacent or surrounding slopes, inflow from high tides, or any combination of sources. Floodwaters can carry both sediment-bound and dissolved P into surface waters. Estimates of flooding frequency are based on the interpretation of soil properties and other evidence gathered during soil survey fieldwork. Flooding frequency is defined as the number of times flooding occurs over a period of time and is expressed as a class.

Distance to Perennial Surface waters / Buffer Widths

Distance to Perennial Surface Waters / Buffer Widths	Criteria (Score)	> 500 feet OR buffer > 30 ft. wide (or meets NRCS standards) next to surface waters (0)	300 – 500 feet OR buffer 20 - 30 ft. wide next to surface waters (0.75)	200 – 299 feet OR buffer 10 -19 ft. wide next to surface waters (1.5)	100 – 199 feet AND buffer < 10 ft. wide next to surface waters (3.0)	< 100 feet AND No buffer next to surface waters (6.0)

This factor considers the flow distance from the edge of the field to the closest perennial surface water, which may include streams, lakes, and those irrigation and drainage ditches that contain water year around. It also considers the presence and width of a vegetated buffer adjacent to that surface water. The closer the edge of the field is to surface water, the higher the potential risk of P transport to that water.

Vegetated buffers are effective in trapping sediment-bound P in runoff water. They are less effective in reducing dissolved P transport. Dissolved P can flow through a buffer and enter surface water. The wider the vegetated buffer, the more effective it will be in reducing total P transport to surface water. Vegetated buffers that are commonly used adjacent to perennial water include filter strips (NRCS Standard 393) and riparian forest buffers (NRCS Standard 391).

Subsurface Drainage

Subsurface Drainage	Criteria (Score)	No Tile Drains (0)	Tile drains present Soil Test P (Bray P1) < 60 ppm (0.5)	Tile drains present Soil Test P (Bray P1) 61 - 140 ppm (1.0)	Tile drains present Soil Test P (Bray P1) 141- 190 ppm (2.0)	Tile drains present Soil Test P (Bray P1) > 190 ppm (4.0)

Recent research has shown that P can leach through the soil profile, and the risk of leaching is directly related to the soil test P concentration in the soil. The higher the P concentration, the greater the potential for leaching. When subsurface drainage is present, such as perforated pipe tile drains, dissolved and sediment-bound P can enter the drains and be directly transported to surface water at the drain outlet. This factor therefore considers whether tile drains are present in the field, and the soil test P concentration.

SOURCE FACTORS-

Soil Test P

Soil Test P – ppm (Bray P1)	(Score)	Soil Test P – 40 x 0.10 = (_____) Assign 0 points if Soil Test P < 40 ppm

A soil sample from the site is necessary to assess the level of "available P" in the surface layer of the soil. Available P is the level customarily reported in a soil test analysis by commercial soil test laboratories. The soil test level for "available P" does not ascertain the total P in the soil. It does however, give an indication of the amount of total P that may be present because of the general relationship between the forms of P (organic, adsorbed, and labile) and the dissolved P available for crop uptake. The higher the soil test P level, the greater the risk of P transport to surface waters.

The depth at which soil samples are collected for available P analysis should be determined from the fertilizer or nutrient management guides for the crops being grown on the site. These guides are available from Oregon State University or Washington State University Cooperative Extension Services. Sampling depth is normally 0 to 6 inches or 0 to 12 inches for cultivated crops, and generally corresponds to typical depth of primary tillage. For established pastures that have not been cultivated for many years, a sample depth of 0 to 3 inches may be appropriate because P tends to be concentrated near the surface when the soil is not cultivated.

In eastern Oregon, soil test P levels should be determined using the Olsen (sodium bicarbonate) extraction method. In western Oregon, the Bray P1 extraction method should be used.

P Fertilizer Application Rate

Commercial P Fertilizer Application Rate	(Score)	lbs/ac P_2O_5 x 0.02 = (_____)

The P fertilizer application rate is the amount of commercial phosphate fertilizer (P_20_5), in pounds per acre per year, which is applied to the soil. This factor does not include phosphorus from organic sources. The higher the application rate, the greater the risk of P transport to surface waters.

Commercial P Fertilizer Application Method

Commercial P Fertilizer Application Method	Criteria	None Applied	Injected / banded deeper than 2 inches OR Incorporated within 5 days of application from March through September	Incorporated within 5 days of application from October through February OR Surface applied March through August	Incorporated more than 5 days after application OR Surface applied September through October	Surface applied November through February
	(Score)	(0)	(1.0)	(2.0)	(4.0)	(8.0)

The manner in which P fertilizer is applied to the soil, and the length of time that fertilizer remains on the soil surface will affect potential P movement. Banding or incorporating P fertilizer into the soil reduces the risk of P transport. P fertilizer that is surface applied, and not incorporated into the soil, has a higher risk of transport to surface water.

The time of year that P fertilizer is applied also affects the risk of P movement. P fertilizer that is applied during the winter and early spring in Western Oregon, when heavy or prolonged precipitation events are likely to occur, creates a higher risk of P transport than applications made from mid-spring to early fall. In Eastern Oregon, there is a greater risk of P transport when fertilizer is surface applied and not incorporated prior to irrigation or winter precipitation.

Organic P Source Application Rate

Organic P Source Application Rate	(Score)	lbs/ac P_2O_5 x 0.02 = (_____)

The organic P source application rate is the amount of phosphate (P_2O_5) contained in organic material that is applied to the soil, in pounds per acre per year. An analysis of the organic material is desirable to determine the phosphorus content. When an analysis of the organic material is not available, values from the Animal Waste Management Field Handbook can be used. The higher the application rate, the greater the risk of P transport to surface waters.

Organic P Source Application Method

Organic P Source Application Method	Criteria	None Applied	Injected deeper than 2 inches OR Incorporated within 5 days of application from March through September	Incorporated within 5 days of application from October through February OR Surface applied March through August	Incorporated more than 5 days after application OR Surface applied September through October	Surface applied November through February
	(Score)	(0)	(1.0)	(2.0)	(4.0)	(8.0)

The manner in which organic P material is applied to the soil, and the length of time it remains on the soil surface will affect potential P movement. Injecting or incorporating organic P sources into the soil reduces the risk of P transport. Organic P material that is surface applied, and not incorporated into the soil, has a higher risk of transport to surface water.

The time of year that organic P is applied also affects the risk of P movement. Organic P that is applied during the winter and early spring in western Oregon, when heavy or prolonged precipitation events are likely to occur, creates a higher risk of P transport than applications made from mid-spring to early fall. In Eastern Oregon, there is a greater risk of P transport when organic material is surface applied and not incorporated prior to irrigation or winter precipitation.

Appendix F

Soil Test Results

DATE : June 15, 2012
REPORT: S 4625
CLIENT: ALLEN, BEAU
GROWER:
SAMPLED:
FIELD: 1
CROP: PASTURE

AgSource Laboratories
A Subsidiary of Cooperative Resources International
323 6th St. • P.O. Box 1350 • Umatilla, OR 97882
Phone 541/922-4894 • Toll-Free 800/537-1129 • Fax 541/922-5496
umatilla@agsource.com • www.agsource.com

SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	S.Salt mmhos	O. M. %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN NO3 #/A	NITROGEN NH4 #/A	S ppm	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Bases	Base Sat.%	SMP Buf.pH	MOISTURE Total %	MOISTURE Avail. Inches	TKN %	Cl ppm
420		5.7			7	270	6.9	5.3											12.9		6.3				

TOTAL BROADCAST FERTILITY NEEDS:

NITROGEN: LBS PER ACRE N
PHOSPHORUS: LBS PER ACRE P205
POTASSIUM: LBS PER ACRE K20
SULFUR: LBS PER ACRE ACTUAL S
BORON: LBS PER ACRE ACTUAL B
ZINC: LBS PER ACRE ACTUAL Zn
MAGNESIUM: LBS PER ACRE ACTUAL Mg
OTHERS:

COMMENTS:

TOTALS:

YIELD GOAL/ACRE:
ACRES:
PREVIOUS CROP:
GYPSUM REQUIREMENT: TONS PER ACRE 6-INCHES
LIME REQUIREMENT: TONS PER ACRE 6-INCHES
DOLOMITE REQUIREMENT: TONS PER ACRE 6-INCHES

PREPLANT: _____

SIDEDRESS: _____

TOTAL INCHES:

SOIL TEXTURE ANALYSIS:

CLASS:

% SAND:
% SILT:
% CLAY:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD: DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %

NOTE: East of Cascades Riparian R & K restrictions/SMP 1/4 SMP Buffer; West of Cascades Weed Boards Apply. Restrictions on fertilizer recommendations may change after application of recommendations.

DATE : June 15, 2012
REPORT: S4625
CLIENT: ALLEN, BEAU
GROWER:
SAMPLED:
FIELD: 2
CROP: PASTURE

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323 6th St. • P.O. Box 1350 • Umatilla, OR 97882
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umatilla@agsource.com • www.agsource.com

SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	S.Salt mmhos	O. M. %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN NO3 #/A	NITROGEN NH4 #/A	S ppm	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Bases	Base Sat. %	SMP Buf.pH	MOISTURE Total %	MOISTURE Avail. Inches	TKN %	Cl ppm
421		5.4			4	402	8.2	7.8											17.0		5.9				

TOTAL BROADCAST FERTILITY NEEDS:

NITROGEN:	LBS PER ACRE N
PHOSPHORUS:	LBS PER ACRE P205
POTASSIUM:	LBS PER ACRE K20
SULFUR:	LBS PER ACRE ACTUAL S
BORON:	LBS PER ACRE ACTUAL B
ZINC:	LBS PER ACRE ACTUAL Zn
MAGNESIUM:	LBS PER ACRE ACTUAL Mg
OTHERS:	

COMMENTS:

TOTALS:

YIELD GOAL/ACRE:
ACRES:
PREVIOUS CROP:
GYPSUM REQUIREMENT: TONS PER ACRE 6-INCHES
LIME REQUIREMENT: TONS PER ACRE 6-INCHES
DOLOMITE REQUIREMENT: TONS PER ACRE 6-INCHES

PREPLANT: _____

SIDEDRESS: _____

TOTAL INCHES:

SOIL TEXTURE ANALYSIS:

CLASS:

% SAND:
% SILT:
% CLAY:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD: DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %

NOTE: East of Cascades Riparian R & K extraction/SMP 1/4 SMP Buffer pH West of Cascades Weak Bray Bray1 Acetate Kextraction Fertility recommendations are based on samples collected after application of any soil amendments.

DATE : June 15, 2012
REPORT: S4625
CLIENT: ALLEN, BEAU
GROWER:
SAMPLED:
FIELD: 3
CROP: PASTURE

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umatilla@agsource.com • www.agsource.com

SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	S.Salt mmhos	O. M. %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN NO3 #/A	NITROGEN NH4 #/A	S ppm	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Bases	Base Sat. %	SMP Buf.pH	MOISTURE Total %	MOISTURE Avail. Inches	TKN %	Cl ppm
422		5.5			7	195	10.5	10.1											21.1		5.9				

TOTAL BROADCAST FERTILITY NEEDS:

NITROGEN: LBS PER ACRE N
PHOSPHORUS: LBS PER ACRE P205
POTASSIUM: LBS PER ACRE K20
SULFUR: LBS PER ACRE ACTUAL S
BORON: LBS PER ACRE ACTUAL B
ZINC: LBS PER ACRE ACTUAL Zn
MAGNESIUM: LBS PER ACRE ACTUAL Mg
OTHERS:

COMMENTS:

TOTALS:

YIELD GOAL/ACRE:
ACRES:
PREVIOUS CROP:
GYPSUM REQUIREMENT: TONS PER ACRE 6-INCHES
LIME REQUIREMENT: TONS PER ACRE 6-INCHES
DOLOMITE REQUIREMENT: TONS PER ACRE 6-INCHES

PREPLANT: _____

SIDEDRESS: _____

TOTAL INCHES:

SOIL TEXTURE ANALYSIS:

CLASS:

% SAND:
% SILT:
% CLAY:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD: DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %

NOTE: East of Cascades Riparian R & K extraction/SMP 1/4 SMP Buffer pH West of Cascades Weak Bray Bray1 Acetate Kextraction Fertility recommendations are based on soil test calibration research conducted in the area where the sample was collected. Recommendations may differ if samples are submitted from outside the area.

DATE : June 15, 2012
REPORT: S4625
CLIENT: ALLEN, BEAU
GROWER:
SAMPLED:
FIELD: 4
CROP: PASTURE

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umatilla@agsource.com • www.agsource.com

SOIL ANALYSIS REPORT

Lab No.	Depth Foot	pH	S.Salt mmhos	O. M. %	P ppm	K ppm	Ca meq	Mg meq	NITROGEN NO3 #/A	NITROGEN NH4 #/A	S ppm	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	CEC meq	Na meq	Total Bases	Base Sat. %	SMP Buf.pH	MOISTURE Total %	MOISTURE Avail. Inches	TKN %	Cl ppm
423		5.6			4	186	10.5	8.1											19.1		6.1				

TOTAL BROADCAST FERTILITY NEEDS:

NITROGEN: LBS PER ACRE N
PHOSPHORUS: LBS PER ACRE P205
POTASSIUM: LBS PER ACRE K20
SULFUR: LBS PER ACRE ACTUAL S
BORON: LBS PER ACRE ACTUAL B
ZINC: LBS PER ACRE ACTUAL Zn
MAGNESIUM: LBS PER ACRE ACTUAL Mg
OTHERS:

COMMENTS:

TOTALS:

YIELD GOAL/ACRE:
ACRES:
PREVIOUS CROP:
GYPSUM REQUIREMENT: TONS PER ACRE 6-INCHES
LIME REQUIREMENT: TONS PER ACRE 6-INCHES
DOLOMITE REQUIREMENT: TONS PER ACRE 6-INCHES

PREPLANT: _____

SIDEDRESS: _____

TOTAL INCHES:

SOIL TEXTURE ANALYSIS:

CLASS:

% SAND:
% SILT:
% CLAY:

PLANT TISSUE ANALYSIS REPORT

Lab No.	FIELD: DESCRIPTION:	Total N %	Nitrate N ppm	S %	P %	K %	Ca %	Mg %	B ppm	Zn ppm	Mn ppm	Cu ppm	Fe ppm	Chloride ppm	Na ppm	Moisture %

NOTE: East of Cascades Riparian R & K extraction/SMP 1/4 SMP Buffer pH West of Cascades Weak Bray Bray1 Acetate Kextraction Fertility recommendations are based on soil test results only. Crop yield goals are based on realistic yields for your area. Actual yields may be affected by factors not measured by this soil test. Fertilizer recommendations are guidelines only and should be modified based on your experience with local conditions. Contact your local fertilizer dealer or agronomist for assistance in interpreting this report.

Appendix G

Manure Tests

DATE: JUNE 15, 2012
REPORT: M 2013
CLIENT: ALLEN, BEAU
SOURCE:
SAMPLED:
TYPE: MANURE

AgSource Laboratories
A Subsidiary of Cooperative Resources International
323 6th St. • P.O. Box 1350 • Umatilla, OR 97882
Phone 541/922-4894 • Toll-Free 800/537-1129 • Fax 541/922-5496
umatilla@agsource.com • www.agsource.com

MANURE ANALYSIS REPORT

LAB NO.	SAMPLE I.D.	UNIT	Total N	P2O5	K2O	Soluble Salts	Moisture	Solids
930	DRY STORAGE DRYER - SOLID	As Rec'd %	0.283	0.151	0.305	0.03	34.83	65.17
		As Rec'd #/T	23.574	12.617	25.387	2.29		
931	LIQUID TANK MOVE MOIST - LIQUID	As Rec'd %	0.265	0.092	0.165	0.07	85.47	14.53
		As Rec'd #/1000 gal.	5.300	1.833	3.301	1.50	1709.34	290.66

Appendix H

Oregon State University and Pacific Northwest Extension Publications

PNW 570-E • October 2003

Monitoring Soil Nutrients Using a Management Unit Approach



M.L. Staben, J.W. Ellsworth, D.M. Sullivan, D. Horneck, B.D. Brown, and R.G. Stevens

What's in this publication?

This publication focuses on how to design a soil nutrient monitoring strategy that fits today's requirements for record keeping and increased accuracy in managing nitrogen (N), phosphorus (P), and other nutrients. We advocate the use of management units or zones for soil testing and nutrient application. To measure a real change in soil test values over time, you will need to use consistent management units over many growing seasons.

In this publication, a management unit is considered an area in a field that is soil-sampled and fertilized separately for one or more nutrients. Different management unit delineations may be more appropriate for insect, weed, and disease control; irrigation water management; and other cultural practices.

The management unit approach is designed to provide better information to make nutrient management decisions at a reasonable cost. This approach combines the ease of traditional whole-field sampling and the power of an intensive grid sampling method (see pages 2–3). With a management unit approach, a grower can vary the amount and type of nutrient applications within a field without the need for grid sampling.

A monitoring strategy will answer only the questions it was designed to answer. Each field will have a specific soil sampling strategy. Key questions to consider when developing a soil testing strategy for nutrient management are discussed in this publication, including time of sampling, depth of sampling, number of subsamples, and location for sampling in the management unit.

A soil sampling protocol designed to measure changes in soil nutrient status over time must minimize random variability in soil test results. This is especially important when soil sampling is part of a required nutrient management plan. This publication suggests strategies for minimizing random variability.

Two examples of nutrient monitoring are provided to illustrate the process of deciding when, where, and how to sample, as well as how to interpret the soil test results. One example uses reference sampling areas

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A Pacific Northwest Extension publication
Oregon State University • University of Idaho • Washington State University

within management units, and the other uses random sampling throughout the management unit. These examples are intended to illustrate the process of using management units to make nutrient management decisions.

What are the advantages of the management unit approach?

The sidebars on this page and the following page describe two approaches to sampling: whole-field sampling and grid sampling. Each sampling strategy has limitations that can be overcome by adopting a management unit approach, as described in this publication.

The goal of using a management unit approach is to save money, and often time, compared to grid-based sampling methods, while obtaining more accurate data than that provided by whole-field sampling. The management unit approach is designed to provide many of the benefits of grid sampling while overcoming its high cost and other limitations. In many cases, this process allows growers to make fertilizer or amendment applications without the use of global positioning system (GPS) units and expensive variable-rate controllers.

Developing and using management units can allow a producer to apply amendments in varying amounts within a field. Higher levels of a particular nutrient can be applied in areas of the field that are likely to respond or have not reached a critical limit, while less or none can be applied in areas that have higher values and are less likely to respond. In most cases, this type of sampling plan satisfies many regulatory requirements while allowing the crop to be managed in a reasonable way.

Whole-field sampling

The whole-field soil sampling approach is a simple protocol used for many cropping systems. Soil cores are collected from the entire field, mixed together, and a single composite sample is sent to a laboratory for analysis.

The problem with whole-field sampling is that it treats the entire field the same regardless of differences in landscape position, soil characteristics, or cropping history. Thus, conclusions drawn from the soil test may not be appropriate for each part of the field. Often, average nutrient levels are found in only a small part of the field. The rest of the field is either higher or lower than the average. Basing fertilizer application on the field average means that some areas will be overfertilized and others will be underfertilized.

What criteria are used to divide a field into management units?

When deciding how to divide a field into management units, both soil features and the grower's needs and priorities for managing each field should be considered. The goal is to divide fields into areas that are more uniform than the field as a whole.

The basis for consideration can include inherent variability (soil texture, topography, mineralogy, drainage, soil test values), variability associated with current management (tillage, irrigation water distribution), and historical variability (previous crop yields, manure application, field leveling, old fence lines) within a field. The minimum size of a management unit should be defined by equipment size, so that each management unit is large enough to be fertilized separately.

Grid sampling

The most accurate picture of the characteristics of a field would be produced by sampling every point within the field. Since it is impractical to do so, grid sampling can be used as an improvement over whole-field sampling. First, a field is systematically divided into areas of uniform size and shape (called cells) to form a grid. Cells often consist of 1 to 5 acres. Then, samples (consisting of a composite of 10 or more cores) are taken from each cell and analyzed. Thus, each cell has its own sample and analysis result.

The purpose of grid sampling is to create a detailed map of the field that allows the grower to identify areas that will receive a unique management practice. Using software that estimates soil test results between cells, patterns of estimated nutrient availability can be determined and a nutrient application map created.

The main challenge of grid sampling is its expense. A 125-acre field can have as many as 125 individual samples (if the field is divided into 1-acre cells). On a farm of several hundred acres, the cost of sampling (labor and equipment) and lab fees can become prohibitive. On the other hand, some labs give a substantial discount to growers who grid sample.

Grid sampling does not need to be done every year for most soil tests. The cost could be spread over a rotation by sampling intensively before one crop to create management units and then taking a few samples in subsequent years to verify the spatial patterns of soil nutrients.

Another limitation to grid sampling is that the grid spacing chosen may either obscure or exaggerate variability caused by a regular pattern such as wheel rows or movable sprinkler lines. However, modified versions of grid sampling patterns can overcome this potential weakness.

Dividing a field into management units is a combination of art and science. The management unit approach for soil sampling described in this publication enables growers to use their knowledge of the field to help define management units. Often, management units can be delineated on the basis of soil color or other landscape features that are easy to identify visually.

Certain field features, such as areas where soil was removed for field leveling, are not clearly delineated on most maps. However, you might be able to obtain cut-and-fill maps from the operator who did the leveling. Such maps can be quite useful in delineating nutrient management units.

Consider using other sources of information to delineate management units. Maps produced from remote sensing data (e.g., aerial photos or satellite imagery) and yield monitors are useful visual aids. Other tools include geographic information systems (GIS) software and GPS units.

Time and skill are required to manipulate the raw map data into a format that allows overlay of maps for the same field. After a multiple layer map is created, many factors can be considered simultaneously to delineate management units. These maps are also useful for recording soil sampling locations within the field.

Where should I collect soil samples from within a management unit?

Collect soil cores throughout each management unit (unit sampling) or from a smaller reference sampling area within a management unit (Figure 1). Select one of these approaches, and use it consistently.

In the center-pivot irrigated field shown in Figure 1, each of the three management units is delineated by one or more soil properties or management practices. For example, Management Unit 1 may be an eroded hilltop, Management Unit 2 may consist of side slopes with shallow topsoil, and Management Unit 3 may consist of bottomlands with poor drainage and high organic matter. The sampling plan for the field on the left (A) uses a zigzag pattern to collect subsamples, or cores, across the entire management unit. Soil cores collected within each management unit are composited into one sample for that management unit. In the field on the right (B), reference sampling areas are established away from the edges of the field but near access points such as the pivot road.

The sampling location for each core may or may not be recorded (georeferenced).

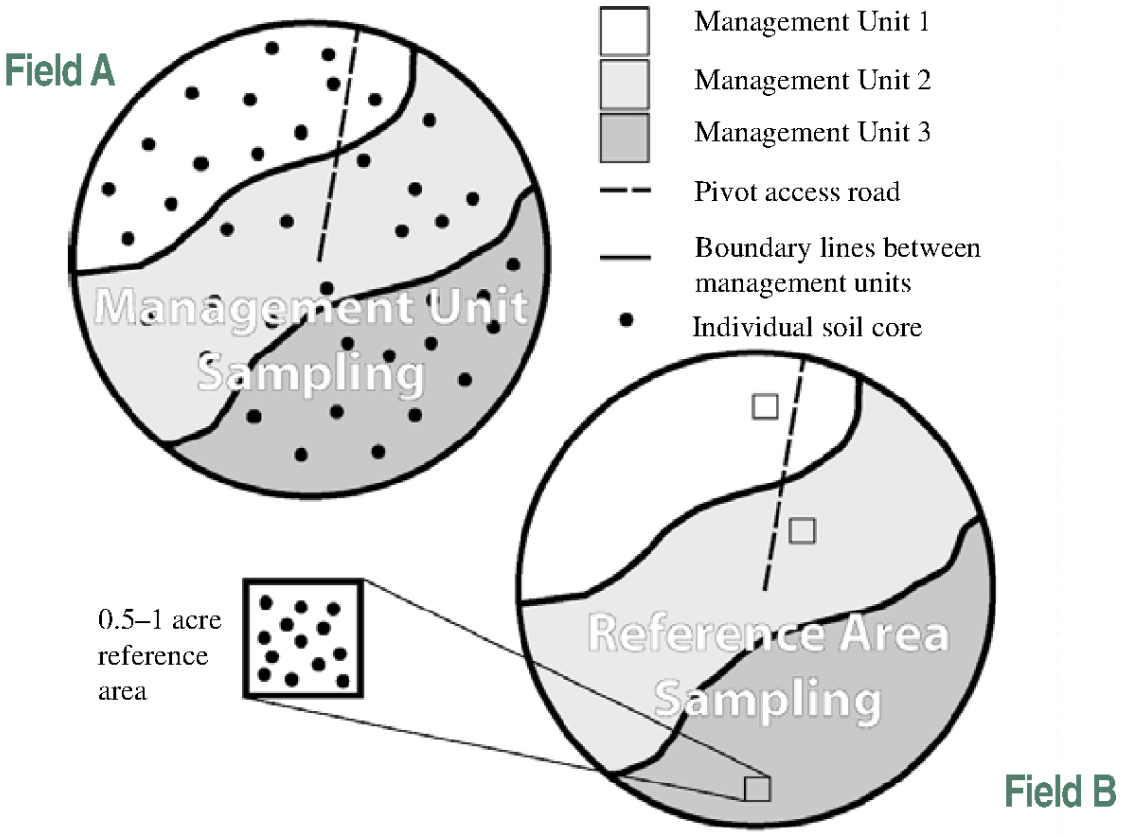


Figure 1.—Aerial view of two fields with a center-pivot overhead sprinkler irrigation system that have been divided into three management units. The top left field (A) illustrates a random sampling approach for sampling within each management unit. The lower right field (B) illustrates the reference sampling area approach for sampling within each management unit.

The benefit of georeferencing sampling locations is that in subsequent years you can return to the same areas with some degree of accuracy and minimize year-to-year variability. Georeferencing commonly is done with a GPS unit. Currently, the least expensive units can be accurate to ± 15 to 20 feet, under ideal conditions. Alternatively, it may be possible to install markers in the field that will withstand farming practices, allowing them to be found for future sampling.

For either the unit or reference sampling approach, avoid collecting samples from small, atypical areas such as animal feeding areas, gate and watering areas, corral and home sites, old roads, field edges, and eroded hilltops. It might be useful to analyze such samples separately for possible consideration as separate management units.

Management unit sampling approach

Take individual soil cores (10 or more) randomly over the entire management unit and mix them into a composite (Figure 1a).

Advantages of sampling randomly within management units include:

- One sample represents the entire management unit.
- Likely to provide better data than the reference sampling area approach when uniformity in soil or management practices (e.g., manure application) is uncertain.

Disadvantages of sampling randomly within management units include:

- Sample collection requires more time compared to sample collection by the reference sampling area approach (described at right).
- Heavy sampling equipment, if required, must be moved across the management unit.

Reference sampling area approach

Reference sampling areas are smaller sampling areas within a management unit. They can be used for representative soil sampling and other crop monitoring activities, such as plant tissue sampling, soil moisture measurement, or crop yield estimates. This method is most beneficial when heavy sampling equipment is used or when the management unit is very uniform.

The intensity of management and variability of the field should dictate how large an area can be represented by one reference sampling area. A local expert (university Extension personnel; private certified crop advisor, agronomist, or soil scientist; or Natural Resources Conservation Service personnel) can be consulted to assist you in determining what might be appropriate for your situation.

Reference sampling areas should be representative of the entire management unit and easy to access. To make sure a reference sampling area is representative, compare soil test values from proposed reference sampling area(s) with soil test values for a composite sample taken from the entire management unit (see "Management unit sampling approach").

Within each management unit, select an area of 0.5 to 1 acre for each reference sampling area (Figure 1b). Plan to georeference the four corners of the sampling area to minimize year-to-year variability. Ways to georeference reference sampling areas, besides using GPS, include using specific tree numbers in an orchard, measuring the distance from a fence or fixed equipment, or installing markers.

Advantages of reference sampling areas include the following.

- Fields can be sampled more quickly.
- It is easier to georeference sampling locations.

- You can use more than one reference sampling area within a management unit to allow for differences in known management variables (e.g., irrigation water distribution).
- There is more year-to-year consistency due to less spatial variability.

Disadvantages of reference sampling areas include the following.

- The reference sampling area may not represent the management unit as a whole.
- If georeference coordinates or field markers are lost, the exact location of the reference sampling area may be lost.
- Heavy traffic within the reference area may occur if care is not taken.
- The sampling area will be compromised if a nutrient or other amendment spill occurs within the reference sampling area.

The reference sampling area approach often is used for in-season testing for soil nitrate, because:

- More soil cores can be collected in a given amount of time.
- Fixed soil moisture monitoring sites (e.g., neutron probe) can be located within the same reference sampling area.
- Reduced sampling equipment traffic over the field reduces crop damage and soil compaction.

How to develop a plan for soil nutrient monitoring

Soil test data will answer only the questions the test was designed to answer. The following steps and questions can help you design a monitoring system tailored to your needs (Table 1). Two examples of how to develop a plan are included (see Examples 1 and 2, pages 10–13).

Table 1.—Considerations and questions for designing a soil nutrient monitoring plan.

Soil monitoring considerations	Specific questions
Objectives	• What is (are) your objective(s) for nutrient monitoring? • What nutrients or other soil chemical properties do you want to measure? • Are you required by any agreement to monitor specific nutrients or soil chemical properties?
Where to sample	• Should you collect samples throughout the management unit, or use a reference sampling area? • Do you plan to georeference locations where soil cores are collected? • What method will you use to georeference sampling locations?
How to sample	• When should samples be collected? • What soil sampling depth(s) are appropriate? • How many soil cores will be collected for each composite sample sent to a laboratory for analysis? • Should you sample using a zigzag approach or a systematic sampling method within the sampling area?

Table 2.—Typical frequency for assessment of changes in soil test values.

As needed for specific cropping system	Annually**	Periodic (once per crop rotation or every 3 to 5 years)	Once, if necessary, for initial site assessment
Nitrate-N (NO_3-N)*: preplant, in-season, or postharvest	extractable boron (B), total or sulfate-sulfur (S)***, electrical conductivity (EC)	pH, lime requirement, Bray or Olsen P, extractable bases (K, Ca, Mg, Na), extractable micronutrients (DTPA-Zn, Mn, Cu, Fe)	soil texture, cation exchange capacity (CEC), organic matter

* Soil testing frequency for nitrate-N varies widely for different cropping systems.

** For cropping systems with high-sodium (Na) irrigation water, an annual test for sodium absorption ratio (SAR) is recommended. The SAR test includes determination of exchangeable calcium (Ca), magnesium (Mg), and sodium (Na).

*** For sulfur (S), plant-tissue testing is preferred over soil testing. Soil test sulfur (sulfate-S or total S) is not a good predictor of crop yield response to S fertilizer in many situations.

Objectives

Think carefully about your objectives. Soil testing can be used just to monitor nutrient levels for record-keeping requirements, or it can be used to guide nutrient application decisions. Agricultural professionals (university Extension personnel; private certified crop advisors, agronomists, or soil scientists; and Natural Resources Conservation Service personnel) often can help in designing a customized sampling strategy.

What nutrients or other soil chemical properties do you want to measure?

Soil tests that provide useful information for nutrient management purposes are listed in Table 2.

One of the goals of a soil testing program may be to avoid excessive application of nutrients or salts. Repeated application of organic materials, such as compost, manure, or biosolids, typically results in buildup of one or more nutrients, and possibly soluble salts. As an example, if manure application rates are based on supplying enough N for the crop, other nutrients (e.g., phosphorus and potassium) usually are added at rates greater than crop utilization. Soil testing can be used to track nutrient accumulation over time.

Because each organic material (e.g., manure, biosolids, compost) contains a unique balance of nutrients, a nutrient analysis of the organic material often is helpful in deciding which soil tests are appropriate. General information about the nutrient concentrations present in various organic materials can be found in Extension publications (see "For more information").

Several tests commonly offered by agricultural testing laboratories—organic matter, ammonium-N (NH_4-N), and sulfur (S)—are less useful in assessing management effects on soil fertility. Their shortcomings are discussed briefly here.

Soil sampling for ammonium-N (NH_4-N) is not recommended unless fertilizer or other organic amendments have been applied during the past 30 days, or if soil has remained dry or cold since N application. In most situations, ammonium-N is rapidly converted to nitrate-N (NO_3-N) in soil.

Soil organic matter testing often is part of a "routine" soil test, but it has limited value for nutrient management. Most fertilizer guides for irrigated crops do not use soil organic matter as a basis for nutrient management recommendations. (Some dryland fertilizer guides use soil organic matter values to adjust N recommendations.)

Soil organic matter content changes very slowly in response to management changes (tillage or organic amendment addition). Annual testing of soil organic matter is not recommended because random measurement error usually obscures small changes in organic matter content over time. Periodic soil organic matter testing (once per crop rotation or every 5 years) may be useful in measuring the impact of long-term management changes that are expected to build soil organic matter.

For sulfur (S), plant-tissue testing is preferred over soil testing. Soil test sulfur (sulfate-S or total S) is not a good predictor of crop yield response to S fertilizer in many situations.

Are you required by any agreement to monitor specific nutrients or soil chemical properties?

Nutrient management plans required by state or federal agencies often specify required soil analyses and sampling frequency. At a minimum, a sampling plan should meet agency requirements (if applicable). For example, landowners who participate in the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) for nutrient management often are required to collect soil test data according to NRCS specifications.

Where to sample

Collect soil cores throughout each management unit (unit sampling) or from a reference sampling area within each management unit, as discussed previously in "Where should I collect soil samples from within a management unit?"

How to sample

When should samples be collected?

The recommended sampling frequency is based on the rate of change in soil test values over time (Table 2). Tests for soil characteristics that do not change greatly in response to fertilizer or organic amendment addition (e.g., soil texture and cation exchange capacity) often are not necessary.

Timing of soil sampling is most critical for nitrate-nitrogen, because this form of N is mobile in soil water. Generally, it is best to collect soil samples for nitrate-N analysis close to N fertilizer application time.

Soil tests for soil characteristics that change slowly in response to management (periodic soil tests in Table 2) are recommended once per crop rotation or every 3 to 5 years. For these tests, small variations occur seasonally due to soil biological processes, crop residue decomposition, soil water status, and tillage. In determining management effects on these soil test values, develop a consistent protocol for the timing of sample collection.

What soil sampling depth(s) are appropriate?

Consult university fertilizer guides or nutrient management guides for the crop. Determine the soil sampling depth and any other special considerations for soil sampling in a particular cropping system. For many agronomic crops, interpretive tables

for soil test values are based on a sample taken to a 0- to 6-inch or a 0- to 12-inch depth. However, some N recommendations are based on sample depths up to 24 or 48 inches.

Using shallower sampling depths, in some cases, can allow for the detection of changes in soil nutrient status before they would be detected using a traditional sampling depth (6 or 12 inches). For pastures and some perennial crops where tillage is absent, nutrients with limited mobility (e.g., P and K) may accumulate near the soil surface. Sampling closer to the soil surface increases the probability of detecting changes in soil test values over time.

In some cases it is useful to split a sample by depth. For example, if the university guide is based on a 12-inch depth, it might be useful to collect two samples, 0 to 3 inches deep and 3 to 12 inches deep. Splitting the samples by depth allows you to compare soil test values for the 0- to 12-inch depth (weighted average of 0- to 3- and 4- to 12-inch depths) with the fertilizer guide, while also evaluating changes in surface soil test values (0 to 3 inches) over time. Table 3 shows how to calculate a weighted average.

How many soil cores should you collect for a composite sample?

Increasing the number of soil cores (subsamples) taken in a sampling area generally increases the accuracy of the data. Fewer soil cores are needed to represent a smaller sampling area (Table 4). Mix soil cores thoroughly and submit a

Table 3.—Calculating a weighted average.

How measured	Sample depth (inches)	Soil core length (inches)	Soil test value (ppm)
Sampled	0–3	3	40
Sampled	4–12	9	20
Calculated*	0–12	12	25

*Weighted average of 0- to 3- and 4- to 12-inch depths is derived by:
[(core length x soil test value) + (core length x soil test value)] ÷ total sample depth

Example: [(3 x 40) + (9 x 20)] ÷ 12 = 25

Table 4.—Minimum number of cores per sample and size of sampling areas.

	Whole field	Entire management unit	Reference sampling area within management unit
Minimum cores/sample	20	10	5–8
Minimum acres/site	100% of field	varies	1% or less of management unit

composite sample to the laboratory. Check with the laboratory to determine the amount of soil needed for the desired analyses.

Should you sample in a zigzag pattern or use a systematic sampling method within the sampling area?

For some crops, a zigzag pattern or other haphazard approach to collecting soil cores is appropriate. Systematic sampling perpendicular to a furrow-irrigated bed, fertilizer band, or perennial crop row sometimes is used to reduce variability in test results. If you choose a systematic sampling method, you must use it consistently in order to compare soil test values over time.

Sampling checklist

Consistent sampling techniques are essential. Make sure each of the following aspects (each was discussed above) will be handled before going to the field to take soil samples:

- Nutrients to be monitored
- Size and location of management units or reference sampling areas
- Sampling depth(s)
- Number of cores per composite sample
- Systematic sampling instructions (if applicable)

See "For more information" for publications describing routine soil sampling collection and handling techniques.

Example 1: Monitoring nitrogen in a silage corn field

Two years ago a grower purchased a 75-acre field. The new owner has no soil test data and little information on how the field was managed. He plans to conventionally till the field and plant it to silage corn and is concerned about how best to manage nitrogen fertilization. He uses best management practices to ensure timely and even distribution of irrigation water via overhead sprinklers.

The grower has a 20-year old aerial photo of the field and the soil survey report for the area. The photo shows that there was a corral in a part of the field. The grower decides that the former corral area will need to be a separate management unit (Management Unit 1), and the rest of the field will be the second management unit (Management Unit 2).

Developing a monitoring plan

Nutrient monitoring objectives

The grower wants to determine an appropriate nitrogen application rate for silage corn in this field. From a longer term perspective, by creating management units, he will be able to more closely meet the nutritional needs of the crops and, ideally, to reduce his fertilizer expenses and possible nitrate loss from the field.

Because part of the field has been a corral, the grower suspects this area may have a higher nutrient-supplying capacity than the rest of the field. The grower does not own livestock and will not be applying manure to the field.



Table 5.—PSNT and at-harvest stalk nitrate-nitrogen for Example 1.

	Nitrate-nitrogen (mg/kg or ppm)	
	Management Unit 1 (old corral site)	Management Unit 2 (rest of field)
Soil test (PSNT) at six-leaf growth stage	30	10
Corn stalk at harvest	4,500	5,500

Sampling approach

The grower wants to keep his sampling plan fairly simple by using reference sampling areas in the two management units. The reference sampling areas are located on the same side of the field and are fairly close to the road for easy access. Should plant tissue testing become necessary, those samples also will be taken from the reference sampling areas.

The grower has a GPS unit and uses it to record the location of the four corners of the reference sampling areas in the two management units. He collects 10 cores (5 cores is the minimum per unit) in each reference sampling area to create a representative sample.

Both soil and plant tissue testing will be used to monitor crop N status. Soil samples (0- to 12-inch depth) will be collected at the six-leaf growth stage. Plant tissue (corn stalks) will be collected at harvest. A university nutrient management guide, *The Presidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington*, will be used to determine methods used in soil and plant tissue sampling. The guide also will be used to interpret soil test and plant tissue test results.

Results

Table 5 shows the results of soil and tissue testing for both management units.

The presidedress soil nitrate test value for Management Unit 1 (previous corral site) was above the 25 ppm nitrate-N sufficiency level given in the nutrient management guide. Thus, fertilizer N was not applied to this unit. Nitrogen was applied at sidedress time to Management Unit 2 at a rate of 100 lb N per acre as recommended in the guide.

The at-harvest stalk nitrate-N concentration in corn from Management Unit 1 was in the range required for optimum yield (above 3,500 ppm) given in the nutrient management guide. This result confirmed the decision not to sidedress N fertilizer in that management unit. Corn in Management Unit 2 had an at-harvest stalk nitrate value of 5,500 ppm, indicating that sufficient N was present for maximum yield. By using the management unit approach, yields were maintained and N fertilizer use was reduced.

Example 2: Monitoring soil phosphorus over a 6-year period

A grower has a 105-acre field that is irrigated with overhead sprinklers mounted on a wheel line. He wants to utilize composted manure from a drylot dairy and commercial fertilizers to supply nutrients for potatoes, a spring small grain crop, and a winter small grain crop grown in a 3-year rotation.

The grower worked with a consulting soil scientist to define management units for this field. The field was leveled many

Table 6.—Nutrient management strategies for Example 2.

Management unit	Initial soil test P	Strategy
1	15	Apply compost every year.
2	21	Apply compost every third year.
3	29	No compost applied.

years ago when it was furrow irrigated. Bare-soil aerial photographs were used to delineate management units defined by the amount of exposed subsoil. Soil color was directly related to topsoil depth, soil organic matter content, and soil test values. The management unit with the lightest color on the aerial photo, Management Unit 1, had the lowest organic matter content and the lowest soil test P value (15 ppm bicarbonate extractable P). Management Unit 3 had the highest organic matter content and the highest soil test P (29 ppm). Management Unit 2 had intermediate organic matter and intermediate soil test P (21 ppm).

Developing a monitoring plan

Nutrient monitoring objectives

The goal of the soil testing program is to efficiently use a combination of composted manure and fertilizer P to satisfy crop needs. Composted manure will be applied each year to Management Unit 1 (lowest soil test P) and every third year to Management Unit 2 (intermediate soil test P). Management Unit 3 will not receive composted manure application because it has higher soil test P values. (See Table 6.)

The phosphorus fertilizer rate for each crop will be determined using university nutrient management guides in conjunction with P soil test values for Management Unit 2 (intermediate soil test P) (Table 6). Phosphorus fertilizer (if needed for a particular crop) will be placed near the row at a single rate across the entire field. The grower does not have equipment capable of delivering a variable rate fertilizer application.

Sampling approach

Annual sampling will be used to track changes in soil test P over time. Because composted manure distribution across the field is not always uniform, the grower chooses a random sampling scheme, collecting soil cores in a zigzag pattern through each management unit. He records each management unit boundary and soil core collection location with a GPS unit to minimize year-to-year variation.

Management units will be sampled every year in the late winter or early spring. Samples will be taken at the 0- to 12-inch depth, as this is the depth recommended in university fertilizer guides for this region. From each management unit, 10 cores will be taken and composited into a single sample.

Results

Figure 2 (page 13) shows that soil test P values remained relatively constant in each management unit in the field over a 6-year period. All crops received adequate P for maximum yield.

The management unit approach allowed the grower to continue composted manure application to the portion of the field where additional P has agronomic benefit (Management Unit 1), while avoiding excess P buildup in the portion of the field

with higher soil test P values (Management Unit 3). Fertilizer costs were reduced because a portion of crop P needs was supplied by composted manure.

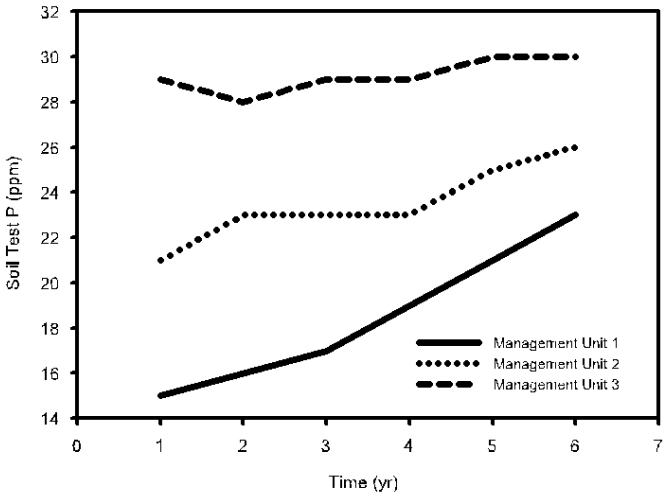


Figure 2.—Soil test P values for three management units in Example 2.

For more information

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Marx, E.S., J. Hart, and R.G. Stevens. Soil Test Interpretation Guide, EC 1478 (Oregon State University, reprinted 1999).

Many OSU Extension Service publications, including fertilizer guides for a variety of crops, may be viewed or downloaded from the Web. Visit the Publications and Videos catalog at **http://eesc.oregonstate.edu**.

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Post-harvest Soil Nitrate Testing

for Manured Cropping Systems West of the Cascades

D.M. Sullivan and C.G. Cogger

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What's in this publication?

This publication describes the use of post-harvest soil nitrate testing as a tool for assessment of nitrogen (N) management in manured cropping systems west of the Cascade Mountains in Oregon, Washington, and south coastal British Columbia.

The first section of this publication gives general information on the test and is designed for use by growers and dairy operators. This section gives a brief introduction to soil sampling, but does not provide all of the technical details. The focus is on how to use the post-harvest test to improve nutrient management. This section describes:

- What the post-harvest test measures
- How to collect soil samples
- Units used in soil nitrate testing
- How to interpret soil nitrate test results for grass and silage corn crops

In addition, background information explains the rationale for the test:

- How to use the post-harvest test as a management tool (page 3)
- Crop and soil response to excess plant-available N (page 4)

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The second section of this publication is designed primarily for use by conservation planners and other agricultural professionals working with farmers to implement nutrient management plans. This section is also designed for dairy operators who do their own soil sampling. This section includes detailed suggestions for the following:

- Collecting, preserving, and analyzing the soil sample
- Developing a long-term soil sampling plan

The post-harvest test and how to use it

What the post-harvest test measures

The post-harvest soil nitrate test measures the quantity of plant-available nitrogen present in the nitrate form in the surface foot of soil in the late summer or early fall. The test measures nitrate-N not utilized by the recently harvested crop. Because crops differ in their ability to remove nitrate-N from the soil, test interpretation is crop-specific.

The test looks backward in time. It evaluates the balance between N supply and crop uptake for the crops produced during the summer. Nitrate-N accumulates in the soil when more plant-available N is supplied than can be utilized by the summer crop (see "Crop and soil response to excess plant-available N," page 4).

Use the post-harvest test to:

- Get a general idea of balance between N supply from manure and other sources and crop N demand
- Identify imbalances in N supply among fields on a farm
- Identify fields that may respond to changes in timing or amount of manure application or other agronomic practices

Soil sampling protocols

Sampling depth

Sample the 0- to 12-inch depth for the post-harvest test. This shallow sampling depth is a good predictor of nitrate in the rest of the soil profile when (1) in-season irrigation is not excessive, and (2) samples are taken prior to heavy rains in the fall.

Composite soil sample

Collect a composite soil sample consisting of a mixture of 15 to 30 soil cores from each field or management unit. See "Collecting, preserving, and analyzing the soil sample" (page 9) for detailed sampling instructions and suggestions for special situations.

What fields to sample

In general, it is not necessary to sample every field on a farm every year. Consult with your farm advisor to determine any regulatory requirements for sampling frequency. We recommend that you sample selected fields that represent typical manure and crop management practices each year to track long-term trends in post-harvest soil nitrate values. See "Developing a sampling plan" (page 11) for more information.

When to sample

In general, samples for the post-harvest test should be collected as soon as possible after a crop harvest. Avoid sampling a field that has had manure application within the past 30 days.

Samples must be taken before heavy fall rains move nitrate below the 12-inch depth. Because the timing of fall rainfall is unpredictable, the best strategy is to sample fields before October 1 whenever possible.

Collect samples from medium- to fine-textured soils (loams, clay loams, and clays) prior to 5 inches of cumulative fall rainfall. Sandy soils (sand, loamy sand, or sandy loam soil texture) have lower water-holding capacities and should be sampled prior to

continues on page 5

How to use the post-harvest test as a management tool

Sampling depth and timing are critical. Interpretation tables for this test apply only to samples taken to a 12-inch depth. Surface soil (0 to 12 inches) typically contains the highest nitrate-N levels and requires the least time and effort for sample collection. Samples must be taken before heavy fall rains move nitrate below the 12-inch depth. The target sampling period generally is August 15 to October 15.

To get the most value from this test, it is important to understand:

- How the test fits into an overall nutrient management program
- Limitations to interpretation of test results
- How *not* to use the test

Using the test as part of a nutrient management program

The post-harvest test is but one measure of success in nutrient management. Post-harvest nitrate test data should be assessed in the context of the current N management plan and records of manure application. Successful N management involves a number of components, including:

- Assessing crop N needs
- Planning manure application to meet crop N needs
- Applying manure according to the plan
- Recording manure application amount and estimated plant-available N amount
- Measuring crop yield and N content
- Monitoring success of the plan

All components of the nutrient management system should be evaluated together.

Limitations to test results

Interpretive values for post-harvest soil nitrate are:

- Calibrated only for high-rainfall portions of the Pacific Northwest (west of the Cascades). Extrapolation to other environments is not recommended.
- Provided only for corn silage and grass hay/silage crops. Field research has been used as the basis for interpretive levels for these crops. Applicable research data are not available for other crops to determine post-harvest nitrate-N levels associated with good crop and nutrient management practices. However, the test may be used for relative comparisons among fields planted to another crop (e.g., comparisons among grass pasture fields).
- Based on the assumption that summer irrigation is less than, or close to, evapotranspiration to ensure that significant nitrate leaching does not occur before the fall test.
- Designed for fields with a history of applied manure (more than 3 consecutive years of regular manure application). Lower post-harvest soil nitrate test values are attainable where only fertilizer N is used, or where manure is applied infrequently.
- Based on good management of the crop and normal yields. Crop moisture stress, insect damage, or plant disease will reduce crop yield and crop uptake of nitrogen, thus increasing post-harvest soil nitrate test levels.

How *not* to use the post-harvest test

The test will *not*:

- Detect a shortage of plant-available nitrogen for crop production. Continual mineralization of nitrogen (conversion of organic N forms to plant-available N forms in the soil) can provide enough plant-available nitrogen for a crop without accumulation of nitrate-N in soil.
- Determine the source(s) of excess plant-available N. Sources of N may include manure slurry, lagoon water, fertilizer, soil organic matter, or previous crop residues.
- Predict crop response to fall manure or N fertilizer applications. The test does not predict the amount of plant-available N that will be mineralized from soil organic matter or crop residues in the fall.

Crop and soil response to excess plant-available N

Crop response to applied N. Crop N uptake is controlled by the environment, crop N uptake potential, and management. Crops respond to plant-available nitrogen supply (ammonium + nitrate-N) by the law of diminishing returns (Figure 1). Without added N, some crop yield is produced from N supplied by soil organic matter, residual plant-available N, and other non-fertilizer sources (e.g., mineralization of crop residues). Additional N supplied from manure or fertilizer increases crop yield until site yield potential is reached.

The application rate of manure or N fertilizer needed to reach near-maximum yield is termed the *agronomic rate*. Rather than a single agronomic rate, the crop response to N is best described as an agronomic rate range (Figure 1). The agronomic rate range concept allows for variability in crop performance among years and for crop uptake of N beyond the yield maximum (increased protein).

Post-harvest soil nitrate test measures nitrate-N not used by the crop. At excessive plant-available N supply levels, crop yield and crop N uptake do not respond to further N additions. The extra soil N not used by the crop accumulates as nitrate-N.

Elevated post-harvest soil nitrate-N concentrations are an indicator of one or more of the following: (1) excess plant-available N, (2) N supplied too late in the season for crop utilization, or (3) poor crop growing conditions due to insect infestation, moisture/heat stress, plant disease, or other cultural problems. If crop yields are acceptable and crop protein is at typical levels, then the most likely explanation is that plant-available N was supplied in excess of crop needs.

Because grass is more efficient than corn at N uptake, target post-harvest soil nitrate levels given in this publication are lower for grass than for corn. There are two key reasons that grass is more efficient than corn in N removal.

- Grass has a greater capacity to take up N supplied in excess of that needed for maximum yield. After enough N has been supplied for maximum yield, grass protein content increases in response to increased N supply. With grass, soil nitrate increases only when the available N supply exceeds that required to produce near-maximum protein. Corn does not take up additional N after the maximum yield is reached. Corn silage protein does not increase much in response to excess N supply.
- Grass utilizes N mineralized late in the growing season more efficiently. Grass managed for silage or hay continues to take up N until harvest. Corn grown for silage completes its N uptake approximately 4 weeks before harvest. Some of the soil nitrate measured after corn harvest is produced by mineralization of soil organic N to available forms during the final weeks of the growing season.

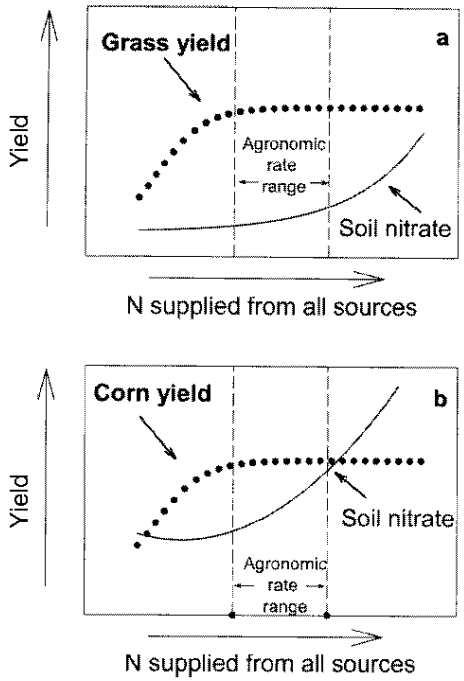


Figure 1.—Crop yield and soil nitrate response to increased N supply. Agronomic rate range = range of N supplied from all sources that results in near-maximum crop yield with acceptable post-harvest nitrate accumulation. Above the agronomic rate range, excess N accumulates as nitrate in soil. More nitrate accumulates in the agronomic rate range with corn (b) than with grass (a).

Table 1.—Average calendar date when cumulative rainfall (after September 1) reaches 5 inches west of the Cascades.[a]

Cumulative rainfall after Sept. 1	Calendar date to reach specified cumulative rainfall							
	Medford (OR)	Salem (OR)	Tillamook (OR)	Coupeville (WA)	Centralia (WA)	Lynden (WA) Abbotsford (BC)	Agassiz (BC)	Comox (BC)
(inches)								
3	10 Nov	20 Oct	26 Sep	31 Oct	8 Oct	1 Oct	26 Sep	10 Oct
5	29 Nov	1 Nov	8 Oct	24 Nov	23 Oct	15 Oct	9 Oct	25 Oct
7	16 Dec	13 Nov	18 Oct	15 Dec	4 Nov	27 Oct	19 Oct	6 Nov

[a]Average daily precipitation data for many other locations is available at: Western Regional Climate Center (http://wrcc.dri.edu) or Environment Canada (http://www.msc-smc.ec.gc.ca/climate/climate_normals/index_e.cfm).

3 inches of cumulative fall rainfall. The starting date for calculating cumulative fall rainfall is September 1. Include inches of irrigation water applied after September 1 in your estimate of cumulative rainfall.

Table 1 shows the average calendar date when cumulative fall rainfall (after September 1) reaches 5 inches at a variety of locations. For most locations, sampling prior to October 15 is acceptable in an average year. In high rainfall areas (coastal areas and the Cascade foothills), plan to sample earlier. A late October sampling date usually is acceptable in lower rainfall areas of southern Oregon, the Puget Sound islands, Olympic Peninsula, or Vancouver Island.

Units used in soil nitrate testing

In this publication, interpretation of a post-harvest soil nitrate test (Tables 3 and 4) is based on units of parts per million (ppm). Some labs report soil test nitrate-N in units of lb/acre by assuming a standard value for soil bulk density. If the lab reports nitrate-N results in pounds per acre, ask them to provide a conversion factor to express data in units of ppm. The conversion factor assumed by laboratories usually is between 3 and 4, because 1 acre-foot of dry soil usually weighs about 3.5 million pounds (3.5 lb per acre-foot = 1 ppm).

Table 2.—Units used to report soil nitrate analyses.

Name	Interpretation	Equivalent units
nitrate-N or NO_3-N	N present in the nitrate form, soil dry weight basis	mg/kg or ppm (dry weight basis)

Interpreting soil nitrate test results

Data quality and variability

The first step in evaluating your soil nitrate data is to verify data quality. Determine whether the sample collection method, timing of sample collection, sample preservation, and laboratory analysis methods are acceptable. Reject data that did not result from reasonable protocols. For example, Tables 3 and 4 should not be used for soil samples collected in November after heavy fall rains.

Make sure that you understand the units used to report test results. See Table 2 for an explanation of units found in soil test reports.

Response of post-harvest soil test N to changes in management

Success in N management is indicated by long-term trends in post-harvest soil nitrate (at least 3 to 5 years). **Because of the large pool of readily mineralizable N in manured soils, fall soil nitrate values may not decline for 3 to 5 years in response to improved management.** For multiyear comparisons, sampling methods and timing must be consistent.

Some portions of a crop rotation will have higher fall nitrate values because of rapid N mineralization stimulated by tillage or incorporation of crop residues. For example, soil nitrate concentrations typically are high, regardless of overall N management, after a perennial grass sod is plowed down and reseeded.

Reductions in fall soil N are most likely to be measured when (1) commercial N fertilizer amounts are reduced or eliminated, (2) cropping systems that maximize N removal in late summer and fall (August to October) are used, and (3) manure or N application is eliminated after August 1. It is more difficult to attain post-harvest soil nitrate-N values of less than 20 ppm for corn than for grass (see "Crop and soil response to excess plant-available N," page 4).

Interpretation for individual fields

Interpretations of soil test nitrate-N should be made first at the field level. You may be able to discover a probable cause for differences in test values among fields. Questions to ask include:

- Are relationships present between known management factors (e.g., manure application rate or timing, crop yield and quality, irrigation frequency, distance to the barn) and soil test values?
- Is a large amount of variation present between fields? Is there a logical explanation for unusual values?
- Are values for grass and corn fields similar?

Annual averages across grass and corn crops

After looking at test values for individual fields, it may be useful to look at averages across all grass or corn fields. You may want to calculate averages only for fields under similar management.

Average nitrate-N test values are most useful for consideration of changes in whole farm nutrient management. Tables 3 and 4 present interpretive information separately for grass and corn fields.

If a few fields have unusual test values, you may be justified in excluding those fields from an average. Although you may want to exclude unusually high test values from the farm average, you definitely should evaluate those fields further to determine the probable cause of the high soil test values. The unusually high test values may reflect the need for management changes or may reflect a soil sampling or analytical error.

Using the interpretive tables (Tables 3 and 4)

Interpretations and management suggestions given in Tables 3 and 4 (pages 7–8) are general in nature and should serve as only one portion of a nutrient management plan evaluation. Some of the management suggestions can be implemented for individual fields, while others need to be implemented on a whole farm basis.

Remember not to focus solely on post-harvest nitrate-N in evaluating N management. Include other important aspects of N management in your evaluation, such as success in following a plan for manure application, calibration of manure application equipment, maintaining good manure application records, and effective irrigation management.

Table 3.—Silage corn. Suggested interpretation for post-harvest soil nitrate-N (0- to 12-inch depth).[a]

If post-harvest nitrate-N is less than 20 ppm (less than approximately 70 lb N per acre)

- Continue present N management.

If post-harvest nitrate-N is 20 to 45 ppm (approximately 70 to 160 lb N per acre)

- Reduce or eliminate sidedress N fertilizer application. Use the pre-sidedress nitrate test (PSNT). Apply sidedress N only when PSNT indicates a need.
- Reduce lagoon water application after August 1.
- Keep records to document crop yield, dry matter, and crop N removal. Total applied manure-N + fertilizer-N should be less than 125 percent of documented crop N removal.
- Reduce manure application on fields where corn follows grass sod plow-down.
- Plan to reduce manure-N application by 10 to 25 percent.
- Improve whole farm N balance.

If post-harvest nitrate-N is greater than 45 ppm (greater than approximately 160 lb N per acre)

- Apply only starter N (20 to 40 lb N/acre at planting).
- Plan not to sidedress N fertilizer in June. Apply sidedress N only when PSNT indicates a need.
- Eliminate lagoon water application after August 1.
- Keep records to document crop yield, dry matter, and crop N removal. Apply manure N at a rate less than or equal to crop N removal (approximately 200 lb total N per acre).
- Eliminate manure application on a few fields or a few strips within a field next year to determine the contribution of mineralized N vs. current-season application of manure.
- Plan to reduce manure-N application by 25 to 40 percent.
- Consult experts to improve whole farm nutrient balance.

[a]The post-harvest test values listed above are for the *end* of a growing season. Management changes (if needed) should be implemented in future years. Interpretive values assume near-optimum crop yields. If yield is below average, improve agronomic practices to increase crop yield and crop N uptake.

Table 4.—Grass for hay or silage. Suggested interpretation for post-harvest soil nitrate-N (0- to 12-inch depth).[a]

If post-harvest nitrate-N is less than 15 ppm (less than approximately 55 lb N per acre)

- Continue present N management.

If post-harvest nitrate-N is 15 to 30 ppm (approximately 55 to 105 lb N/acre)

- Apply manure earlier in the growing season.
- Keep records to document crop yield, dry matter, and crop N removal. Total applied manure-N + fertilizer-N should be less than 125 percent of documented crop N removal.
- Check protein levels in forage. Grass crude protein greater than 21 percent is associated with increased potential for nitrate toxicity to cows.
- Plan to reduce manure-N application by 10 to 25 percent.
- Improve whole farm nutrient balance.

If post-harvest nitrate-N is greater than 30 ppm N (greater than approximately 105 lb N/acre)

- Apply manure earlier in the growing season. Reduce manure application after August 1.
- Keep records to document crop yield, dry matter, and crop N removal. Total manure-N + fertilizer-N should be less than or equal to crop N removal. Even if calculated crop removal exceeds 400 lb N per acre, apply manure-N + fertilizer-N not to exceed 400 lb N per acre per year.
- Consider reseeding or interseeding if grass yield is limited by poor stand or undesirable species.
- Check protein levels in forage. Grass crude protein greater than 21 percent is associated with increased potential for nitrate toxicity to cows.
- Plan to reduce manure-N application by 25 to 40 percent.
- Consult experts to improve whole farm nutrient balance and reduce danger of nitrate toxicity to cows.

[a] The post-harvest test values listed above are for the *end* of a growing season. Management changes (if needed) should be implemented in future years. Interpretive values assume near-optimum crop yields. If yield is below average, improve agronomic practices to increase crop yield and crop N uptake.

Detailed suggestions for soil sampling and planning

Collecting, preserving, and analyzing the soil sample

Tools for field sampling

Collect a sample that is representative of the entire sampling depth. For example, a representative sample for a 0- to 12-inch depth has the same amount of soil from the soil surface (0 to 6 inches) and from the bottom of the sampling depth (6 to 12 inches).

Always use a tool specifically designed for soil sampling. Don't use a shovel, because the samples won't be uniform with depth. Tools for soil sampling often are called soil probes or augers. There are several kinds available.

Push probes are tubes that you push into the soil. They have a T-shaped handle attached to a cylindrical tube (about 1 inch diameter) with a beveled tip. The tube collects a cylinder, or "core," of soil. Push probes work well in soft, uncompacted soils.

Hammer probes are designed for hard or compacted soils. They have a sliding weight (hammer) instead of a T-handle to drive the probe into soil.

Soil test consultants often use hydraulic probes mounted on a tractor or pickup to sample soils. These reduce the time and effort of sampling in hard soils. Gravelly and rocky soils are difficult to sample. A hydraulic probe with a rotating auger can sample some gravelly soils.

A mud auger or bucket auger is the best tool for hand-sampling at sites that are difficult to sample with push probes. Use an auger for compacted, muddy, rocky, or dry soils. Augers can be purchased from several manufacturers. A 2- to 4-inch diameter mud auger (open-sided) works best for most situations because it is easy to remove the sample from the bucket. Use a larger diameter auger for soils with large rocks. Augers sample a 4- to 6-inch depth. You will need to take several bites from the same hole to sample to 12-inch depth. You will collect a larger sample volume, about 5 to 10 times that collected with a push tube. Because of the extra effort required for auger sampling, use this method only if other sampling methods are difficult or impossible.

Field sampling protocol

Plan ahead. Use field maps and soil maps to divide the farm into different management units. A management unit is usually a field, but you may want to subdivide a large field if sections can be managed separately for nutrient application. The simplest approach is to collect a composite sample from the entire management unit. You may choose to restrict sampling to the dominant soil type if the management unit has soils that differ markedly in visual appearance (soil color, texture, organic matter).

Alternatively, you can restrict your sampling to a representative area (usually about an acre in size) within the management unit. Choosing a representative area within the field where manure application rate, timing, and uniformity are well documented is essential. If you use the "representative area" sampling approach, record the sampling location using a GPS receiver or record the distance from a fixed location (e.g., fenceline).

Avoid large buffer zones that are sometimes present adjacent to water bodies or roads, especially with big gun manure applicators. Avoid small atypical areas such as:

- Swales
- Very rocky or shallow soil (less than 12 inches deep)
- Site of an old manure pile or a feeding, watering, or resting area for livestock
- Abandoned field roads
- Field edges

Collect 15 to 30 soil cores from each management unit or representative sampling area with a push probe or similar tool. If you use an auger, 10 holes per management unit or zone is sufficient.

Choose sampling locations in a zigzag pattern across the field. Your general route of travel should be across rows, rather than down one row in the field. Make sure you sample within the part of the field where manure is routinely applied. For grazed pastures, choose sampling locations that have average crop growth and productive forage species.

Scrape away loose crop residues or manure present on the soil surface. Sample only the soil. Including the accumulated organic debris from the soil surface in the soil sample will increase variability in test results.

Once you are satisfied with a sampling strategy, repeat the same procedure each year. This will increase the validity of year-to-year comparisons of results.

Obtaining a representative sample from fields where manure has been injected into soil or placed in bands on the soil surface is difficult. The depth of manure injection, the width of injection zone, and the spacing between bands depend on equipment, soil, and the applicator. Some injection equipment can place manure below the 12-inch sampling depth used for the post-harvest nitrate test. Manure may be injected or banded more than one time per year, with several orientations in a field (e.g., north–south or east–west). Because of the added variability associated with manure injection or banding, plan to collect a larger number of soil cores to obtain a representative composite sample.

Sample handling

Mixing. If it is not too hard to break up the soil cores, break them, mix them all together, and homogenize thoroughly. Take a 1-cup subsample for shipment to the lab. If the soil cores are too hard to break apart, send the entire sample to the lab, where they can pass the sample through a mechanical grinder. Check with the lab to make sure they will grind and mix the *entire* sample before subsampling.

Preservation. Soils kept moist and warm continue to accumulate nitrate via biological activity after sampling. The simplest way to limit biological activity is to cool the soil after collection. Put the samples in plastic bags and place them in a cooler on ice while still in the field. Refrigerate them when you return from the field. Freeze the samples if they will be held longer than 48 hours before analysis.

Shipment. Keep the samples refrigerated or frozen until you deliver them to the lab. Contact the lab before you sample, so they will be prepared to receive the samples. Use a shipping method that will get the samples to the lab within 48 hours. You may want to freeze the samples before shipping to make sure they remain cool in transit.

Working with an analytical laboratory

Choose a laboratory that has experience with agricultural samples. Ask if they participate in the North American Proficiency Testing Program or a similar quality assurance program for agricultural testing labs. Find out what extraction and analytical procedures they use. Procedures should be consistent with those recommended for the western states (Gavlak et al., 1994).

Labs may use one of several colorimetric (color-based) lab procedures or they may use an electrode method to measure nitrate. Sample comparisons have shown that the colorimetric procedures usually are more precise than the electrode method.

Some testing labs also have sampling and consulting services. This can be convenient for people who have little experience in sampling or need help with sampling.

Find out how the lab reports soil test data. Standard units for soil nitrate-N are parts per million (ppm, Table 2). If you aren't familiar with the lab, it's a good idea to obtain a copy of a sample laboratory report.

Because you will use sample results to compare post-harvest soil nitrate across years, laboratory consistency over time is a major issue. A standard reference sample (soil sample with known concentration of nitrate) can help you assess laboratory variability. Consider submitting a standard reference sample (approximately 50 to 100 g dry weight) with a nitrate-N concentration of 20 to 45 ppm with each batch of soil samples. Keep track of test results for the standard reference sample over time. If you note a major error in the nitrate concentration reported for the standard reference sample, then the test data is questionable.

Standard reference samples are available from the North American Proficiency Testing Program (see "For more information," page 15). Standard reference samples must be dried, ground, and thoroughly mixed.

We do not recommend that you split a field sample to check laboratory consistency. The one-time nature of such comparisons, the uncertainty of obtaining a homogeneous sample, and the uncertainty of sample preservation in-transit to the lab limit the interpretation of split-sample data.

Developing a sampling plan

Nutrient management plans can be voluntary, required by regulatory agencies, or a part of an agreement with a conservation planning agency (e.g., Natural Resources Conservation Service or conservation district). If your nutrient management plan is not voluntary, consult the agency that supervises your nutrient management plan to determine whether they have specific requirements for how often fields must/should be sampled. Suggestions given here for sampling frequency are general in nature and are not intended to serve as policy for any agency.

Representative fields for long-term monitoring

Representative fields are fields that you sample every year to track trends in sample values over time. Select fields that represent typical management practices. Criteria that can be used to choose representative fields include: (1) records or estimates of annual manure application rate, (2) number of years of continuous manure application, (3) soil test values for P and K. On dairies where P and K fertilizers are not routinely applied, soil test values above 75 ppm P (Bray P1 method) and 400 ppm K (ammonium acetate method) usually reflect substantial manure application in the past.

Sample the representative fields every year to assess trends over time. If you grow corn silage and perennial grass forage, plan to sample at least four grass fields and four corn fields each year. At a small dairy (fewer than four fields), sample all fields each year.

Other fields

Periodically, you will need to evaluate the fields not designated as "representative" fields. Consider sampling all fields every 3 years. Compare whole farm soil data to representative field data.

If you have only a few fields with elevated soil test N, then focus management on those fields. If all fields on the farm give similar test data, then focus your N management efforts at the whole farm level. If representative fields consistently have test values of less than 15 ppm (grass) or less than 20 ppm (corn) over a 3-year period, and all other fields sampled have similar test values, consider reducing the number of post-harvest soil nitrate tests.

Sampling priority

Prioritize fields for fall sampling ahead of time so that you get high-priority fields sampled at an appropriate time. Highest priority should be given to representative fields used to track long-term trends. Fields with high manure application rates or elevated soil test N the previous year should also have a high priority.

Corn fields can be sampled for soil nitrate in June (PSNT, pre-sidedress nitrate test) or in the fall (post-harvest test described in this publication). You will get the most management information by sampling your high-priority representative corn fields both in June (PSNT) and after harvest. You also may want to sample fields with PSNT values greater than 45 ppm nitrate-N again in the fall.

For other corn fields where only one soil test per year is planned, we recommend using the PSNT in preference to the post-harvest soil nitrate test. The PSNT is preferred because test results are applicable to in-season N management. Growers can save money and reduce post-harvest nitrate by omitting sidedress N fertilizer application on fields where sufficient soil nitrate-N is present in June.

Sampling corn fields at PSNT time also will reduce the number of post-harvest samples that need to be collected during the short interval between harvest and the end of the fall sampling window (approximately October 15). If you miss a planned fall sampling on a corn field, consider sampling next year using the PSNT.

Grass fields are best sampled in the fall, using the protocols described in this publication. Think carefully about the best way to achieve consistent timing of sample collection for your fields. The timing of manure application and the timing of grass harvest are key variables to consider.

Samples collected shortly after manure application are not a good indicator of the balance between N supply and crop N demand over the entire growing season. If manure is applied late in the year, postpone soil sampling until after a fall grass harvest. Wait at least 30 days after a late-season manure application before sampling. Sampling need *not* be postponed until after the last manure application or until after the last grass harvest in the fall.

Questions and answers

Why is it difficult to achieve post-harvest nitrate-N less than 15 to 20 ppm with organic sources such as manure?

First, the timing and rate of application for organic sources is less flexible than for fertilizer N. Second, environmental processes that control the quantity and timing of N availability from organic sources are difficult to manage. The biggest factors controlling N availability are soil temperature and moisture. The timing of crop N uptake usually does not match the timing of N supplied from manure and other organic sources. Soil temperature and moisture often support continued release of available N after crop N uptake is complete.

Is there a relationship between soil organic matter content and potential N mineralization?

Research west of the Cascades has demonstrated a lack of correlation between soil organic matter content and N mineralization potential for soils having 3 to 8 percent organic matter. The active fraction of soil organic matter that controls annual N mineralization rates is a small proportion of total organic matter (usually less than 10 percent of total). Recent site management affects soil N mineralization potential; it does not have much effect on soil organic matter content. Because most soil total N is contained in soil organic matter, soil total N is also an unreliable indicator of mineralization potential.

What other soil tests can be used to provide information to guide N management for corn?

Soil nitrate testing in spring and early summer can assist with N management for silage corn. Test soil ammonium + nitrate-N several weeks after a spring manure application to track early-season N availability. Test soil nitrate when corn is at the four- to six-leaf stage (pre-sidedress nitrate test, PSNT) to determine the need for sidedress N application to corn.

How much variability should I expect in post-harvest nitrate-N test values for the same grass field sampled between August 15 and October 15?

It all depends on weather, soil biology, and crop management. A good stand of actively growing grass can maintain nitrate-N concentrations of less than 15 ppm throughout the post-harvest sampling period. Where soil is dry in late summer, increased N availability may occur for 2 or 3 weeks following the first heavy rain. It may be useful to take several soil nitrate tests from the same field in the fall to document changes in nitrate concentration with time. Soil nitrate values given in the interpretive table in this publication are for typical precipitation and sampling date.

Ammonium-N is plant-available. Why doesn't the post-harvest test include ammonium-N analysis?

Post-harvest ammonium-N analyses cost money, and they do not yield reliable interpretive information. Ammonium-N does not accumulate in soils supplied with an excess of plant-available N. It is rapidly converted to nitrate. Soil samples taken at least 30 days after manure application usually have negligible ammonium-N concentrations unless soil has remained dry.

Drying of soils after sampling releases ammonium-N from microbial biomass. Most dried soils have 2 to 20 ppm ammonium-N that is caused by the soil drying process. Dry soil ammonium-N concentrations are poorly correlated with other indices of N availability in controlled experiments.

Should post-harvest nitrate tests be used for fields with organic soils?

Other methods should be used to assess the success of nutrient management plans on organic soils. Goals for post-harvest nitrate-N of less than 20 ppm are difficult if not impossible to attain on organic soils, which contain more than 20 percent organic matter. These soils formed as organic matter accumulated under natural poorly drained conditions. Soil organic matter decomposition and N mineralization processes are greatly accelerated under typical farming practices such as artificial drainage and tillage.

Should I measure or estimate soil bulk density to estimate post-harvest nitrate-N in units of pounds per acre?

The variation in bulk densities among soils typically is less than the variation associated with soil nitrate sampling and testing. Interpretive information in this publication is based on units of parts per million (ppm; mg per kg dry soil). You can approximate soil nitrate-N in the surface foot of soil by assuming typical bulk density (ppm x 3.5 = lb/acre). This conversion factor is based on the weight of 1 acre-foot of soil at a bulk density of 1.3 g cm^3 (1 acre-foot = 3.5 million lb). Organic soils (more than 20 percent organic matter) have lower bulk density (0.6 to 0.8 g cm^3).

What is whole farm nutrient management?

The goals of whole farm management are: (1) to move toward a balance of nutrient imports and exports, and (2) to utilize nutrients on the farm at agronomic rates that minimize nutrient losses to the environment. Managing nutrients at the whole farm level requires knowledge of the major nutrient imports, major nutrient exports, crop

utilization of nutrients on the farm, and nutrient losses to air and water.

The Livestock and Poultry Environmental Stewardship (LPES) Curriculum, available through the Midwest Plan Service, includes a Web presentation of whole farm nutrient management principles and a worksheet for evaluating whole farm nutrient balance. See "For more information" (page 15) for details.

What is the role of post-harvest nitrate testing in connection with Comprehensive Nutrient Management Plans (CNMPs)?

CNMPs, developed by the Natural Resources Conservation Service (NRCS) or other nutrient management professionals under NRCS supervision, are broader than just nutrient management. Other components of a CNMP are: (1) manure and wastewater handling and storage, (2) land treatment practices, (3) record-keeping, (4) feed management, and (5) other waste utilization options.

Post-harvest nitrate test values may be used as part of a process to develop a new CNMP or to update an existing CNMP. The CNMP typically includes a plan for regular soil testing. Appropriate timing of the post-harvest nitrate test is critical (see "When to sample," page 2), while soil samples for P and K analysis may be collected any time of the year. Soil samples collected for the post-harvest nitrate test can be analyzed by routine agronomic soil testing procedures and used in developing plans for P and K utilization in a CNMP.

What are the implications of high nitrate concentrations in forages?

Nitrate in ensiled forages can interfere with normal fermentation processes, resulting in poor-quality forage. Forage nitrate affects the distribution of nitrogen compounds in silage. It is difficult to use the silage to formulate rations that meet cow needs for specific protein fractions. Enough nitrate is sometimes present in the silage itself to create a health risk to the animal. Grass silage that is greater than 21 percent crude protein should be tested for the level of nitrate-N. See Johnson et al. (2002) for interpretation of forage nitrate concentrations.

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Many OSU Extension Service publications, as well as additional gardening information, may be viewed or downloaded from the Web (http://eesc.oregonstate.edu).

Copies of many of our publications and videos also are available from OSU Extension and Experiment Station Communications. For prices and ordering information, visit our online catalog (http://eesc.oregonstate.edu) or contact us by fax (541-737-0817), e-mail (puborders@oregonstate.edu), or phone (541-737-2513).

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Soil Test Interpretation Guide

E.S. Marx, J. Hart, and R.G. Stevens

Regular soil testing is an important element in nutrient management. You can use soil tests as a diagnostic tool or to identify trends through time. To obtain meaningful test results, you must sample soil correctly, at the same time each year, and you must maintain records. For more information, see EC 628, *How to take a soil sample. . .and why (*see "For more information," page 7).

Soil testing laboratories use different test methods, which may influence results and sufficiency ranges. Therefore, the sufficiency ranges in this publication are accurate only for the test methods listed.

Soil tests used to evaluate fertility measure the soil nutrients that are expected to become plant-available. They do not measure total amounts of nutrients in the soil. Measurements of total nutrient content are not useful indicators of sufficiency for plant growth, because only a small portion of the nutrients are plant-available.

Adequate soil nutrient levels vary depending on plant species. Similarly, plant tolerance of excessive nutrient levels, nutrient imbalances, or less-than-optimum growing conditions varies. If excessive nutrient levels exist, review management to determine the cause.

Nutrient concentrations vary with soil depth. Depth of sampling, therefore, affects test results. To determine the proper sampling depth, you must consider the purpose of the soil test. To estimate nutrient availability for a crop prior to planting, sample soil to the depth where most root activity will occur. Shallow sampling sometimes is used to evaluate surface conditions in perennial crops where fertilizers have been applied to the soil surface. Deep sampling may be necessary to diagnose problems in orchards.

Soil test values do not vary greatly from year to year. Drastic changes in test values may indicate an unrepresentative soil sample or a laboratory error. When in doubt, submit a new sample or ask the lab to repeat the analysis.

This publication provides general guidelines for interpreting soil test results. Fertilizer guides for many individual crops are available from your county office of the OSU Extension Service or Washington State University Cooperative Extension, or from Extension and Experiment Station Communications, Oregon State University (see "For more information").

Nitrogen (N)

Plant-available nitrogen (nitrate and ammonium)

Plant-available forms of nitrogen are nitrate (NO_3^--N) and ammonium (NH_4^+-N). Soil concentrations of NO_3^--N and NH_4^+-N depend on biological activity, and therefore fluctuate with changes in conditions such as temperature and moisture. Nitrate is easily leached from the soil with high rainfall or excessive irrigation. Soil tests can determine NO_3^--N and NH_4^+-N concentrations at the time of sampling, but do not reflect future conditions.

When you collect samples for nitrogen testing, keep them cold, or dry them immediately to prevent NO_3^--N and NH_4^+-N concentrations from changing.

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Ammonium-nitrogen (NH_4^+-N)

Ammonium-nitrogen does not accumulate in the soil, as soil temperature and moisture conditions suitable for plant growth also are ideal for conversion of NH_4^+-N to NO_3^--N. Ammonium-nitrogen concentrations of 2–10 ppm are typical. Soil NH_4^+-N levels above 10 ppm may occur in cold or extremely wet soils, or if the soil contains fertilizer residue.

Nitrate-nitrogen (NO_3^--N)

West of the Cascades. Soil nitrate-nitrogen measurements are most useful as a post-harvest "report card" to evaluate N management. Nitrate remaining in the soil after harvest can leach during winter rains, contaminating surface and groundwater. If residual nitrate levels are consistently high, reduce fertilizer N inputs in future growing seasons.

Table 1.—Residual soil nitrate-nitrogen for evaluating N management.

	NO_3^--N in surface foot (ppm)*
low	<10
medium	10–20
high	20–30
excessive	>30

*See Table 13 (page 7) for conversion of ppm to lb/acre.

Mid-season measurement of soil nitrate is used for field corn production. See EM 8650, *The Pre-sidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington*, for more information.

East of the Cascades. In arid regions, soil nitrate (NO_3^--N) is evaluated by measuring NO_3^--N to the expected rooting depth of the crop to be grown. If test results are reported in ppm, convert to lb/acre using Table 13 (page 7). Then subtract the soil nitrate from the crop requirement to determine a fertilizer rate.

Failure to account for NO_3^--N in the soil can lead to over-application of nitrogen fertilizers. Also, irrigation water should be analyzed for NO_3^--N content, and fertilizer rates reduced accordingly. Proper irrigation increases N use efficiency and reduces nitrate leaching.

Total nitrogen

Total nitrogen analysis measures N in all organic and inorganic forms. Total nitrogen does *not* indicate plant-available N, and is not included in standard soil testing programs.

A typical agricultural soil in the Willamette Valley contains about 0.10 to 0.15 percent N, or approximately 5,000 lb N/acre in the surface foot. Only 1 to 4 percent of this total N becomes plant-available during a growing season. East of the Cascades, soils tend to have smaller amounts of total N.

Total N analysis, while not recommended as part of a standard soil testing program, may be better than organic matter analysis for estimating soil N supplying capability.

Phosphorus (P)

The Bray P1 (for acid soils) and the Olsen sodium bicarbonate ($NaHCO_3$) (for alkaline soils) tests estimate plant-available phosphorus. Soil testing laboratories also use several other extraction methods. For interpretation of results from other extraction methods, contact the laboratory that performed the analysis.

Phosphorus soil tests are an index of P availability. The test values cannot be used to calculate available lb P_2O_5/acre.

When sampling soil, you must be aware of previous P management. Phosphorus is relatively immobile in soil. If phosphorus has been applied in a fertilizer band, concentrations of P may persist where the band was placed. Avoid fertilizer bands when collecting soil samples.

Table 2.—Phosphorus soil test.

	West of Cascades (Bray P1 test) ppm P	East of Cascades (Olsen test) ppm P
low	<20	<10
medium	20–40	10–20
high	40–100	20–40
excessive	>100	>40

The phosphorus application rate necessary to correct P deficiencies varies depending on soil properties. Phosphorus availability decreases in cool, wet soils. In many situations, banded phosphorus applications are more effective than broadcast applications.

Phosphorus applications generally are not recommended if tests are high or excessive. High soil phosphorus combined with surface runoff can cause excessive growth of plants and algae in surface waters, damaging aquatic ecosystems.

Cations

Of the three primary cations (potassium, calcium, and magnesium), potassium requires the most management attention. Few crops have responded to calcium and magnesium in the Pacific Northwest.

If extremely high levels of a single cation exist, plant deficiencies of other cations may occur due to competition for plant uptake.

The soil test ranges in Tables 3, 4, and 5 are for the ammonium acetate extraction method. If a sodium bicarbonate ($NaHCO_3$) extraction is used, test values may be slightly lower.

Potassium (K)

Excessive soil potassium levels can result in elevated K levels in grass forage crops, which may be detrimental to animal health.

Table 3.—Extractable potassium (K).

	K
low	<150 ppm* <0.4 meq/100 g soil
medium	150–250 ppm 0.4–0.6 meq/100 g soil
high	250–800 ppm 0.6–2.0 meq/100 g soil
excessive	>800 ppm >2.0 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Calcium (Ca)

Calcium deficiencies usually are found only on very acid soils. They can be corrected by liming with calcium carbonate ($CaCO_3$).

Table 4.—Extractable calcium (Ca).

	Ca
low	<1,000 ppm* <5 meq/100 g soil
medium	1,000–2,000 ppm 5–10 meq/100 g soil
high	>2,000 ppm >10 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Magnesium (Mg)

Magnesium deficiencies on acid soils can be corrected by liming with dolomitic lime.

Magnesium toxicity can occur on serpentine soils in southwest Oregon.

Table 5.—Extractable magnesium (Mg).

	Mg
low	<60 ppm* <0.5 meq/100 g soil
medium	60–180 ppm 0.5–1.5 meq/100 g soil
high	>180 ppm > 1.5 meq/100 g soil

*See Table 13 (page 7) for conversions from ppm to meq/100 g soil.

Sulfate-sulfur (SO_4^{2-}-S)

Plants absorb sulfur in the sulfate (SO_4^{2-}-S) form. In high rainfall areas west of the Cascades, SO_4^{2-} is readily leached, and soil test data are not well correlated with plant growth. In arid regions east of the Cascades, soil test information may be useful. Also, irrigation water may contain significant amounts of sulfate-sulfur. Plant analysis often is useful for diagnosing sulfur deficiency.

Table 6.—Sulfate-sulfur, east of the Cascades.

	SO_4^{2-}-S (ppm)
low	<2
medium	2–10
sufficient	>10

Micronutrients

Deficiencies of micronutrients other than boron and zinc are uncommon. Availability of most micronutrients is largely pH-dependent; availability decreases as pH increases (except for molybdenum, which becomes more available as pH increases). Deficiencies rarely occur in soils with pH below 6.5.

Soil testing for micronutrients other than boron and zinc is recommended only when a deficiency is suspected. If you suspect a micronutrient deficiency, plant tissue testing may be a better diagnostic tool than soil testing.

Boron (B)

Crops such as alfalfa, table beets, brassicas, caneberries, and root crops have responded to boron fertilization on B-deficient soils in western Oregon. Tree fruits and alfalfa are examples of crops sensitive to low boron levels east of the Cascades.

While low levels of boron may limit plant growth, high concentrations can be toxic. When applying boron, apply uniformly and mix thoroughly with the soil.

Table 7.—Boron by the hot water extraction method.*

	B (ppm)
low	<0.5
medium	0.5–2
high	>2

*The hot water extraction method for boron may result in incorrectly high values on soils with high organic matter content.

Zinc (Zn)

Zinc values above 1.0 ppm using the DTPA extraction method are sufficient. Zinc deficiencies have been identified in some crops in certain regions. Corn, beans, grapes, hops, onions, and deciduous fruit trees are especially sensitive to low levels of available zinc. Deficiencies sometimes are associated with high soil P concentrations, soils high in fine clay and silt, or soils with high pH.

Copper (Cu)

Copper values above 0.6 ppm using the DTPA extraction method are sufficient. Copper deficiencies are uncommon. Deficiencies have been identified on muck soils such as those in the Klamath area in Oregon and the Colville area in Washington.

Manganese (Mn)

Manganese values above 1.5 ppm using the DTPA extraction method are sufficient. Manganese deficiencies generally occur only in soils with pH 7.0 or above. Manganese toxicity may occur on acid soils. On alkaline soils east of the Cascades, Mn availability may increase in acidified microzones where fertilizers have been placed. These acidified microzones can alleviate Mn deficiencies sometimes encountered on high pH soils. In some instances, however, acidic microzones can result in Mn toxicity.

Iron (Fe)

Soil testing for iron is not recommended. Most test methods do not discern between forms of iron, and therefore have little meaning for plant nutrition.

Iron deficiencies are uncommon on acid soils in the Pacific Northwest. Where deficiencies occur, they often are associated with acid soil plants, such as azaleas or rhododendrons, growing on soils with unsuitably high pH. Acidifying fertilizers such as ammonium sulfate will help correct problems.

Iron applications on alkaline soils are inefficient unless a chelated form is used. Lowering soil pH to increase iron availability on a field scale is not economical. However, adding acidifying materials such as elemental sulfur to fertilizer mixes can acidify microzones around the fertilizer material and increase Fe availability.

Foliar applications of Fe sometimes are used to correct deficiencies in fruit, turf, and other high-value crops.

Molybdenum (Mo)

Soil Mo concentrations are too low for most labs to evaluate. Molybdenum deficiencies are rare, and are of concern mostly for leguminous crops. Molybdenum-deficient legumes appear chlorotic. Liming to raise soil pH may alleviate deficiencies. Molybdenum-coated seed also can be used.

Excessive molybdenum in forage can harm animal health. If you suspect excessive molybdenum in your forage, determine Mo content by forage analysis.

Chloride (Cl^-)

Soil testing for chloride is not a common practice, and little data exists for interpretation of test results. Evidence indicates that wheat sometimes benefits from chloride applications. The values in Table 8 are based on wheat research in Montana and South Dakota. Little information exists on chloride soil testing in Washington and Oregon.

Table 8.—Chloride soil test ranges for wheat in Montana and South Dakota, 2-foot sampling depth.

	ppm	lb/acre
low	0–4	0–32
medium	4–8	32–64
high	>8	>64

pH, lime requirement (LR)

Soil pH is a measure of soil acidity. Most crops grow best if the soil pH is between 6.0 and 7.5.

Table 9.—Soil pH ranges.

	pH
strongly acid	below 5.1
moderately acid	5.2–6.0
slightly acid	6.1–6.5
neutral	6.6–7.3
moderately alkaline	7.4–8.4
strongly alkaline	above 8.5

Soil pH can be increased by liming. The soil pH test indicates *if* lime is needed. The lime requirement test determines *how much* lime is needed. Accurate lime recommendations cannot be made without performing an SMP or similar test.

SMP* lime requirement test

The SMP lime requirement test is used to estimate the amount of lime required to raise the pH of 6 inches of soil. The SMP test is performed by mixing soil with a buffered pH 7.5 solution and determining the pH of the mixture. During the reaction, the soil's reserve acidity lowers the pH of the SMP solution. Soils with low SMP values have high reserve acidity and high lime requirements.

Some soils may have a low pH (<5.3) and a fairly high SMP buffer value (>6.2). This condition can be caused by the application of fertilizer. In this case, the low pH value is temporary, and the pH of the soil will increase as the fertilizer completes its reaction with the soil.

Sandy soils also may have a low pH and high SMP buffer value. This condition occurs because sandy soils have low amounts of reserve acidity due to low cation exchange capacity (CEC). In such cases, a light application of lime (1 to 2 t/a) should suffice to neutralize soil acidity.

Table 10 is used to determine the amount of lime required, based on the SMP test, to raise soil pH to a desired level. The target pH is determined by the crop to be grown and possibly by other factors.

*SMP stands for Shoemaker, MacLean, and Pratt—the people who developed the test.

Without an SMP or similar test, there is no way to know how much lime is required to adjust soil pH to a desired level. Accurate lime recommendations cannot be made solely on the basis of soil pH.

Table 10.—SMP lime requirement—field scale.

SMP buffer	Tons/acre of 100-score lime needed to raise pH of surface 6 inches of soil to the following pH's			
	5.3	5.6	6.0	6.4
6.7	—	—	—	—
6.6	—	—	—	1.1
6.5	—	—	1.0	1.7
6.4	—	—	1.1	2.2
6.3	—	—	1.5	2.7
6.2	—	1.0	2.0	3.2
6.1	—	1.4	2.4	3.7
6.0	1.0	1.7	2.9	4.2
5.9	1.4	2.1	3.3	4.7
5.8	1.7	2.5	3.7	5.3
5.7	2.0	2.8	4.2	5.8
5.6	2.3	3.2	4.6	6.3
5.5	2.6	3.6	5.1	6.8
5.4	2.9	3.9	5.5	7.3
5.3	3.2	4.3	6.0	7.8
5.2	3.6	4.7	6.4	8.3
5.1	3.9	5.0	6.9	8.9
5.0	4.2	5.4	7.3	9.4
4.9	4.5	5.8	7.7	9.9
4.8	4.8	6.2	8.2	10.4

Example: If the "SMP buffer" value is 5.9, the amount of lime needed to raise the pH to 6.0 is 3.3 tons of 100-score lime/acre.

Table 11.—SMP lime requirement—gardens.

If the SMP lime requirement test is	Apply this amount of lime (lb/1,000 ft²)
5.4 or below	250
5.5–6.0	150–250
6.0–6.5	100–150
above 6.5	0

Some plants, such as blueberries, rhododendrons, azaleas, and cranberries, grow best in acid soils. Fertilizers such as ammonium sulfate can help maintain acidic conditions.

Sodium (Na)

Sodium is not a plant nutrient and therefore is not necessary for plant growth. High levels of sodium are detrimental to soil tilth and plant growth.

Sodium levels are evaluated based on Exchangeable Sodium Percentage (ESP). The ESP is the percent of the cation exchange capacity (CEC) occupied by Na.

ESP values above 10 percent are of concern. Excessive sodium levels can occur naturally or can result from irrigation with high-sodium water. Reclamation involves establishment of drainage followed by gypsum application and leaching with low-sodium water.

Soluble salts (SS)

Soluble salt problems usually are associated with arid regions such as eastern Oregon and Washington. Soils with high levels of soluble salts are called saline soils. Soils high in sodium are called sodic soils (see "Sodium"). Saline-sodic soils are high in both soluble salts and sodium. Soluble salts are measured by electrical conductivity (EC) of a saturated paste soil extract.

Table 12.—Soluble salts.

	Conductivity (mmhos/cm*)	ppm salt**
low	<1.0	<640
medium	1.0–2.0	640–1,280
high	>2.0	>1,280

*mmhos/cm is equivalent to decisiemen/m.

**Multiply mmhos/cm by 640 to estimate ppm salt.

Because salts move readily with water, salt problems often are transient. Salt toxicity can occur, and salts may leach before soil is tested. Low salt values, therefore, do not always rule out salt toxicity as a cause of problems.

Salt tolerance varies greatly among plant species. Seedlings are especially sensitive to high salt concentrations. Excessive salts may inhibit seed germination. Excessive fertilization and poor irrigation water quality are sources of salts.

Organic matter

Maintenance of soil organic matter is one of the most important goals of soil management. Accurate measurement of soil organic matter is difficult.

Many laboratory methods are used. Most methods are indirect; they measure soil carbon and make an assumption about the percent carbon content of organic matter. The Walkley-Black method is common and gives consistent results. The loss on ignition method can give inconsistent results and tends to overestimate organic matter.

When estimating potential nitrogen release of a soil, total N testing is preferred to organic matter determination. Neither approach provides accurate estimates of soil N availability. If you are monitoring changes in organic matter over time, use the same lab for all analyses.

Cation exchange capacity (CEC)

CEC is a measure of a soil's capacity to retain and release elements such as K, Ca, Mg, and Na. Soils with high clay or organic matter content tend to have a high CEC. Sandy soils have a low CEC. Soil CEC is relatively constant over time, so there is no need for repeated analyses.

CEC often is determined by the ammonium acetate (NH_4OAc) or sodium acetate (NaOAc) methods. While these methods are standard in many regions, there are potential sources of error. Errors are most likely to occur for soils containing appreciable amounts of $CaCO_3$ or gypsum.

Some labs estimate CEC based on soil texture, organic matter content, cations, and pH. Such estimates often are inaccurate. The "sum of bases" method for calculating CEC of alkaline soils can give inaccurate results, especially if there are significant amounts of free $CaCO_3$.

CEC determination can be important for predicting behavior of pesticides and other chemicals in soils.

Base saturation

Base saturation is the percentage of the CEC that is occupied by cations other than hydrogen (H) and aluminum (Al). Soils with low base saturation generally are acidic. Base saturation and pH increase together.

For more information

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Table 13.—Conversions.

To convert column 1 into column 2, *divide* by	**Column 1**	**Column 2**	**To convert column 2 into column 1, *multiply* by**
390	ppm K	meq K/100 g soil	390
200	ppm Ca	meq Ca/100 g soil	200
121	ppm Mg	meq Mg/100 g soil	121
230	ppm Na	meq Na/100 g soil	230
1	meq/100 g soil	cmol/kg soil	1
2*	lb/acre (7 inch depth)	ppm	2*
3.65*	lb/acre (1 foot depth)	ppm	3.65*
43.56	lb/acre	lb/1,000 sq ft	43.56
43,560	square feet	acres	43,560
2.471	acres	hectares	2.471

*These values vary with soil bulk density.

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EM 8585-E • Revised July 2007

NUTRIENT MANAGEMENT
FOR DAIRY PRODUCTION

Manure application rates for forage production

T. Downing, D. Sullivan, J. Hart, and M. Gamroth

Most dairies can supply all the nitrogen, phosphorus, potassium, and other nutrients needed for forage production by applying manure to forage crops. As a manager, your goal is to match nutrient supply with crop needs by deciding when and how much manure to apply.

This publication explains how to estimate the amount of manure to apply for forage production. To do so, you need:

- A current manure analysis for your dairy (see *Dairy Manure as a Fertilizer Source*, EM 8586)
- A list of forage crops to be produced
- A soil test for phosphorus and potassium from each field where manure will be applied

Applying too much manure leads to several problems. First, plants take up excess amounts of nutrients such as potassium. High-potassium grass forages can lead to health problems, especially in dry cows. Second, excess manure can add nutrients and microorganisms to runoff or surface water, and can provide nitrogen that can leach into groundwater.

Application rates in this publication are based on soil tests and growing conditions in western Oregon.

Manure analysis

Analyzing manure is critical to determining the correct application rate. If you don't test your dairy's manure, you can only guess its nutrient value.

Manure testing in western Oregon has shown more variation among dairies than within one dairy. Develop a manure nutrient history for your dairy by testing manure two or three times a year for 2 or 3 years. These records will help you manage nutrient resources.

Have manure analyzed for total nitrogen (N), ammonium nitrogen (NH_4-N), phosphorus (P), and potassium (K). Laboratories often perform these as a standard analysis package.

Call your county office of the OSU Extension Service or your local USDA Natural Resources Conservation Service office for sampling directions. *Laboratories Serving Oregon: Soil, Water, Plant Tissue, and Feed Analysis* (EM 8677) lists laboratories that test manure.

Crop nitrogen requirements

Nitrogen (N) typically is the limiting nutrient for crop production on dairies. Table 1, page 3, shows the estimated nitrogen removal rate (or uptake) for average yields of the most common forage crops grown on dairies. Values in the upper part of the table are on a dry matter (DM) basis; in the lower part, as-harvested values are adjusted for moisture. For example, 1 ton of forage dry matter is equivalent to 4 tons of harvested forage if the silage is 25 percent DM. When discussing nutrient removal, you need to know whether you are dealing with as-harvested or dry-matter values so that you can interpret values correctly.

Troy Downing, Extension agriculture faculty (dairy), Tillamook County; Dan Sullivan, Extension soil scientist; John Hart, Extension soil scientist; and Mike Gamroth, Extension dairy specialist; all of Oregon State University. This publication replaces EC 1094, *Calculating the Fertilizer Value of Manure from Livestock Operations.*

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Determining manure application rate

Your goal is to match manure nutrient application rates with crop removal rates. Table 1 and Figures 1 and 2 provide the information you need to determine nutrient removal for many annual and perennial crops. Instructions for using the table and figures follow.

1. In Table 1, find the crop you will grow. Let's assume it's perennial ryegrass. The table is arranged to help you separate different levels of intensity. For example, low-intensity harvesting might be only one or two cuttings per year, medium will be three to five cuttings, and high intensity is six to seven cuttings per year.
2. For our example, let's assume you harvest four times a year, and your ryegrass averages 15 percent protein. That is equivalent to 48 lb of nitrogen per ton of dry matter, yielding around 5 tons of dry matter (240 lb N) per year.
3. You need to replace 240 lb N/a/year from the four cuttings. This is equivalent to 60 lb/a of nitrogen per cutting.
4. Find the figure below (Figure 1 or 2) that represents the type of manure you want to apply. Let's assume you want to apply lagoon effluent, so you'll use Figure 2.
5. Figure 2 contains three lines representing N application rates of 50, 100, and 150 lb N/a. Find the line closest to the rate you need to apply. In this example, you'll use the line for 50 lb/a.
6. Select the manure analysis from your dairy for nitrogen on the left side of the graph. Assume a manure test shows that the effluent contains 6 lb/1,000 gal or 750 ppm N. Move to the right across the graph until you meet the line for the application rate you have chosen (50 lb N/a).
7. Now move straight down to the line labeled "effluent acre-inches to apply" and estimate the number of acre-inches of effluent to apply (in this case, about 0.3 acre-inch). Remember that you will need about 20 percent more nitrogen because no line exists for 60 lb N/a. Your final result will be about 0.4 acre-inch.

Testing your soil for P and K

Test your soil for phosphorus (P) and potassium (K) before applying manure. Table 2 (back page) provides interpretations of P and K soil tests.

If you've applied manure for more than 5 years, additions of P and K usually are not needed. For example, potassium usually is not deficient in soils

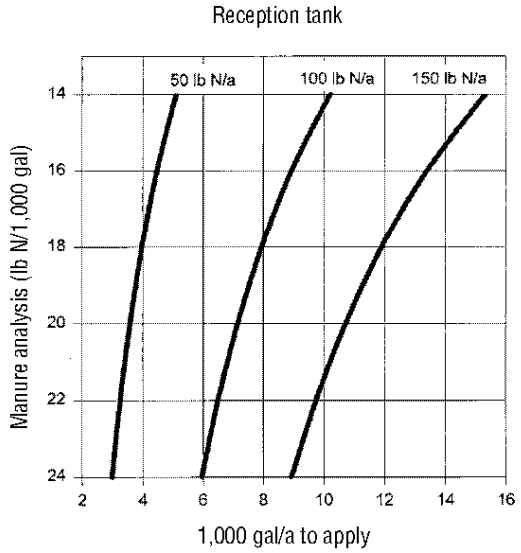


Figure 1.—Determining application rate for reception tank manure.

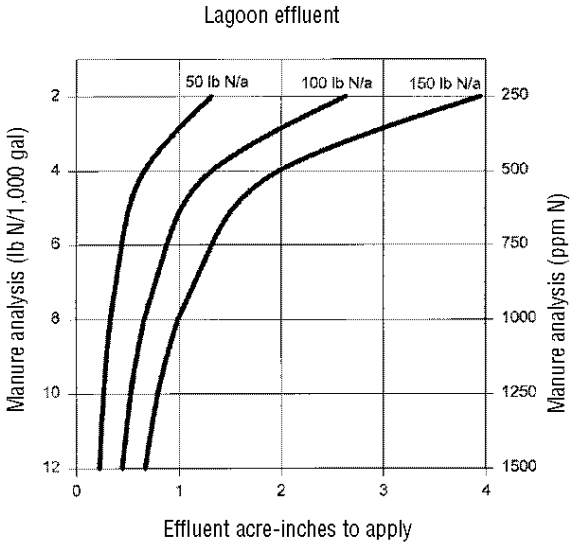


Figure 2.—Determining application rate for lagoon effluent.

Note: For reception-tank manure, approximately 70 percent of the total N is considered available. For lagoon effluent, 100 percent of the total N is considered available.

Table 1.—Nitrogen, phosphorus, and potassium removal of common perennial and annual forage crops.

Crop (dry matter)	Cuttings (no.)	DM[1] (%)	CP[1] (%)	N (lb/t)	P (lb/t)	K (lb/t)	DM (t/a)	N used (lb/a)
Red clover	1	100	18	58	8	48	4	232
Alfalfa hay	3	100	20	64	8	42	5	320
Perennial grass (low intensity)	1–2	100	10	32	6	38	4	128
Perennial grass (medium to low intensity)	2–3	100	12	38	6	38	4.5	171
Perennial grass (medium intensity)	4–5	100	15	48	7	38	5	240
Perennial grass (medium to high intensity)	5–6	100	18	58	8	40	6	348
Perennial grass (high intensity)	6–8	100	20	64	8	40	7	448
Annual ryegrass	1	100	12	38	6	38	4	152
Annual ryegrass	2	100	15	48	7	40	5	240
Corn silage	1	100	8	25	4	20	8	200
Small grains (boot stage)	2	100	12	38	5	32	5	190
Small grains (soft dough)	1	100	8	25	5	30	4	100
Crop (as harvested)	**Cuttings (no.)**	**DM[1] (%)**	**CP[1] (%)**	**N (lb/t)**	**P (lb/t)**	**K (lb/t)**	**AH[1] (t/a)**	**N used (lb/a)**
Red clover	1	25	5	14	2	12	16	232
Alfalfa	3	30	6	19	2	12	16	320
Perennial grass (low intensity)	1–2	30	3	10	2	11	13	128
Perennial grass (medium to low intensity)	2–3	30	4	11	2	11	15	171
Perennial grass (medium intensity)	4–5	30	5	14	2.1	11	17	240
Perennial grass (medium to high intensity)	5–6	30	5	17	2.4	12	20	348
Perennial grass (high intensity)	6–8	30	6	19	2.4	12	23	448
Annual ryegrass	1	30	4	11	1.8	11	13	152
Annual ryegrass	2	25	4	12	1.8	10	20	240
Corn silage	1	25	2	6.7	1	5	30	200
Small grains (boot stage)	2	30	4	11	1.5	10	16	190
Small grains (soft dough)	1	30	2	8	1.5	9	13	100

[1]DM=dry matter; CP=crude protein; AH=as harvested

where manure has been applied unless the applications were light and a high yield of grass hay was removed. A manure application that meets crop N needs usually supplies sufficient amounts of P and K. Manure contains as much, if not more, K than N. For more information, see *Dairy Manure as a Fertilizer Source* (EM 8586).

In fact, fields that have received manure for a decade or more often have high soil test values for P and K. Fields with soil test K above 1,000 ppm can produce grass forage with a high K concentration. Dry cows fed grass forage containing more than 3 percent K may become seriously ill or die.

In some cases, a soil test shows excessive K, but N is needed. In this case, if another area is available for manure application, apply manure there and buy N fertilizer for the area that has excess K.

Contact your county office of the OSU Extension Service for additional information.

Soil and plant tissue testing for N

The tables and figures in this publication only estimate manure application rates. A soil test for nitrate nitrogen or a stalk nitrate test for silage corn can aid in adjusting manure application rates.

Table 2.—Interpretation of soil tests for P and K.

	Nutrient (ppm)	
Soil status	Phosphorus (P)	Potassium (K)
Deficient	below 25	below 150
Sufficient	25–50	150–500
High	50–75	500–1,000
Excess	above 75	above 1,000

For more information, see *The Presidedress Soil Nitrate Test* (EM 8650) and *Post-harvest Soil Nitrate Testing for Manured Cropping Systems West of the Cascades* (EM 8832).

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Feed Management

A tool for balancing nutrients on dairies and other livestock operations

M. Gamroth, T. Downing, and P. French

Many studies have shown that dairies consistently overfeed nutrients such as phosphorus (P) and potassium (K). This practice is expensive and potentially damaging to the environment and to animal health. This publication suggests ways to improve feed management and thus avoid overfeeding P and K. Proper ration balancing is good for the environment and for the producer's bottom line.

Phosphorus

Phosphorus is an important plant nutrient for growing dairy forages. Unfortunately, on many dairies, more P is excreted and stored in manure than can be used during a crop year. Application of P to crops at rates greater than crop needs allows P to accumulate in soil. Soils have the ability to store moderate overapplications of P for future crop production, but continued over-application can lead to losses of P to surface water.

Of all the essential dietary minerals for dairy cattle, P represents the greatest potential risk for environmental damage via pollution of surface water. In Oregon, most dairy producers report that surface water borders their farm property, creating a high risk of water contamination.

The concentration of P in manure is positively correlated to the concentration of P in the diet. Therefore, feeding P in excess of requirements results in greater excretion of P. Thus, managing dietary P levels to reduce P excretion should help minimize water contamination.

Over the past decade, numerous field studies and surveys have reported overfeeding of P to lactating dairy cows. Dairy producers around the country were reported to feed as much as 40 percent above the level recommended by the National Research Council (NRC).

A recent survey of dairy herds in Virginia showed that the average P concentration in the diet was 0.49 percent, while calculated requirements averaged only 0.34 percent. In many herds, P could be reduced by 45 percent if diets were formulated to meet NRC requirements. By formulating rations more precisely, dairies in this survey could reduce the P in manure by 71 percent and save $8 to $15 per cow in feed costs each year.

Research conducted in 2003 indicated that Oregon producers were overfeeding P by 18 percent. The average dairy in this study needed 100 more acres to agronomically apply the P being overfed.

Much of the overfeeding has been attributed to a 1951 publication that reported improved conception rates in dairy cattle that consumed higher levels of P. However, this improvement

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Mike Gamroth, Extension dairy specialist; Troy Downing, district dairy agent; and Patrick French, assistant professor of dairy nutrition.

occurred in cows consuming P-deficient diets (less than 0.25 percent). Therefore, over the past 50 years, the importance of dietary P for reproductive performance has been overemphasized. Recent studies have shown no beneficial effect on reproduction or production when recommended dietary P concentrations are exceeded.

Even without overfeeding, there is potential for concentrating P on the farm. Consider a 400-cow dairy. If we assume a P requirement of 0.4 percent and animals eat 50 pounds of dry matter daily, each animal needs 0.2 pound P per day. Multiplying by 400 cows and 365 days shows that the dairy will consume 29,200 pounds of P in feeds each year. If cropping on the farm removes 35 pounds P per acre per year, the dairy needs 835 acres of cropland to utilize this P, or more than 2 acres per cow!

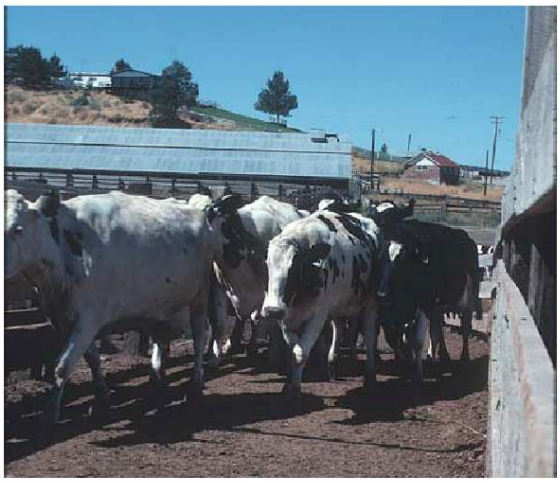
The good news is that not all consumed P is excreted in manure. However, a dairy cow absorbs only about 30 percent of feed P to support her body maintenance and production. Thus, she excretes 70 percent. This seems like a low absorption rate, but 45 to 60 percent of consumed P is indigestible without special extraction prior to feeding. Animals fed deficient or marginally deficient diets absorb more P, so overfeeding this nutrient reduces the absorption rate and adds more P to the manure.

Thus, it is clear that strategies to avoid excess P in the diet are essential to reducing the potential for excess P accumulation on the dairy.

Potassium

When applied in excess, some nutrients accumulate within plants instead of in the soil. One such nutrient is potassium (K); forages are able to consume K in excess of plant need. When excess K is applied to soil, it is taken up by the plant and harvested with the forage.

Although K is not an environmental concern, it has been implicated in the incidence of metabolic disease around the time of calving. Forages are the primary ingredients of the



prepartum cow's diet, and the use of high-K forages increases the incidence of milk fever, which can lead to other metabolic diseases.

In 1998, Oregon dairy producers were overfeeding K in dry cow rations by 2.5-fold. Potassium continues to be overfed in the diets of both lactating and dry cows. Of particular concern is the increase in overfeeding that has occurred in dry cow diets during the past 5 years. The ability to grow low-K forages for dry cow rations will continue to challenge the industry.

Sources of excess nutrients

Much of the P and K brought onto a dairy is in livestock feeds. Research in 1992 looked at whole-farm balances for three dairies and a beef operation in an Oregon watershed listed as water-quality-impaired due to P. The dairies each milked about 100 cows, raised their own heifers, produced part of their forages, and grew crops for sale. Not surprisingly, much of their imported P came from feeds brought onto the farm (Table 1).

Table 1. Phosphorus imported onto livestock operations, Washington County, Oregon, 1992.

	Total P (lb)	Feed P (lb)	Feed P (%)
Dairy 1	3,383	2,400	71
Dairy 2	13,321	6,500	49
Dairy 3	10,354	5,700	55
Cow/calf beef	1,040	1,000	96

Using feed management to avoid overfeeding

In 2003, the U.S. Environmental Protection Agency released new guidelines for Concentrated Animal Feeding Operations and Animal Feeding Operations (CAFOs/AFOs). Under these guidelines, CAFOs/AFOs are required to develop a Nutrient Management Plan (NMP). One type of NMP is a Comprehensive Nutrient Management Plan (CNMP) as defined by USDA's Natural Resources Conservation Service.

There are six core elements of a CNMP: (1) feed management, (2) manure and wastewater handling and storage, (3) nutrient management, (4) land treatment, (5) record keeping, and (6) other manure and wastewater utilization options.

As noted above, feed represents the largest import of nutrients to the farm (followed by commercial fertilizer). Most animal livestock and poultry operations could reduce imports of nutrients in feed, particularly nitrogen and phosphorus. Good ration balancing includes giving credit to the minerals in all feeds, developing rations to consistently meet animal requirements, and avoiding the use of "insurance" supplementation.

Some or all of the following feed management strategies can become part of a farm's NMP:

- Formulate diets closer to animal requirements. Most species require a P concentration of 0.16 to 0.4 percent of ration dry matter. Many traditional feed sources contain adequate or abundant P for supporting animal growth and milk production. Table 2 shows typical P values of feeds. (All feeds, especially by-products, vary in nutrient content. It is wise to analyze each feed ingredient to know its nutrient content, including P.)

Table 2. Typical P content of selected feeds.

Feed	% P (dry matter basis)
Almond hulls	0.13
Barley grain	0.39
Brewer's grains	0.67
Canola meal	1.10
Cereal silage	0.31
Cool-season grass	0.23
Corn grain	0.30
Corn silage	0.26
Distiller's grain	0.83
Legume hay	0.26
Oats	0.40
Soy hulls	0.17
Soybean meal	0.70
Wheat bran	1.18
Wheat midds	1.02
Whole cottonseed	0.60

- Analyze livestock drinking water to determine the mineral content and adjust the diet to account for this source of nutrients.
- Decrease crude protein levels in feed and supplement with amino acids.
- Manipulate the crude protein and energy (carbohydrate and fat) content of the diet to enhance the availability of amino acids.
- Use highly digestible feeds, as appropriate.
- Consider potential impacts of alternate feed ingredients (e.g., by-products) on the nutrient content of excreted manures.
- Use concentrates and forages grown on-farm to minimize the quantity of nutrients imported and maximize the recycling of nutrients on-farm.
- Use phytase and decrease the supplemental phosphorus content of the diet for nonruminants.
- If P is being overfed, decrease P in the diet.
- Use growth enhancers as allowed by law.
- Implement phase feeding. Consider nutrient requirements based on stage of growth, intended purpose of the animal, and type of production (e.g., meat, milk).

- Implement split-sex feeding.
- Use other feed management or diet manipulation techniques that have demonstrated the ability to decrease manure nutrient content.

Record keeping

Review farm feeding practices periodically to determine whether adjustments or modifications are needed. Records can help monitor progress in feed management. Useful records might include:

- Feed analyses and ration formulation (including formulations used before and after implementing a new feeding strategy). Routinely analyze feed to document the rates at which nitrogen and phosphorus were fed. When rates fed differ from the planned rates, records should indicate the reasons for the differences.
- Manure analyses—to determine manure nutrient content (both before and after implementing a new feeding strategy).
- Soil tests—to determine accumulation or depletion of P and K in the soil (both before and after implementing a new feeding strategy). Remember that soil composition does not change overnight; it takes years to reflect dietary changes.

Conclusion

As farms increase animal numbers relative to the acres of land managed, it becomes more important to evaluate and manage the whole-farm nutrient balance. This management involves both reducing mineral imports through a feed management program *and* increasing nutrient exports off the farm.

Reduce P and K brought onto the farm

- Test soils and target manure applications to reduce use of purchased fertilizers.
- Balance rations often to precisely meet P requirements by production stage. Don't ignore the P provided in by-product feeds. Avoid free-choice and ready-to-use minerals not matched to feeds. Supplemental K is not required on most farms.
- Plant appropriate varieties of forages or cereal grains for higher yield and quality.

Increase P and K sent off the farm

- Maintain an efficient herd or flock for best conversion of feed to animal product.
- Develop a manure management system that allows for export of manure off-farm. Composting dries the product, reduces volume, and is more acceptable to users. Lagoon sludge is rich in P; find a place for it off the farm.
- Consider planting cash crops that pull P and K out of soils.
- Prevent animal mortality. Dispose of carcasses off-farm when possible.
- Contract graze with other producers when forage exceeds farm needs.

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Annual Manure Application Schedule for Western Oregon

M. Gangwer, B. Wilson, and M. Gamroth

The overall objective of manure management should be to take as many excretable manure nutrients to the soil and have them used by plants for optimal crop yield. This reduces the need to purchase feed and inorganic fertilizer. The usual outcome of manure management is finding as many acres as possible for manure application. Manure application scheduling depends on the type of manure.

Apply *liquid manure* on a schedule that provides nutrients in the soil root zone in anticipation of crop growth. Apply when soils are at field capacity or less moisture content, i.e., some air space exists in the topsoil. (See Figure 1.) There are several ways to measure soil moisture. You can squeeze a handful of soil and see whether it clumps together. If it does, it probably is at least at field capacity. If water runs out of your hands, then the soil probably is near or at complete soil saturation. You also can measure soil moisture with portable soil meters, tensiometers, watermarks, or other sensory devices.

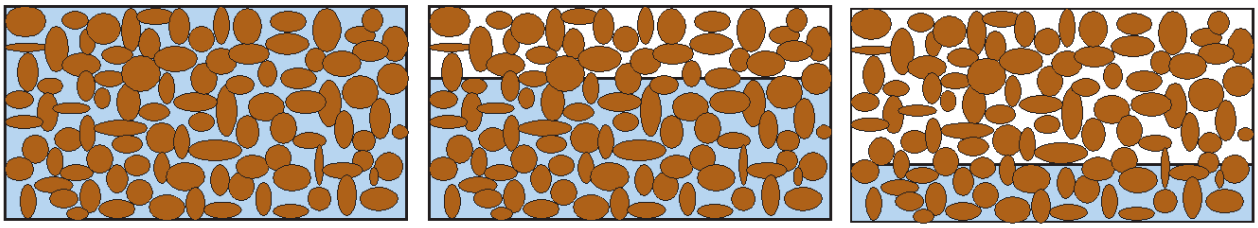
Apply *solid manure* in such a manner that it will not leave the field surface during rainfall events or flooding.

Spring and summer are the best times for manure application. Empty all storage facilities by October 1 of every year in preparation for the winter storage season.

Soil testing is an important part of manure application scheduling. A fall test is especially important as it serves as a report card to evaluate crop yield during the previous growing period in relationship to plant-available nutrients, especially nitrate-N. If excessive soil nutrients (N, P, K) are measured, plan a strategy for reducing these values by reducing manure application, changing crop variety, and/or increasing yield.

Soil tests also help you decide where to apply manure. They help show whether you are distributing manure on enough crop acres to result in optimal crop yield per acre. Placing too many manure nutrients on too few acres results in excess soil concentrations and reduced nutrients used for crop growth.

Figure 1.—*Topsoil profile: **blue** indicates soil moisture, **white** indicates air space (capacity for liquid to fill), and soil particles are **brown.***



Probable fall/winter soils
- 100% saturated
- Apply minimal solids.
- **Do not apply liquid.**

Probable spring/fall soils
- Typical field capacity
- Apply solids.
- **Apply minimal liquid/ application.**

Probable summer soils
- Typical wilting coefficient
- Apply solids.
- **Apply liquid.**

Mike Gangwer, Extension agent, Marion County; Bruce Wilson, conservation planning engineer, USDA-NRCS; and Mike Gamroth, Extension dairy specialist; Oregon State University.

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Agronomic considerations

Nitrogen (N)

Take a fall soil sample from manured fields. Any concentration of 100 lb (27 ppm) nitrate-N or higher is excessive and indicates less agronomic uptake than the sum of organic mineralization, fertilizer input, and manure application. A goal for this report card test is 55 lb (15 ppm) soil nitrate-N in the top foot. Reduce manure application the following year and increase crop yield (or change the crop) in order to reduce fall nitrate-N.

A spring nitrate-N analysis generally is not required because winter rainfall, high water tables, and denitrification leach nitrate-N out of the soil. A cover/relay/double crop or permanent grass will scavenge some of this leftover nitrate-N.

A spring application of manure-N is highly recommended due to the winter losses. This application is especially important for annual and perennial grass. In corn fields, the pre-sidedress soil nitrate test (PSNT) will indicate whether further manure is required.

Manure excretion N is half organic and half ammonium. There is no nitrate in manure.

Phosphorus (P)

You can take a soil test for P at any time. The soil test for P shows extractable P, or plant-available P. It indicates the amount of P in the soil that can be used for plant growth at a given time. Heavily manured fields usually have higher levels of soil test P than do nonmanured fields.

Any concentration of 100 ppm or higher of soil test P is excessive. Do not add P to these fields. However, storage pond supernatent contains very little manure P; applications can be made based on N or K requirement.

If soil test P is excessive, reduce manure application the following year so P can be mined out of the soil by plants. However, fields with high levels of organic matter can buffer P so that soil test P does not drop rapidly. Mining will occur slowly in these fields.

Excessive P in the soil in any form can have a negative impact on water quality if soil erosion moves topsoil into surface waters, carrying with it all forms of soil P. Excessive P in surface water increases aquatic plant growth and reduces the amount of oxygen in the water available for fish.

Potassium (K)

You can take a soil test for K at any time. The soil test for K indicates plant-available K. Heavily manured fields usually have a higher level of K, especially fields receiving liquid manure.

Any concentration of 800 ppm or higher of plant-available K is excessive. Problems with excessive K in the soil can cause high plant K concentrations that can have a negative impact on herd health, especially in fresh and early lactating cows. Excessive K, if leached into groundwater, can increase the salt concentration of water. Also, like sodium, excessive K can reduce water infiltration through soil by hanging onto water.

Therefore, managing K on the basis of ration makeup is a good strategy. If feeds low in K are needed for a particular ration, you may need to avoid applying liquid manure on one field until K is mined out.

For more information

See page 3 for ordering instructions.

Assessing the Risk of Groundwater Contamination from Livestock Manure Management Worksheet, EM 8596 (1995). $1.00

Calculating the Fertilizer Value of Manure from Livestock Operations, EC 1094 (revised 1991, reprinted 1993). $1.00

Date, Rate, and Place: The Field Book for Dairy Manure Applicators, PNW 506 (1998). $5.50

Manure Management in Small Farm Livestock Operations: Protecting Surface and Groundwater, EM 8649 (published 1996, reprinted 1997). $1.75

Manure Management Practices to Reduce Water Pollution, FS 281 (published 1982, reprinted 1993). No charge.

Nutrient Management for Dairy Production: Assessing Your Manure Management for Water Quality Risk, EM 8646 (1996). 75¢

Nutrient Management for Dairy Production: Dairy Manure as a Fertilizer Source, EM 8586 (published 1995, reprinted 1997). $1.00

Nutrient Management for Dairy Production: Manure Application Rates for Forage Production, EM 8585 (published 1996, reprinted 1997). $1.00

Nutrient Management for Dairy Production: The Pre-Sidedress Soil Nitrate Test (PSNT) for Western Oregon and Western Washington, EM 8650 (published 1996, reprinted 1997). 75¢

Nutrient Management for Dairy Production: Which Test Is Best? Customizing Dairy Manure Nutrient Testing, PNW 505 (1997). $2.00

Reducing the risk of Groundwater Contamination from Livestock Manure Management, EM 8597 (1995). $1.25

Ordering instructions

To order copies of the publications listed under "For more information," send the publication's complete title and series number, along with a check or money order for the amount listed (payable to Oregon State University), to:

Publication Orders
Extension & Station Communications
Oregon State University
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Corvallis, OR 97331-2119
Fax: 541-737-0817

You may order up to six no-charge publications without charge. If you request seven or more no-charge publications, include 25 cents for each publication beyond six.

If you would like additional copies of this publication, *Annual Manure Application Schedule for Western Oregon*, EM 8724, send $2.00 per copy to the above address.

We offer discounts on orders of 100 or more copies of a single title. Please call 541-737-2513 for price quotes.

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Summary

- Apply liquid manure on a schedule that provides nutrients in the soil root zone in anticipation of crop growth.
- Apply liquid manure when soils are at field capacity or less moisture content, i.e., some air space exists in the topsoil. A soil moisture sensor/meter or field hand-grab sample is useful.
- Apply solid manure in such a manner that it will not leave the field surface during rainfall events or flooding.
- Empty all storage facilities of any size by October 1 of every year.
- Use soil testing, especially the fall test, as a report card to evaluate crop yield during the previous growing period in relationship to plant-available nutrients, especially nitrate-N.
- If excessive soil nutrients (N, P, K) are measured, plan a strategy for reducing these values by reducing manure application, changing crop variety, and/or increasing yield.
- Soil tests will help you decide where to apply manure. They will help show whether you are distributing manure on enough crop acres to result in optimal crop yield per acre. Placing too many manure nutrients on too few acres results in excess soil concentrations and reduced nutrients used for crop growth.
- The overall objective of manure management should be to take as many excretable manure nutrients to the soil and have them used by plants for optimal crop yield. This reduces the need to purchase feed and inorganic fertilizer. The usual outcome of manure management is finding as many acres as possible for manure application.

Example Manure Application Calendar

Sample liquid manure application dates are indicated with **orange**. Solids application dates are underlined. Actual application dates will be determined by weather and soil conditions.

Winter

January

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

March

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

- Apply liquid when soil is at field capacity or less moisture content.
- Apply solids when application will not leave the surface during heavy rainfall.
- Do not apply liquid to bare fields.
- Do not apply liquid to fields with a high or perched water table.
- Do not apply liquid to fields with soggy soils or to flooded fields.
- Identify "go-to fields" every winter that are better drained and have crop biomass.

Likely application days

	Liquid	Solid
January	6	15
February	10	18
March	15	24

Spring

April

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May

						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

- Apply liquid when soil is at field capacity or less moisture content.
- Apply solids any time.
- Use this season for liquid pumping on all crop ground.
- Liquids can be applied to bare ground.
- Liquids can be applied to fields with high or perched water tables and to fields that have soggy soils but have drained.
- Use this season for emptying accumulated manure fines-solids in all ponds.
- This is the season for more frequent, but light-rate, applications.

Likely application days

	Liquid	Solid
April	20	30
May	24	30
June	24	27

Summer

July

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

- Apply liquid when soil is at field capacity or less moisture content.
- Apply solids any time.
- Use this season for liquid pumping on grass and corn (use PSNT).
- Liquids can be applied to postharvest fields of any kind, especially nonmanured fields of grains or grass seed.
- All storage facilities should be drawn down (pumped out) in preparation for the winter storage season.

Likely application days

	Liquid	Solid
July	15	27
August	12	20
September	10	15

Fall

October

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

November

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

- Apply liquid when soil is at field capacity or less moisture content.
- Apply solids when application will not leave the surface during heavy rainfall.
- Do not apply liquid to bare fields.
- Do not apply liquids to fields with high or perched water tables.
- Do not apply liquids to fields with soggy soils or those that are likely to flood.
- Apply liquids to fields with plant biomass such as a double crop.
- Use this season primarily for liquid storage.

Likely application days

	Liquid	Solid
October	6	6
November	3	6
December	3	4