

ANIMAL WASTE MANAGEMENT PLAN

for the

Straight Ranch

CONFINED ANIMAL FEEDING OPERATION

Located at
44 Township Road
Klamath Falls, OR 97603

for submittal to

Oregon Department of Agriculture
Natural Resources Division CAFO Program
635 Capitol Street NE
Salem, OR 97301-2532

prepared by

Fazio Engineering
P.O. Box 246
Milton-Freewater, OR 97862

October 22, 2019



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Straight Ranch

Owner/Operator:
Straight Ranch, LLC
Arie deJong
4721 Harpold Road
Bonanza, OR 97623
541-545-6173

As owner of Straight Ranch, I intend to manage in accordance with the practices and operation and maintenance described in this Animal Waste Management Plan. I understand that I am responsible for keeping all necessary records associated with the implementation of this plan.

Signature  _____

Date 10-22-2019

Prepared By: Fazio Engineering
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**STRAIGHT RANCH
CONFINED ANIMAL FEEDING OPERATION (CAFO)
ANIMAL WASTE MANAGEMENT PLAN (AWMP)**

1. SUMMARY OF CAFO OPERATION

a. Contact Information

Owner/Operator:
Straight Ranch, LLC
Arie deJong
4721 Harpold Road
Bonanza, OR 97623
541-545-6173

b. Facility Location

Straight Ranch is located at 44 Township Road, Klamath Falls, OR 97603. The feed yard is located in Section 3 in Township 41 South, Range 8 East, Willamette Meridian.

c. Type of Operation

Straight Ranch is a heifer raising facility and a Large Confined Animal Feeding Operation.

i. Livestock Numbers

This AWMP is for 2,500 heifers.

d. Manure Handling System

i. Collection

Heifers are housed in open lots and in pastures. Solid manure, straw used for bedding and wasted feed is collected and stored within the pens. Manure deposited in the open pens is scraped and mounded within the pens then hauled to the manure handling area, fields, and export. Some manure is left in the pens, mounded and packed for bedding in the fall.

ii. Storage

Solid manure is stored within the open lots or the manure handling area. Liquid manure is deposited in the pens and pasture. The majority of pens are sloped and runoff flows into a collection ditch. A planned storage pond with a manure drying area will connect with the collection ditch. A storage pond is proposed that is sized to store the 25-year 24-hour precipitation and normal runoff for the storage period.

iii. Transfer

Solid manure is hauled using a standard dump truck and conventional spreaders. Slurry and liquid manure is hauled using vacuum tank wagons.

iv. Utilization

Straight Ranch has about 1,721 irrigated acres for manure application. Additional crop nutrients are supplied as commercial and other organic fertilizers. Manure can be exported to other farms.

2. SPECIFIC DESCRIPTIONS AND CALCULATIONS

a. Description of Production Area and Land Application Location

i. Site Layout and Topography

Appendix A contains a Production Area Map and Appendix B includes land application maps showing an aerial photograph and topography of the farm.

ii. Site Soils

Appendix B contains the USDA-Natural Resources Conservation Service soils map and map unit descriptions. The predominant soils for the CAFO is Lorella very stony loam, Lalos very fine sandy loam, and Algoma silt loam. Algoma silt loam is the predominant soil for the fields. Algoma silt loam is poorly drained lakebed soil that has no frequency of flooding, but frequently ponds.

b. Manure, Litter and Process Waste Volumes

The ORAWM 4.9 spreadsheet was used to estimate the manure and nutrients based on the number of each type of livestock, average weight, and grazing access.

i. Manure and Bedding Volumes

Manure volumes are based on the number of heifers, their average weight, and the amount of time on pastures.

Straw is used for bedding during the winter months as needed.

ii. Process and Wash Water Volumes

There is no process or wash water used.

iii. Silage and Feed Processing Leachate

Silage is stored in AgBags without significant leachate.

c. Contaminated Storm Water

Storm water collected includes runoff from open pens and feed lanes. The majority of the pens drain into a collection ditch with a planned extension to catch all pens. A storage pond is planned that will receive water from the collection ditch through a culvert. The planned storage pond will use a compacted soil liner to satisfy the final specific discharge of 500 gallons per acre per day. The planned pond is sized to store the 24 hour 25 year precipitation and runoff for a 150 day storage period, which is about 11.4 acre feet. Appendix A contains the runoff calculations and propose pond layout.

d. Nutrient Content of Manure

The manure amount and nutrients per ORAWM are shown in Table 1.

Table 1: Manure Nutrient Content

Volume	Units	Concentration in Storage			
		N	P ₂ O ₅	K ₂ O	Units
455,005	Gallons	1.15	1.58	2.69	lbs/1,000 Gal
4,207	Tons	10.67	5.79	8.03	lbs/Ton

e. Farm Nutrient Balance

i. Nutrients Generated and Losses

The ORAWM spreadsheet was used to estimated amount of nutrients generated and remaining after storage, application, and denitrification losses. See ORAWM output in Appendix C.

ii. NRCS Agronomy Technical Note #26 and Phosphorous Index

Current soil tests for the owned or rented fields is not available. Soil tests were taken 4/26/18 for fields 16, 17, and 18 with P levels of 11 - 21 ppm. These fields are located adjacent and east of the property. The P Index calculations assume soil has the 21 ppm value. Field soil P values will be taken from the fields and the P index calculations will be updated.

The Site Vulnerability Class has been determined to be MEDIUM for the fields. The phosphorous index calculations for each field are located in Appendix B. With a MEDIUM or LOW phosphorous index the nutrient calculations balance for nitrogen.

iii. Acreage Owned or Leased

Straight Ranch owns approximately 1,721 irrigated acres for manure applications.

Based on the ORAWM nutrient calculations the acreage owned can utilize all of the manure generated. Please refer to the ORAWM nutrient balance calculations in Appendix C. The crop removal of nutrients is included in Appendix C for various crops.

f. Application Schedule and Limitations

i. Schedule of Applications and Methods

Prior to field application, the owner will test the nutrient levels in both the liquid and solid manure. The owner will continue to sample both the liquid and solid manure in the spring, mid-summer and fall until the records consistently and reliably show the approximate nutrient content of the manure at each period and continue with annual sample of the materials thereafter.

Application of liquids and solids will be done during favorable climatic conditions and crop condition. Application of manure will be done at appropriate times of the year to utilize nutrients for high forage production.

Slurry is spread using the vacuum tank wagon. Solid manure is applied using conventional end spreaders or side slingers. Solid and liquid manure application equipment is calibrated every two years, using Load Area Calibration procedure.

ii. Application Limitations

The application limitations for Straight Ranch are:

1. All liquid and solid manure applications are applied at agronomic rates.
2. Manure solids and liquids will not be applied within 100 feet of any down gradient irrigation, drainage ditch or surface water, for fields without vegetated buffers. Setback can be reduced by establishing a 35 feet vegetated buffer where manure, litter and other process waste waters are prohibited.
3. Manures will not be applied during any precipitation that is excessive enough to cause ponded water.
4. Manure will not be applied to frozen soils.
5. Solid manure intended for field applications, may only be stored in fields or staging areas for a reasonable time in preparation of being applied.
6. If manure is applied to a cropped field or pasture, it will not be flood irrigated for 2 weeks.

iii. Minimum Storage Requirements

Pens are scraped once a year, so they provide for 12 months of solids storage.

iv. Irrigation Water Management

The irrigated farm land is located within Klamath Drainage District who manages the canal and drainage networks. A layout map of Klamath Drainage District is located in Appendix B. The closed system offers good control of irrigation water amounts and timing, and with proper irrigation water management will minimize leaching of soluble nutrients.

The Drainage District is a closed system and no water leaves. Water can be reused several times before being pumped back. Water flows by gravity from the canals, across the fields generally west to east, then into a collection return ditch that flows north to district lift pumps. The lift pumps put the water back into the canal and additional makeup water can also be added.

Normally 1/3 of the farm is irrigated at a time and it takes 2 to 3 weeks to get across the farm. It takes 1/2 to 2 days for water to flow across each field. The plan is to irrigate so that the top 2 feet or less becomes saturated during each irrigation.

Much of the farm is in pasture that is being rejuvenated and rotated back into pasture. The majority of solid manure will be applied to fields during crop rotations when the fields are dried and prepping the soil for a cover and silage crops.

Fields will be irrigated when livestock are not grazing in them.

g. Animal Mortality Management

Mortalities are hauled off the farm within two days to Bonanza View Dairy for disposal.

h. Mechanical Operation and Maintenance

i. Operation and Maintenance of Pens

Solid manure will be contained within the pen until removed for export or field application. Pen manure is harrowed and groomed during the dry months to facilitate drying and transport. Short-term mounding may be used in conjunction with quick clean-ups used to reduce manure pack from around aprons and under fences. Manure is removed annually from pens. When removing manure from pens, care is taken to maintain the integrity of the compacted protective seal or "hard pan".

The operator will immediately repair any damage to structures or appurtenances.

ii. Trough or Tank

Watering facilities will be inspected daily and repaired if damaged. Float valves will be maintained in working order. Area immediately around the facility will be maintained in a stable condition.

3. Record Keeping and Reporting

a. Monitoring and Testing

i. Liquid and Solid Manure Testing

The nutrient content of all applied manure sources is tested to determine the correct application amounts to satisfy crop requirements. Liquid and solid manure will be sampled annually at a minimum. Test will sample for total nitrogen and total phosphorus at a minimum.

Sample according to guidance contained in PNW 0533 and PNW 505, or local laboratory.

ii. Field Soil Sampling

Annually on a minimum of 20% of the fields that receive manure applications each year. All fields that receive manure must be sampled at least once every 5 years for total nitrogen, total phosphorus (Olsen), and nitrate-nitrogen at a minimum.

Soil samples will be according to guidance contained in PNW 570-E, EM 8832-E for post-harvest nitrate-nitrogen. Additional soil sampling interpretation can be found in the OSU Bulletin EC 1478: Soil Test Interpretive Guide.

The operator will maintain records of these soils analyses.

iii. Crop Nutrient Removal

The ranch maintains accurate records of crop yields and nutrient applications for each field. Combined with soil sampling, the overall nutrient removal and losses are documented for each field that receives manures in any given year.

b. Inspections

Daily Inspections:

- Water lines, including drinking water or cooling water lines
- Equipment (when in use) used for land application of manure, litter, or process wastewater

Weekly Inspections:

- Stormwater diversions devices, animal waste storage structures, and devices channeling contaminated stormwater

c. Recordkeeping

Record results of:

1. Daily inspections.
2. Weekly inspections.
3. Corrective actions taken, explain those not corrected.
4. Expected crop yields (if not in the plan).

5. Applications of manure, litter and process waste will be kept, including the date, location, and the amount of N and P applied during each application.
6. Weather conditions at the time of manure, litter or process water application and 24 hours before and after application.
7. Total amount of manure or wastewater transferred to other persons, including date and amount of each transfer and the name and address of each recipient with a copy of the nutrient analysis.

i. REPORTING TO OREGON DEPARTMENT OF AGRICULTURE (ODA):

1. Any discharge will be reported orally to ODA within 24 hours. Within 5 days, a written statement describing this discharge will also be submitted to ODA.
2. The amount of manure, litter and process waste applied will be reported annually.
3. The amount of manure, litter and process waste exported will be reported annually.

ii. OPERATION REQUIREMENTS

1. Must have depth markers in all surface liquid impoundments (i.e. lagoons, ponds, tanks). Markers must indicate:
 - a. Maximum design volume (freeboard).
 - b. Minimum capacity necessary to contain 25-year, 24-hour rainfall event.
 - c. Depth of manure and process wastewater.
2. Maintain setback area within 100-feet of any down gradient surface water, open tile line intake structure, sinkholes, agricultural wellheads, monitoring wells or other conduits to surface and groundwater where manure, litter, and other process wastewaters are prohibited. As a compliance alternative, and if demonstrated to the satisfaction of ODA, the permittee may:
 - a. Establish a 35 ft vegetated buffer where manure, litter and other process waste waters are prohibited, or
 - b. Demonstrate that a setback or vegetated buffer is not necessary or may be reduced.

APPENDIX A: SITE LAYOUT AND RUNOFF CALCULATIONS



Straight Ranch
 Production Area Map
 1/23/20

Straight Ranch: Runoff and Storage Estimates

2/23/20

Site Surface Area		Total
Description	Sq. Feet	Sq. Feet
<i>Roof Areas</i>		
none	-	
		Roof Area Total -
<i>Unroofed Areas</i>		
Pens	1,896,640	
		Unroofed Area Total 1,896,640
<i>Concrete/Asphalt Surfaces</i>		
Feed Alley	20,000	
		Paved Total 20,000
		Total Runoff Area <u>1,916,640</u>
		44.00 Acres, matches 44.0 acres from Production Area Map

Runoff Calculations
Klamath Falls

Month	Days	Monthly Average		Lot Runoff Factors as		Paved cubic-feet	Unroofed cubic-feet	Roof cubic-feet	Total Runoff cubic-feet
		Inches Precipitation	Inches Evaporation	a % of Monthly Precipitation Paved	Unpaved				
October	31	0.89	3.23	40%	10%	593	14,067	-	14,660
November	30	1.87	0.67	40%	10%	1,247	29,556	-	30,803
December	31	2.04	0.38	40%	10%	1,360	32,243	-	33,603
January	31	1.14	0.5	45%	15%	855	27,027	-	27,882
February	28	1.86	0.88	35%	10%	1,085	29,398	-	30,483
March	31	1.31	1.77	35%	10%	764	20,705	-	21,469
April	30	0.73	3.65	30%	10%	365	11,538	-	11,903
May	31	0.67	5.54	30%	5%	335	5,295	-	5,630
June	30	0.63	6.53	40%	5%	420	4,979	-	5,399
July	31	0.48	7.78	30%	0%	240	-	-	240
August	31	0.48	7.23	35%	5%	280	3,793	-	4,073
September	30	0.75	4.69	35%	10%	438	11,854	-	12,292
Annual	365	12.85	42.85			7,982	190,454	-	198,436

24 Hour 25 Year Storm
 Precipitation from 24hr 25yr storm 2.40 inches
 Selected CN 95
 Runoff from 24hr 25yr storm 1.86 inches (Table 2-2 EFH) 297,718 cubic feet
 6.83 acre-feet

Estimated Water Use	gpd	cubic feet	acre-feet/day
Miscellaneous	-	0	-

Estimated Total Solids in Water

- cubic-ft/day per ORAWM
 0.000 acre-feet/day

Storage Requirements

Storage Period	150	Days				
Pond Surface Area	118,400	Sq. Feet				
Month	Days	Prec.-Evap. acre-feet	Normal Runoff acre-feet	Wash acre-feet	Total Manure acre-feet	Total Storage acre-feet
October	31	(0.53)	0.34	-	-	(0.19)
November	30	0.27	0.71	-	-	0.98
December	31	0.38	0.77	-	-	1.15
January	31	0.14	0.64	-	-	0.79
February	28	0.22	0.70	-	-	0.92
March	31	(0.10)	0.49	-	-	0.39
April	30	(0.66)	0.27	-	-	(0.39)
May	31	(1.10)	0.13	-	-	(0.97)
June	30	(1.34)	0.12	-	-	(1.21)
July	31	(1.65)	0.01	-	-	(1.65)
August	31	(1.53)	0.09	-	-	(1.44)
September	30	(0.89)	0.28	-	-	(0.61)
Annual	365	(6.80)	4.56	-	-	(2.24)

Component Entering Storage	Inches	Acre-Feet	Source
Rainfall on lagoon, 24hr 25yr	2.40	0.5	Klamath Weather Station
Runoff, 24hr 25yr Storm		6.8	Runoff Calculations Above
Precipitation - Evaporation		0.91	Weather Station Data (October to March)
Runoff from normal precipitation		3.2	Runoff Calculations (October to March)
Other water		-	(October-March)
Total Manure		-	(October-March)
Solids Accumulation		-	
Total		11.4	

Straight Ranch

1/23/2020

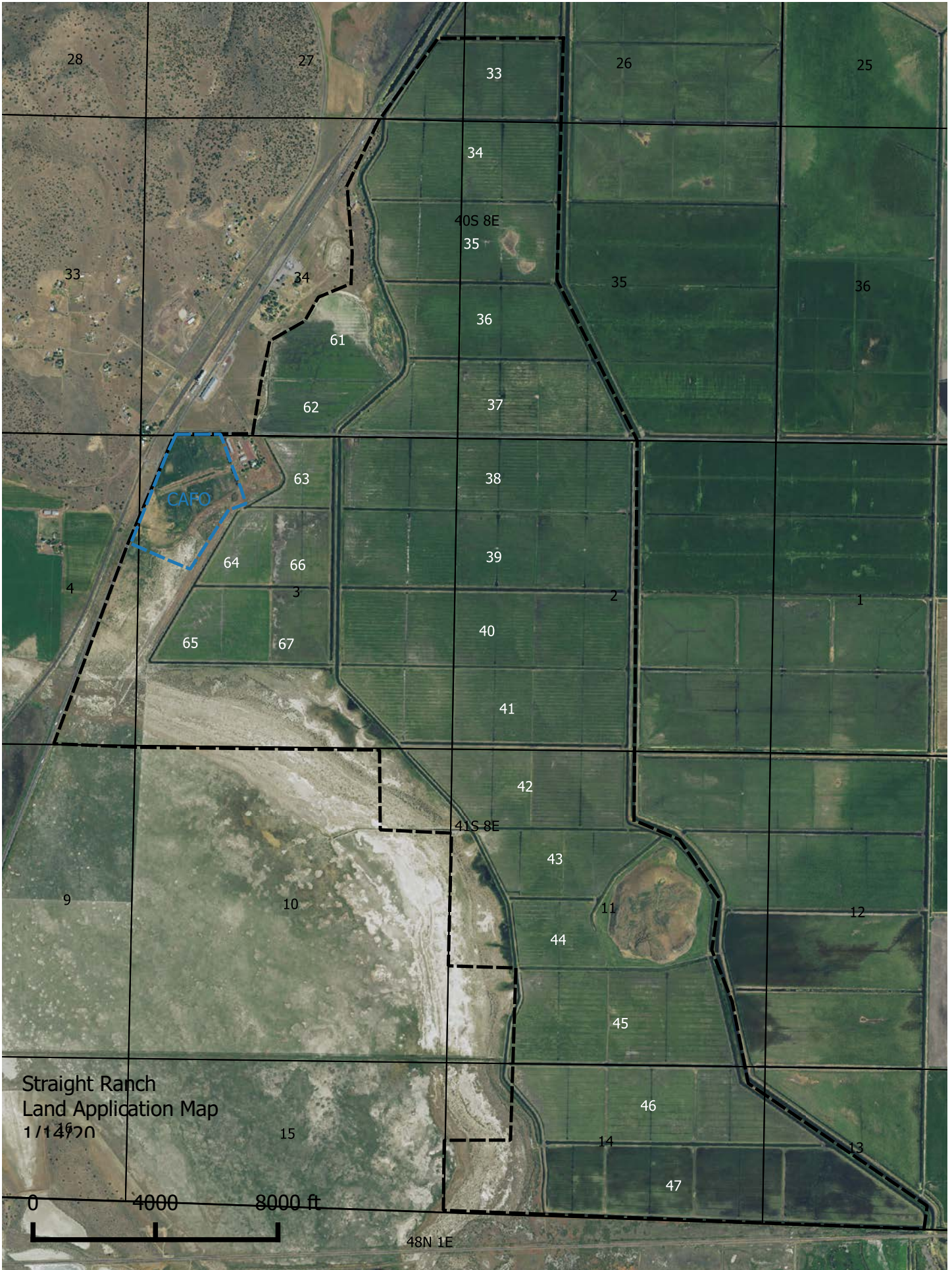
Est. Volume

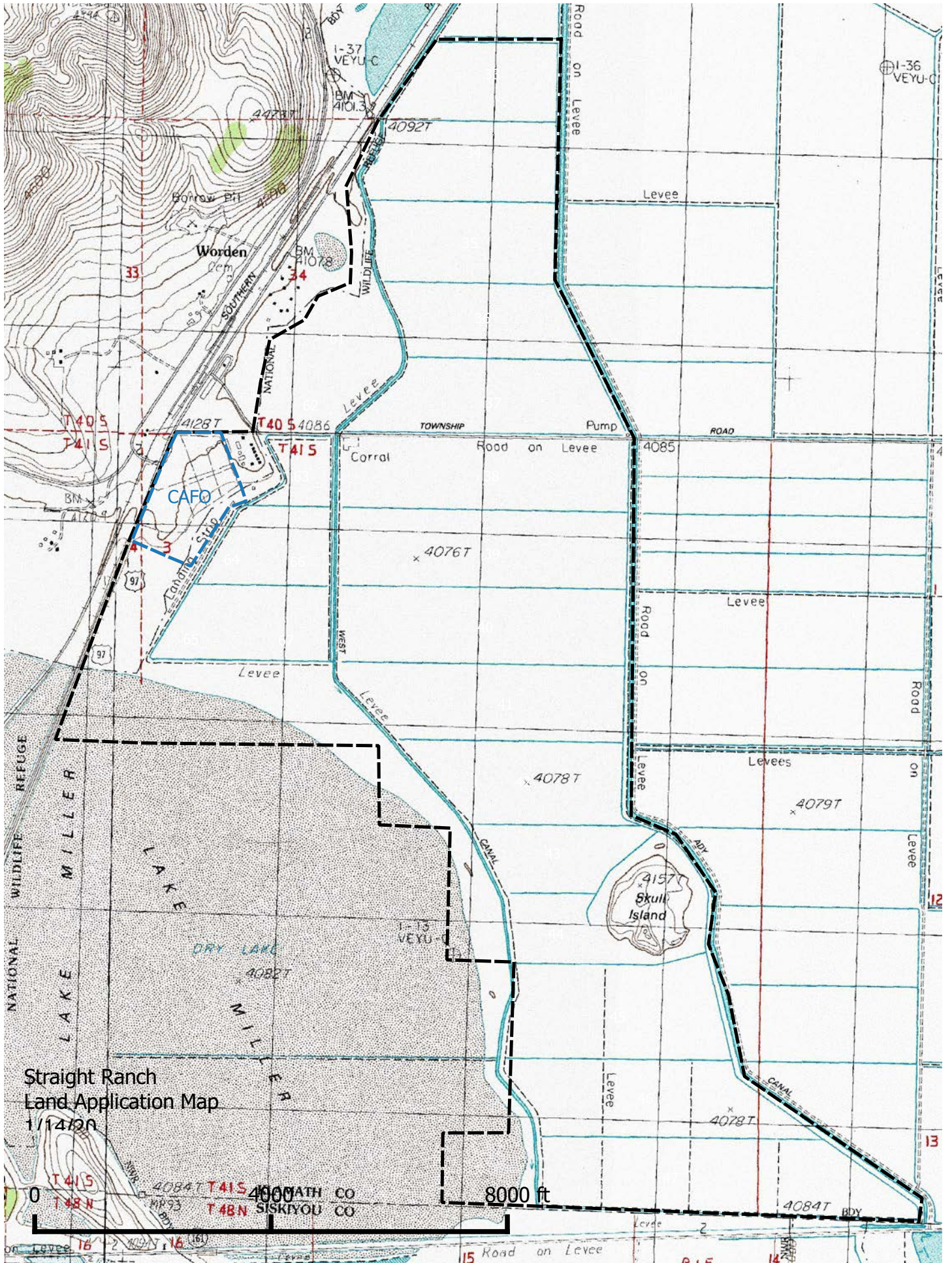
average

Location	Side Slope ft/ft	Bottom Width feet	Bottom Length feet	Inside Top Width feet	Inside Top Length feet	Water Depth feet	freeboard feet	Active Storage cubic-feet	Total Storage cubic-feet	Active Storage acre-feet	Total Storage acre-feet
Pond sloped bottom	4.0	108	688	160	740	5.50	1.00	508,537	623,359	11.7	14.3



APPENDIX B: LAND APPLICATION MAP AND SOILS INFORMATION





Straight Ranch
Land Application Map
1/14/00

8000 ft

T41S
T48N
4084T
T41S
4080T
T48N
SISKIYOU CO
RATH CO

15 Road on Levee

D.F.

14

Field List

farm#	tract#	Field#	2018 crop year	acres
4622	4460	33	grass	68.5
4622	4460	34	grass	87.4
4622	4460	35	grass	85.9
4622	4460	36	grass	77.4
4622	4460	37	grass	97.5
4622	4460	38	grass	124.7
4622	4460	39	grass	132.7
4622	4460	40	grass	131.7
4622	4460	41	grass	123.6
4622	4460	42	grass	94.1
4622	4460	43	grass	54.9
4622	4460	44	grass	33.5
4622	4460	45	grass	122.8
4622	4460	46	grass	113.3
4622	4460	47	grass	154.7
4622	4460	61	grass	45.0
4622	4460	62	grass	27.4
4622	4460	63	grass	22.5
4622	4460	64	grass	24.1
4622	4460	65	grass	44.8
4622	4460	66	grass	27.9
4622	4460	67	grass	27.2
			Total	1,721.4

Straight Ranch
Phosphorous Index Summary

	Field	33	34	35	36	37	38	39	40	41
Predominant Map Unit		1, 78	1	1	1	1	1	1	1	1
Hydraulic Soil Group		C/D	C/D	C/D	C/D	C/D	C/D	C/D	C/D	C/D
Average Slope %		<1	<1	<1	<1	<1	<1	<1	<1	<1
Flooding Frequency		none	none	none	none	none	none	none	none	none
Crops		Sudan	Sudan	Sudan	Sudan	Sudan	Sudan	Sudan	Sudan	Sudan
Soil Test P Olsen 1ft (ppm)		21	21	21	21	21	21	21	21	21
Commercial Application Rate (lbs/ac P2O5)		0	0	0	0	0	0	0	0	0
Organic Application Rate (lbs/ac P2O5)		209	209	209	209	209	209	209	209	209
Nutrient Application Method		Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk

Transport Factors

Soil Erosion		3	3	3	3	3	3	3	3	3
Soil Erosion from Sprinkler Irrigation		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Soil Erosion from Surface Irrigation		0	0	0	0	0	0	0	0	0
Runoff Class		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Distance to Perennial Surface Waters		0	0	0	0	0	0	0	0	0
Subsurface Drainage		0	0	0	0	0	0	0	0	0
Transport Factors Subtotal (TFS)		3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75

Source Factors

Soil Test P (0-12")		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Commercial P Application Rate		0	0	0	0	0	0	0	0	0
Commercial P Application Method		0	0	0	0	0	0	0	0	0
Organic P Application Rate		4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18
Organic P Application Method		4	4	4	4	4	4	4	4	4
Source Factors Subtotal (SFS)		8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28

Total Rating Value (TFS x SFS) 31.05 31.05 31.05 31.05 31.05 31.05 31.05 31.05 31.05 31.05

Site Vulnerability Class Medium Medium Medium Medium Medium Medium Medium Medium Medium Medium

Assumption/Notes:

Assumed soil erosion factor of 3.

Used highest P value for 2018 tests

Solids applied, incorporated within 21 days

P applied to Sudan when balancing for N

Straight Ranch
Phosphorous Index Summary

	Field	42	43	44	45	46	47	61	62	63	64
Predominant Map Unit		1	1	1	1	1	1	1	1	1	103C
Hydraulic Soil Group		C/D	C/D	C/D	C/D	C/D	C/D	C/D	C/D	C/D	C/D
Average Slope %		<1	<1	<1	<1	<1	<1	<1	<1	<1	2
Flooding Frequency		none	none	none	none	none	none	none	none	none	none
Crops		Sudan	Sudan	Sudan	Sudan	Sudan	Sudan	Sudan	Sudan	Sudan	Sudan
Soil Test P Olsen 1ft (ppm)		21	21	21	21	21	21	21	21	21	21
Commercial Application Rate (lbs/ac P2O5)		0	0	0	0	0	0	0	0	0	0
Organic Application Rate (lbs/ac P2O5)		209	209	209	209	209	209	209	209	209	209
Nutrient Application Method		Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk	Inject/Spk

Transport Factors

Soil Erosion		3	3	3	3	3	3	3	3	3	3
Soil Erosion from Sprinkler Irrigation		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Soil Erosion from Surface Irrigation		0	0	0	0	0	0	0	0	0	0
Runoff Class		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
Distance to Perennial Surface Waters		0	0	0	0	0	0	0	0	0	0
Subsurface Drainage		0	0	0	0	0	0	0	0	0	0
Transport Factors Subtotal (TFS)		3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	4.25

Source Factors

Soil Test P (0-12")		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Commercial P Application Rate		0	0	0	0	0	0	0	0	0	0
Commercial P Application Method		0	0	0	0	0	0	0	0	0	0
Organic P Application Rate		4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18	4.18
Organic P Application Method		4	4	4	4	4	4	4	4	4	4
Source Factors Subtotal (SFS)		8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28	8.28

Total Rating Value (TFS x SFS) 31.05 31.05 31.05 31.05 31.05 31.05 31.05 31.05 31.05 31.05 35.19

Site Vulnerability Class

Medium Medium Medium Medium Medium Medium Medium Medium Medium Medium Medium

Assumption/Notes:

Assumed soil erosion factor of 3.

Used highest P value for 2018 tests

Solids applied, incorporated within 21 days

P applied to Sudan when balancing for N

Straight Ranch
Phosphorous Index Summary

	Field	65	66	67
Predominant Map Unit		103C	1	1
Hydraulic Soil Group		C/D	C/D	C/D
Average Slope %		2	<1	<1
Flooding Frequency		none	none	none
Crops		Sudan	Sudan	Sudan
Soil Test P Olsen 1ft (ppm)		21	21	21
Commercial Application Rate (lbs/ac P2O5)		0	0	0
Organic Application Rate (lbs/ac P2O5)		209	209	209
Nutrient Application Method		Inject/Spk	Inject/Spk	Inject/Spk

Transport Factors

Soil Erosion		3	3	3
Soil Erosion from Sprinkler Irrigation		0.25	0.25	0.25
Soil Erosion from Surface Irrigation		0	0	0
Runoff Class		1	0.5	0.5
Distance to Perennial Surface Waters		0	0	0
Subsurface Drainage		0	0	0
Transport Factors Subtotal (TFS)		4.25	3.75	3.75

Source Factors

Soil Test P (0-12")		0.1	0.1	0.1
Commercial P Application Rate		0	0	0
Commercial P Application Method		0	0	0
Organic P Application Rate		4.18	4.18	4.18
Organic P Application Method		4	4	4
Source Factors Subtotal (SFS)		8.28	8.28	8.28

Total Rating Value (TFS x SFS) 35.19 31.05 31.05

Site Vulnerability Class Medium Medium Medium

Assumption/Notes:

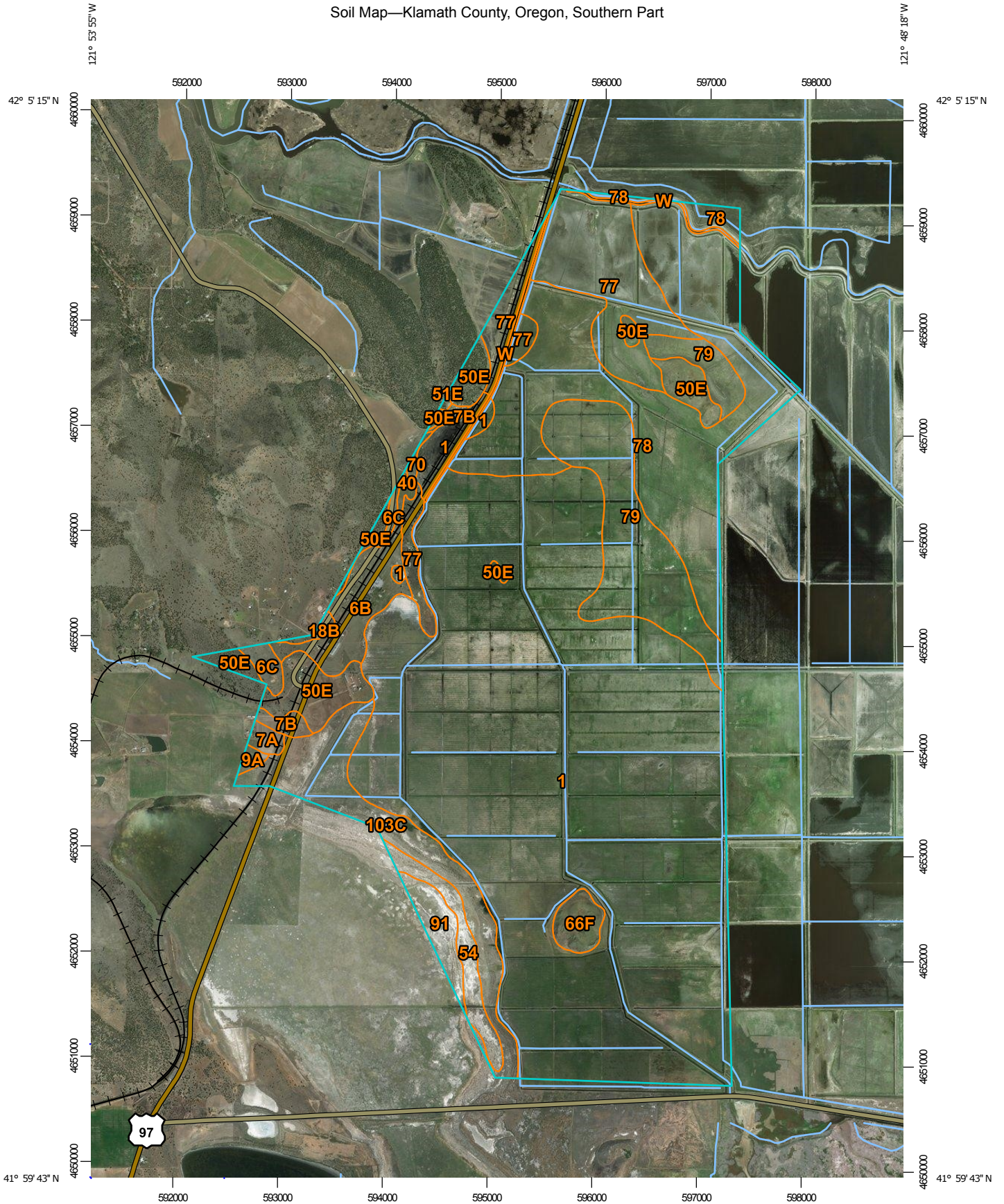
Assumed soil erosion factor of 3.

Used highest P value for 2018 tests

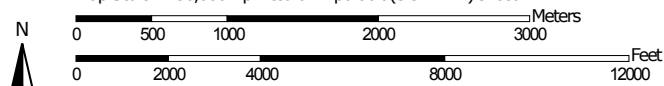
Solids applied, incorporated within 21 days

P applied to Sudan when balancing for N

Soil Map—Klamath County, Oregon, Southern Part



Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84




Natural Resources Conservation Service

Web Soil Survey National Cooperative Soil Survey


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MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)




















Soils







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Klamath County, Oregon, Southern Part
 Survey Area Data: Version 14, Oct 5, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 7, 2012—Aug 22, 2016

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Algoma silt loam, MLRA 21	3,602.0	54.1%
6B	Calimus fine sandy loam, 2 to 5 percent slopes	163.4	2.5%
6C	Calimus fine sandy loam, 5 to 15 percent slopes	37.2	0.6%
7A	Calimus loam, 0 to 2 percent slopes, low precip, MLRA 21	18.9	0.3%
7B	Calimus loam, 2 to 5 percent slopes	29.5	0.4%
9A	Capona loam, 0 to 2 percent slopes	10.3	0.2%
18B	Dodes loam, 2 to 15 percent slopes	10.7	0.2%
40	Laki-Henley loams	0.7	0.0%
50E	Lorella very stony loam, 2 to 35 percent south slopes	250.4	3.8%
51E	Lorella-Calimus association, steep north slopes	2.3	0.0%
54	Malin variant silt loam	90.2	1.4%
66F	Rock outcrop-Dehlinger complex, 35 to 65 percent slopes	53.7	0.8%
70	Scherrard clay loam	6.3	0.1%
77	Teeters silt loam	462.6	6.9%
78	Tulana silt loam	1,030.3	15.5%
79	Tulana silt loam, sandy substratum	473.5	7.1%
91	Zuman silt loam	69.9	1.0%
103C	Lalos very fine sandy loam, 2 to 15 percent slopes	324.9	4.9%
W	Water	26.3	0.4%
Totals for Area of Interest		6,663.2	100.0%

Map Unit Description

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, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

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

Report—Map Unit Description

Klamath County, Oregon, Southern Part

1—Algoma silt loam, MLRA 21

Map Unit Setting

National map unit symbol: 2wcv5

Elevation: 4,070 to 4,200 feet

Mean annual precipitation: 11 to 21 inches
Mean annual air temperature: 45 to 46 degrees F
Frost-free period: 80 to 110 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Algoma, drained, and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Algoma, Drained

Setting

Landform: Flood plains, lakebeds (relict)
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits of silty diatomaceous material over fine sand

Typical profile

A - 0 to 11 inches: silt loam
C1 - 11 to 30 inches: silt loam
2C2 - 30 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 3 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Algoma, muck surface, drained

Percent of map unit: 10 percent
Landform: Flood plains, lakebeds (relict)
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: Yes

Tulana, drained

Percent of map unit: 10 percent
Landform: Lakebeds (relict)
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Teeters, drained

Percent of map unit: 10 percent
Landform: Flood plains, lakebeds (relict)
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

6B—Calimus fine sandy loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: jdn8
Elevation: 4,100 to 4,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Calimus and similar soils: 76 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calimus

Setting

Landform: Alluvial fans, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Alluvium and lacustrine sediment derived from tuff, basalt and diatomite

Typical profile

H1 - 0 to 11 inches: fine sandy loam
H2 - 11 to 40 inches: loam
H3 - 40 to 60 inches: loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat):

Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Hydric soil rating: No

6C—Calimus fine sandy loam, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: jdn9

Elevation: 4,100 to 4,700 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Calimus and similar soils: 73 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calimus

Setting

Landform: Alluvial fans, terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Convex, linear

Parent material: Alluvium and lacustrine sediment derived from tuff, basalt and diatomite

Typical profile

H1 - 0 to 11 inches: fine sandy loam

H2 - 11 to 40 inches: loam

H3 - 40 to 60 inches: loam

Properties and qualities

Slope: 5 to 15 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat):

Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: DEEP LOAMY 10-14 PZ (R021XY206OR)
Hydric soil rating: No

7A—Calimus loam, 0 to 2 percent slopes, low precip, MLRA 21

Map Unit Setting

National map unit symbol: 2wcv7
Elevation: 4,090 to 4,200 feet
Mean annual precipitation: 12 to 17 inches
Mean annual air temperature: 46 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Calimus and similar soils: 59 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calimus

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy sediment derived from tuff, basalt and diatomite

Typical profile

A - 0 to 11 inches: loam
Bw - 11 to 40 inches: loam
C - 40 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 2c

Land capability classification (nonirrigated): 6c

Hydrologic Soil Group: B

Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 1 percent

Landform: Terraces

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

7B—Calimus loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: jdnr

Elevation: 4,100 to 4,700 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 90 to 110 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Calimus and similar soils: 67 percent

Minor components: 1 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calimus

Setting

Landform: Alluvial fans, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Convex, linear

Parent material: Alluvium and lacustrine sediment derived from tuff, basalt and diatomite

Typical profile

H1 - 0 to 11 inches: loam

H2 - 11 to 40 inches: loam

H3 - 40 to 60 inches: loam

Properties and qualities

Slope: 2 to 5 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 1 percent
Landform: Lake terraces
Hydric soil rating: Yes

9A—Capona loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: jdpb
Elevation: 4,100 to 4,700 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Capona and similar soils: 57 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Capona

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from diatomite, tuff and basalt

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 25 inches: gravelly sandy clay loam
H3 - 25 to 35 inches: unweathered bedrock

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat):

Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 3s

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 1 percent

Landform: Lake terraces

Hydric soil rating: Yes

18B—Dodes loam, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: jdl1

Elevation: 4,100 to 4,400 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 90 to 120 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Dodes and similar soils: 80 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dodes

Setting

Landform: Structural benches, terraces

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from tuffaceous sandstone, tuffaceous breccia, diatomite and basalt

Typical profile

H1 - 0 to 12 inches: loam

H2 - 12 to 22 inches: clay loam
H3 - 22 to 29 inches: weathered bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: LOAMY 10-14 PZ (R021XY200OR)
Hydric soil rating: No

40—Laki-Henley loams

Map Unit Setting

National map unit symbol: jdly
Elevation: 4,050 to 4,150 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 80 to 110 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Laki and similar soils: 60 percent
Henley and similar soils: 38 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laki

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and lacustrine deposits derived from basalt, diatomite, tuff and ash

Typical profile

H1 - 0 to 19 inches: loam
H2 - 19 to 32 inches: loam
H3 - 32 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 36 to 60 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to strongly saline (0.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 20.0
Available water storage in profile: Very high (about 13.5 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Henley

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and lacustrine deposits derived from diatomite, tuff, basalt and ash

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 36 inches: sandy loam
H3 - 36 to 60 inches: cemented material

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 4w

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Aquolls

Percent of map unit: 1 percent
Landform: Lake terraces
Hydric soil rating: Yes

50E—Lorella very stony loam, 2 to 35 percent south slopes

Map Unit Setting

National map unit symbol: jdmd
Elevation: 4,140 to 5,500 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Lorella, south, and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lorella, South

Setting

Landform: Escarpments
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Very cobbly and gravelly colluvium and residuum derived from basalt and tuff

Typical profile

H1 - 0 to 5 inches: very stony loam
H2 - 5 to 10 inches: very cobbly clay loam
H3 - 10 to 19 inches: very gravelly clay
H4 - 19 to 29 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 35 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: LOAMY 10-14 PZ (R021XY200OR)

Hydric soil rating: No

51E—Lorella-Calimus association, steep north slopes

Map Unit Setting

National map unit symbol: jdmj

Elevation: 4,140 to 4,700 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 80 to 100 days

Farmland classification: Not prime farmland

Map Unit Composition

Lorella, north, and similar soils: 60 percent

Calimus, north, and similar soils: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lorella, North

Setting

Landform: Escarpments

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Crest, nose slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Very cobbly and gravelly colluvium and residuum derived from basalt and tuff

Typical profile

H1 - 0 to 5 inches: very stony loam

H2 - 5 to 10 inches: very cobbly clay loam

H3 - 10 to 19 inches: very gravelly clay

H4 - 19 to 29 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 35 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat):

Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: NORTH SLOPES 14-18 PZ (R021XY312OR)
Hydric soil rating: No

Description of Calimus, North

Setting

Landform: Escarpments
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy lacustrine sediment

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 48 inches: loam
H3 - 48 to 60 inches: loam

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: NORTH SLOPES 14-18 PZ (R021XY312OR)
Hydric soil rating: No

54—Malin variant silt loam

Map Unit Setting

National map unit symbol: jdmm
Elevation: 4,050 to 4,750 feet
Mean annual precipitation: 10 to 16 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 50 to 110 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Malin, variant, and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Malin, Variant

Setting

Landform: Lakebeds

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Lacustrine deposits derived from basalt, diatomite, tuff and ash

Typical profile

H1 - 0 to 12 inches: silt loam

H2 - 12 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: None

Frequency of ponding: Frequent

Calcium carbonate, maximum in profile: 8 percent

Salinity, maximum in profile: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 30.0

Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 6w

Hydrologic Soil Group: D

Hydric soil rating: Yes

Minor Components

Playas

Percent of map unit: 10 percent

Landform: Playas

Hydric soil rating: Yes

Malin

Percent of map unit: 10 percent

Landform: Lakebeds (relict)

Hydric soil rating: Yes

66F—Rock outcrop-Dehlinger complex, 35 to 65 percent slopes

Map Unit Setting

National map unit symbol: jdn3
Elevation: 4,100 to 6,000 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 90 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 45 percent
Dehlinger and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Dehlinger

Setting

Landform: Escarpments
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Very gravelly colluvium derived from basalt, tuff and andesite

Typical profile

H1 - 0 to 6 inches: very stony loam
H2 - 6 to 60 inches: extremely gravelly clay loam

Properties and qualities

Slope: 35 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: SOUTH SLOPES 10-14 PZ (R021XY300OR)
Hydric soil rating: No

70—Scherrard clay loam

Map Unit Setting

National map unit symbol: jdnb
Elevation: 4,050 to 4,750 feet
Mean annual precipitation: 10 to 16 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 50 to 110 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Scherrard and similar soils: 70 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scherrard

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and lacustrine deposits derived from diatomite and tuff

Typical profile

H1 - 0 to 5 inches: clay loam
H2 - 5 to 21 inches: silty clay
H3 - 21 to 33 inches: cemented material
H4 - 33 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 10 percent

Salinity, maximum in profile: Very slightly saline to strongly saline
(2.0 to 16.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 30.0

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: D

Ecological site: SODIC FLAT 10+ PZ (R021XY102OR)

Hydric soil rating: Yes

Minor Components

Malin

Percent of map unit: 15 percent

Landform: Flood plains

Hydric soil rating: Yes

77—Teeters silt loam

Map Unit Setting

National map unit symbol: jdnm

Elevation: 4,080 to 4,150 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 80 to 110 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Teeters, drained, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Teeters, Drained

Setting

Landform: Flood plains, lakebeds

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Silty lacustrine deposits containing diatomaceous materials and volcanic ash

Typical profile

H1 - 0 to 16 inches: silt loam

H2 - 16 to 62 inches: silt

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat):
Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Very high (about 19.3 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Algoma, drained

Percent of map unit: 10 percent
Landform: Flood plains, lakebeds (relict)
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

78—Tulana silt loam

Map Unit Setting

National map unit symbol: jdnn
Elevation: 4,080 to 4,150 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 80 to 110 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Tulana, drained, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tulana, Drained

Setting

Landform: Lakebeds
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits containing diatomaceous materials and volcanic ash

Typical profile

- H1 - 0 to 23 inches: silt loam*
- H2 - 23 to 37 inches: silt*
- H3 - 37 to 46 inches: mucky silt*
- H4 - 46 to 57 inches: silt*
- H5 - 57 to 92 inches: stratified fine sand to silt loam*

Properties and qualities

- Slope: 0 to 1 percent*
- Depth to restrictive feature: More than 80 inches*
- Natural drainage class: Poorly drained*
- Capacity of the most limiting layer to transmit water (Ksat):*
 - Moderately high (0.20 to 0.57 in/hr)*
- Depth to water table: About 0 inches*
- Frequency of flooding: None*
- Frequency of ponding: Frequent*
- Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)*
- Sodium adsorption ratio, maximum in profile: 3.0*
- Available water storage in profile: Very high (about 28.3 inches)*

Interpretive groups

- Land capability classification (irrigated): 3w*
- Land capability classification (nonirrigated): 5w*
- Hydrologic Soil Group: C/D*
- Hydric soil rating: Yes*

Minor Components

Algoma, drained

- Percent of map unit: 5 percent*
- Landform: Flood plains, lakebeds (relict)*
- Landform position (three-dimensional): Tread, talf*
- Down-slope shape: Linear*
- Across-slope shape: Linear*
- Hydric soil rating: Yes*

Teeters, drained, strongly alkaline

- Percent of map unit: 5 percent*
- Landform: Flood plains, lakebeds*
- Landform position (three-dimensional): Tread*
- Down-slope shape: Linear*
- Across-slope shape: Linear*
- Hydric soil rating: Yes*

Tulana, drained, muck surface

- Percent of map unit: 5 percent*
- Landform: Lakebeds (relict)*
- Hydric soil rating: Yes*

79—Tulana silt loam, sandy substratum

Map Unit Setting

National map unit symbol: jdnp
Elevation: 4,080 to 4,150 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 80 to 110 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Tulana, drained, sandy substratum, and similar soils: 80 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tulana, Drained, Sandy Substratum

Setting

Landform: Lakebeds
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits containing diatomaceous materials and volcanic ash

Typical profile

H1 - 0 to 23 inches: silt loam
H2 - 23 to 37 inches: silt
H3 - 37 to 46 inches: mucky silt
H4 - 46 to 57 inches: silt
H5 - 57 to 92 inches: stratified fine sand to silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Very high (about 28.3 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Algoma, drained

Percent of map unit: 10 percent
Landform: Flood plains, lakebeds (relict)
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

91—Zuman silt loam

Map Unit Setting

National map unit symbol: jdp8
Elevation: 4,050 to 4,080 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 80 to 110 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Zuman and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zuman

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy lacustrine deposits derived from tuff, diatomite and basalt

Typical profile

H1 - 0 to 4 inches: silt loam
H2 - 4 to 17 inches: silty clay loam
H3 - 17 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 3 percent
Salinity, maximum in profile: Very slightly saline to strongly saline
(2.0 to 16.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

103C—Lalos very fine sandy loam, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: rnny
Elevation: 4,000 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 50 to 110 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lalos and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lalos

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from lake sediments

Typical profile

H1 - 0 to 13 inches: very fine sandy loam
H2 - 13 to 30 inches: loam
H3 - 30 to 65 inches: very fine sandy loam

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat):
Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Moderately saline to strongly saline
(8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 40.0
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: SALINE SODIC DUNES 10-12" (R021XF092CA)

Hydric soil rating: No

Minor Components

Lamath

Percent of map unit: 2 percent

Landform: Basin floors

Landform position (three-dimensional): Talf

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: SALINE MEADOW 10-12" (R021XF093CA)

Hydric soil rating: Yes

Zuman

Percent of map unit: 1 percent

Landform: Basin floors

Landform position (three-dimensional): Talf

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: Yes

W—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Data Source Information

Soil Survey Area: Klamath County, Oregon, Southern Part

Survey Area Data: Version 14, Oct 5, 2017

APPENDIX C: ORAWM SPREADSHEET PRINTOUT

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

1/30/2020

Version 4.9

CLIENT: **Straight Ranch**

ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM INVENTORY

ANIMAL INVENTORY

Type of Animal	Number of Animals	Average Weight (lbs.)	Animal Units (1,000 lb.)	Nutrient Production						Manure CF/D/AU	Annual		
				(lbs./day/1000 lb. Animal Unit)			(lbs./day)				Days Confined	Days Grazed	Days Off Farm
				N	P	K	N	P	K				
HEIFERS (12-24 Months)	2,500	1,000	2,500.0	0.27	0.05	0.12	665.00	113.75	300.00	0.90	212	153	0
Totals/Averages-	2,500	1,000	2,500.0	0.27	0.05	0.12	665.0	113.8	300.0	0.9			

GRAZING PERIOD

Type of Animal	Percent of Month and Number of Animals Grazing												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AU-YR.
HEIFERS (12-24 Months)	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	12,500
	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	
													0
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Total AUM's Available>	0	0	0	0	0	0	0	0	0	0	0	0	0
Total AUM's Needed>>>	0	0	0	0	0	0	0	2,500	2,500	2,500	2,500	2,500	12,500
Total AUM's>>>>>>>>>>>	0	0	0	0	0	0	0	-2,500	-2,500	-2,500	-2,500	-2,500	-12,500

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

1/30/2020

Version 4.9

CLIENT: **Straight Ranch**

ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM PRODUCTION

MONTHLY NUTRIENT PRODUCTION

Month	Pounds of Nutrients from LIQUIDS			Pounds of Nutrients from SOLIDS			Pounds of Nutrients from GRAZING			Total Pounds of Nutrients from ALL SOURCES		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
October	412	162	224	20,203	7,917	10,982	0	0	0	20,615	8,079	11,207
November	399	156	217	19,551	7,662	10,628	0	0	0	19,950	7,818	10,845
December	412	162	224	20,203	7,917	10,982	0	0	0	20,615	8,079	11,207
January	412	162	224	20,203	7,917	10,982	0	0	0	20,615	8,079	11,207
February	372	146	202	18,248	7,151	9,920	0	0	0	18,620	7,297	10,122
March	412	162	224	20,203	7,917	10,982	0	0	0	20,615	8,079	11,207
April	399	156	217	19,551	7,662	10,628	0	0	0	19,950	7,818	10,845
May	0	0	0	0	0	0	20,615	8,079	11,207	20,615	8,079	11,207
June	0	0	0	0	0	0	19,950	7,818	10,845	19,950	7,818	10,845
July	0	0	0	0	0	0	20,615	8,079	11,207	20,615	8,079	11,207
August	0	0	0	0	0	0	20,615	8,079	11,207	20,615	8,079	11,207
September	0	0	0	0	0	0	19,950	7,818	10,845	19,950	7,818	10,845
Annual	2,820	1,105	1,533	138,160	54,143	75,105	101,745	39,872	55,310	242,725	95,119	131,948

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

Version 4.9

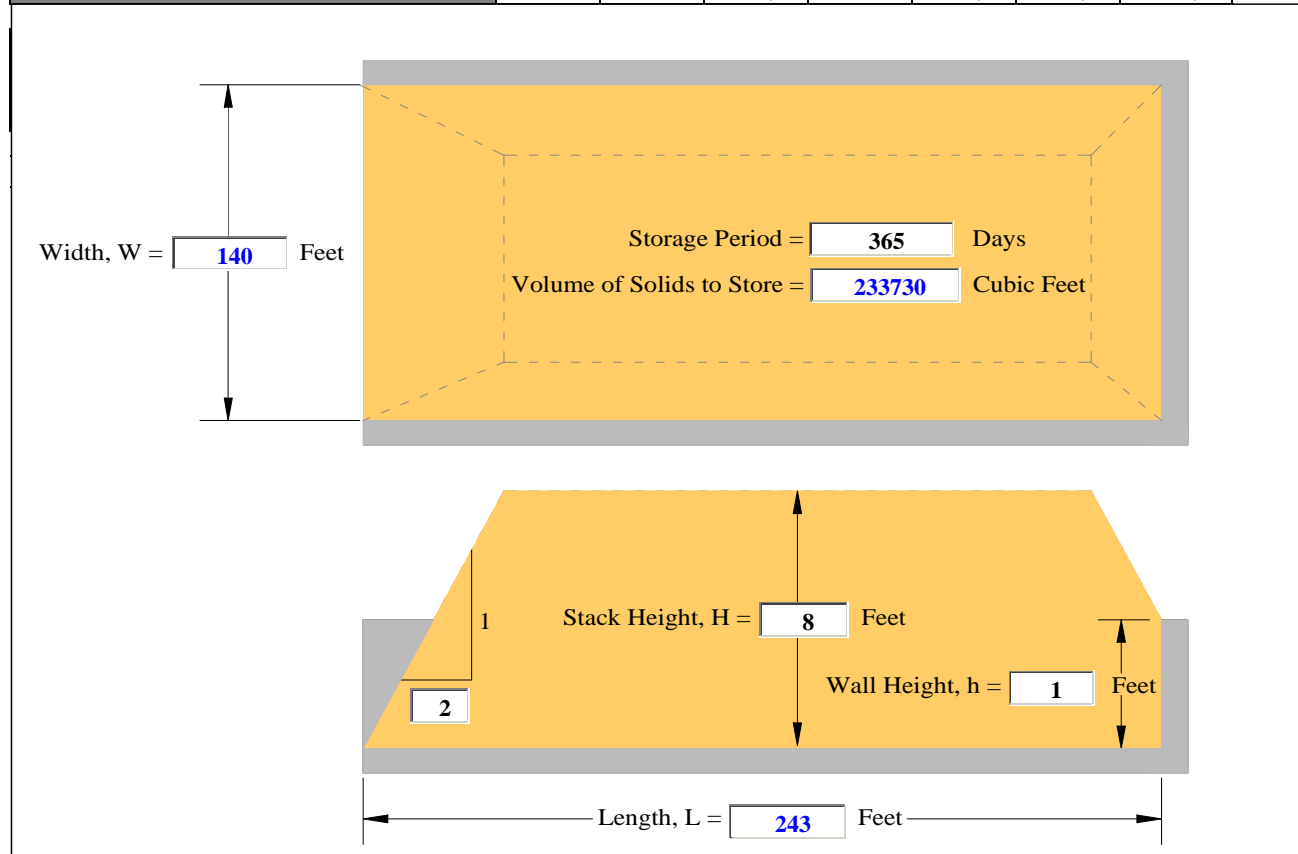
CLIENT: **Straight Ranch**
ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM STORAGE

SOLIDS STACKING FACILITY

VOLUME OF MONTHLY SOLIDS STACKED IN FACILITY

Solids Storage Facility Parameters	Value	Month	Number of Days	Manure CF	Bedding CF	Solids to Store CF	Solids to Store Tons	Normal Runoff CF
Storage Period, Days=	365	October	31	68,355	0	34,178	1,230	252
Stacking Width, W in Feet=	140	November	30	66,150	0	33,075	1,191	530
Stacking Height, H in Feet=	8.00	December	31	68,355	0	34,178	1,230	578
Wall Height, h in Feet=	1.00	January	31	68,355	0	34,178	1,230	485
Stack Side Slope (X:1)=	2.00	February	28	61,740	0	30,870	1,111	527
Existing Storage, Cubic Feet=	0	March	31	68,355	0	34,178	1,230	371
Surface Area of Existing Storage, SF=	0	April	30	66,150	0	33,075	1,191	207
25 Year-24 Hour Storm Runoff, CF=	4,082	May	31	0	0	0	0	95
Volume Needed, Cubic Feet=	233,730	June	30	0	0	0	0	89
Design Volume, Cubic Feet=	234,551	July	31	0	0	0	0	0
Is Facility Covered?	NO	▼	August	0	0	0	0	68
Volume Reduction Factor=	0.50	September	30	0	0	0	0	213
		Annual	365	467,460	0	233,730	8,414	3,416



OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

Version 4.9

CLIENT: **Straight Ranch**
 ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TRACTOR SPREADER APPLICATION OF SOLIDS

To apply 467,460 cubic feet of solids generated from the operation it will take approximately 1,336 trips annually. Based on applying NITROGEN, N at agronomic rate use the application depths, travel lengths, and loads per acre listed below for each crop.													
Field Number	Acres	Crop	Tractor Spreader Capacity		Spread Width Feet	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Tons per Acre of Solids to Apply	Travel Length per Load Needed in Feet	Loads per Acre	Assumed Solids Density lbs/CF
			Bushels	CF		PPM	Lbs/Ton						
			pasture	621		Perennial Hay/Pasture(Med Intensity)	281						
pasture/legume	800	Grass/Legume Hay/Pasture	281	350	15	5,336	10.67	160	1.00	24.6	745	4	36
sudan	150	Sorghum-Sudan Haylage	281	350	15	5,336	10.67	218	1.00	33.5	546	5	36
oats	150	Oat Haylage	281	350	15	5,336	10.67	128	1.00	19.7	929	3	36

MANAGEMENT CRITERIA FOR BIG GUN SPRINKLER APPLICATION OF LIQUIDS

To apply 455,005 gallons of liquids generated from the operation it will take approximately 25 hours of pumping annually. Based on applying NITROGEN, N at agronomic rate use the application depths, set times, and travel rates listed below for each crop.													
Field Number	Acres	Crop	Sprinkler Flowrate GPM	Wetted Diameter Feet	Portion of Wetted Diameter Receiving Liquids	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Application Rate in Inches/Hour	Set Time Needed in Hours	Travel Rate Needed in Feet/Minute
						PPM	Lbs/1000Gal						
						pasture	621						
pasture/legume	800	Grass/Legume Hay/Pasture	300	250	1/2 Circle ▼	138	1.15	160	1.00	7.83	1.45	13.28	0.25
	150	Sorghum-Sudan Haylage	300	250	1/2 Circle ▼	138	1.15	218	1.00	10.67	1.45	18.10	0.18
oats	150	Oat Haylage	300	250	1/2 Circle ▼	138	1.15	128	1.00	6.28	1.45	10.65	0.31

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)

Version 4.9

1/30/2020

CLIENT: **Straight Ranch**
 ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM APPLICATION

MANAGEMENT CRITERIA FOR TANK WAGON APPLICATION OF LIQUIDS

To apply 455,005 gallons of liquids generated from the operation it will take approximately 114 trips annually. Based on applying NITROGEN, N at agronomic rates use the application depths, travel lengths, and loads per acre listed below for each crop.											
Field Number	Acres	Crop	Tank Wagon Capacity Gallons	Spread Width Feet	NITROGEN, N Concentration in Storage Facility		Pounds of Nutrients to be Applied	Number of Applications Needed to meet Crop Demand	Inches of Liquids to Apply	Travel Length per Load Needed in Feet	Loads per Acre
					PPM	Lbs/1000Gal					
pasture	621	Perennial Hay/Pasture(Med Intensity)	4,000	15	138	1.15	144	1.00	3.01	142	20.4
pasture/legume	800	Grass/Legume Hay/Pasture	4,000	15	138	1.15	160	1.00	3.33	128	22.6
sudan	150	Sorghum-Sudan Haylage	4,000	15	138	1.15	218	1.00	4.54	94	30.8
oats	150	Oat Haylage	4,000	15	138	1.15	128	1.00	2.67	160	18.1

COMPUTED NUTRIENT CONCENTRATIONS IN STORAGE

Storage Facility	Annual Volume Production	Units	Concentration of Nutrients in Storage			
			N	P ₂ O ₅	K ₂ O	Units
Storage Pond (>50%) Dilution	455,005	Gallons	1.15	1.58	2.69	lbs/1,000 Gal
Open Lot (Arid Region)	4,207	Tons	10.67	5.79	8.03	lbs/Ton

CLIENT: **Straight Ranch**
ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

NUTRIENTS AVAILABLE AFTER STORAGE

Nutrient Source	Type of Operation	Pounds of Nutrients Available			Percent Nutrients Retained After Storage			Pounds of Nutrients Retained After Storage		
	Type of Storage Facility	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
Liquids	Storage Pond (>50%) Dilution	2,820	1,105	1,533	19%	65%	80%	524	718	1,226
Solids	Open Lot (Arid Region)	138,160	54,143	75,105	65%	90%	90%	89,804	48,728	67,595
Grazing	NONE	101,745	39,872	55,310	100%	100%	100%	101,745	39,872	55,310

NUTRIENTS AVAILABLE AFTER APPLICATION

Nutrient Source	Type of Application System	Pounds of Nutrients Available			Percent Nutrients Retained After Application			Pounds of Nutrients Retained After Application		
		N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O
Liquids	Sprinkling	524	718	1,226	75%	100%	100%	393	718	1,226
Solids	Broadcast (Incorporated 7 or more days after application)	89,804	48,728	67,595	70%	100%	100%	62,863	48,728	67,595
Grazing	Grazing	101,745	39,872	55,310	85%	100%	100%	86,483	39,872	55,310

NUTRIENTS AVAILABLE AFTER DENITRIFICATION

Nutrient Source	Location	Pounds of Nutrients Available			Percent Nutrients Retained After Denitrification			Pounds of Nutrients Retained After Denitrification			
	Soil Drainage Class	N	P2O5	K2O	N	P2O5	K2O	N	P2O5	K2O	
Liquids	East of Cascade Mountains	Somewhat Poorly Drained	393	718	1,226	87%	100%	100%	342	718	1,226
Solids			62,863	48,728	67,595	87%	100%	100%	54,691	48,728	67,595
Grazing			86,483	39,872	55,310	87%	100%	100%	75,240	39,872	55,310
TOTAL-								130,273	89,318	124,130	

OREGON ANIMAL WASTE MANAGEMENT DESIGN AID (ORAWM)
Version 4.9

1/30/2020

CLIENT: **Straight Ranch**
ASSISTED BY: **John Fazio**

ANIMAL WASTE MANAGEMENT SYSTEM UTILIZATION

PERCENT OF MANURE TO BE APPLIED TO FIELD AND UTILIZATION ACRES NEEDED BASED ON NITROGEN, N <input type="button" value="v"/>											
Field Number	Acres	Crop	LIQUIDS			SOLIDS			GRAZING		
			Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients	Percent to be Applied	Pounds of Nutrients to be Applied	Acres Needed for Utilization of Nutrients
pasture	621.0	Perennial Hay/Pasture(Med Intensity)	33%	114	1	33%	18,114	126	33%	25,017	174
pasture/legume	800.0	Grass/Legume Hay/Pasture	47%	162	1	55%	29,963	188	47%	35,720	224
sudan	150.0	Sorghum-Sudan Haylage	12%	41	0	5%	2,724	13	12%	9,131	42
oats	150.0	Oat Haylage	7%	24	0	7%	3,889	30	7%	5,371	42
Off Farm			0%	0		0%	0		0%	0	
TOTALS-	1721		100%	342	2	100%	54,691	356	100%	75,240	481

NUTRIENT BALANCE BASED ON AVAILABLE ACRES

Field Number	Acres	Crop	NUTRIENTS APPLIED			- NUTRIENTS REMOVED			= NUTRIENT BALANCE		
			Nitrogen, N Lbs/Acre	Phosphorous, P2O5 Lbs/Acre	Potassium, K2O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P2O5 Lbs/Acre	Potassium, K2O Lbs/Acre	Nitrogen, N Lbs/Acre	Phosphorous, P2O5 Lbs/Acre	Potassium, K2O Lbs/Acre
pasture	621.0	Perennial Hay/Pasture(Med Intensity)	70	48	66	144	48	137	-74	0	-71
pasture/legume	800.0	Grass/Legume Hay/Pasture	82	57	80	160	57	43	-77	0	37
sudan	150.0	Sorghum-Sudan Haylage	79	49	68	218	59	280	-138	-10	-211
oats	150.0	Oat Haylage	62	42	59	128	51	90	-66	-9	-31
Off Farm											

Crop Removal of Nutrients

Crop	Yield		lbs/Unit	% of Dry Yield			Removal per Acre		
	Unit	Condition		N %	P %	K %	N lbs/ton	P2O5 lbs/ton	K2O lbs/ton
AWMFH Chapter 6 & OSU Extension									
Alfalfa	ton	DHM	2000	3.45%	0.35%	2.85%	69.0	16.0	68.7
Wheat/Oat/Trit Haylage	ton	DHM	2000	2.16%	0.38%	2.90%	43.2	17.4	69.9
Corn Silage	ton	DHM	2000	1.10%	0.25%	1.09%	22.0	11.4	26.3
Corn Grain	ton	DHM	2000	1.61%	0.28%	0.45%	32.2	12.8	10.8
Potato	ton	AH	2000	0.33%	0.09%	0.52%	6.6	4.1	12.5
Mint	ton	DHM	2000	2.41%	0.24%	1.85%	48.2	11.0	44.6
Sweet Corn	ton	AH	2000	0.89%	0.24%	0.58%	17.8	11.0	14.0
Wheat Grain & Straw	ton	DHM	2000	2.66%	0.62%	0.80%	53.2	28.4	19.3
Peas and Pea Hay	ton	DHM	2000				65.0	19.1	55.6
Carrots (org. & conv.)	ton	AH	2000				4.3	3.5	9.6
Onions	ton	AH	2000				5.6	2.5	5.0
Sudan Grass Hay	ton	DHM	2000				45.0	21.9	105.6
Beans & Bean Straw	ton	DHM	2000				83.0	19.0	75.0
Barley Grain & Straw	ton	DHM	2000				36.0	12.0	28.0
Soybeans	ton	DHM	2000				132.0	26.7	60.0
Teff Grain & Straw	ton	DHM	2000				40.0	12.0	28.0
Canola	ton	DHM	2000				67.0	31.0	55.0
Safflower	ton	DHM	2000				56.0	30.7	40.0
Grass for Seed	ton	DHM	2000				30.3	10.9	52.6
Fruit Trees	ton	AH	2000	0.13%	0.02%	0.16%	2.6	0.9	3.9
Grapes	ton	AH	2000	0.28%	0.10%	0.50%	5.6	4.6	12.1

*DHM = Dry Harvested Material

AH = As Harvested

Crop Removal of Nutrients

Per ORAWM 4.9

Crop	% DM	Yield Units	lb/Unit	Removal per Acre		
				N lbs/unit	P2O5 lbs/unit	K2O lbs/unit
Alta Fescue Hay/Pasture	100%	Ton	2000	38.8	18.6	53.3
Grass/Legume Hay/Pasture	100%	Ton	2000	39.9	14.3	10.7
Perennial Hay/Pasture(Low Intensity)	100%	Ton	2000	32.0	13.7	45.8
Perennial Hay/Pasture(Med-Low Intensity)	100%	Ton	2000	38.0	13.7	45.8
Perennial Hay/Pasture(Med Intensity)	100%	Ton	2000	48.0	16.0	45.8
Perennial Hay/Pasture(Med-High Intensity)	100%	Ton	2000	58.0	18.3	48.2
Perennial Hay/Pasture(High Intensity)	100%	Ton	2000	64.0	18.3	48.2
Meadow Fescue Hay/Pasture	100%	Ton	2000	48.9	23.5	67.2
Oats Hay/Pasture	100%	Ton	2000	30.6	27.5	21.0
Orchard Grass Hay/Pasture	100%	Ton	2000	62.6	23.1	26.4
Ryegrass Hay/Pasture	100%	Ton	2000	39.3	14.7	40.2
Timothy Hay/Pasture	100%	Ton	2000	28.2	11.9	44.8
Wheatgrass Hay/Pasture	100%	Ton	2000	33.4	14.5	76.0
Alfalfa-Orchardgrass Haylage	100%	Ton	2000	52.0	7.8	27.5
Oat Haylage	100%	Ton	2000	32.0	12.8	22.4
Ryegrass Haylage	100%	Ton	2000	50.0	18.3	51.3
Sorghum-Sudan Haylage	100%	Ton	2000	54.4	14.7	69.9
Triticale, Haylage	100%	Ton	2000	49.0	15.6	13.7
Wheat, Haylage	100%	Ton	2000	41.3	11.5	69.0
Corn Silage	100%	Ton	2000	25.0	9.2	24.1
Alfalfa for Seed	100%	cwt	100	6.8	1.8	3.1
Barley, Grain	100%	Bu	48	1.0	0.4	0.3
Barley, Grain Straw Removed	100%	Ton	2000	60.0	23.8	47.2
Buckwheat, Grain	100%	Bu	48	1.1	0.5	0.4
Buckwheat, Grain Staw Removed	100%	Ton	2000	57.2	19.7	76.9
Bluegrass for Seed	100%	cwt	100	3.2	1.1	2.7
Corn, Grain	100%	Ton	2000	32.2	12.8	9.6
Fescue Seed	100%	cwt	100	1.4	0.0	0.0
Peppermint, Oil	100%	Ton	2000	4.2	4.1	3.4
Peppermint, Oil Stems & Leaves Removed	100%	Ton	2000	87.2	84.3	69.6
Rapeseed	100%	Bu	50	1.5	0.8	0.4
Rapeseed, Stray Removed	100%	Ton	2000	161.6	45.8	117.2
Red Clover Seed	100%	cwt	100	5.2	1.2	0.0
Ryegrass Seed	100%	cwt	100	8.1	2.4	2.4
Wheat, Spring Hard Red	100%	Bu	60	1.8	0.9	0.4
Wheat, Spring Hard Red Straw Removed	100%	Ton	2000	83.4	39.2	44.7
Wheat, Winter Hard Red	100%	Bu	60	1.8	0.9	0.4
Wheat, Winter Hard Red Straw Removed	100%	Ton	2000	83.4	39.2	44.7
Beans, Dry	100%	Ton	2000	62.6	20.6	20.7
Blueberries	100%	Ton	2000	14.3	3.0	14.2
Peas, Austrian Winter	100%	Ton	2000	72.0	18.3	28.9
Peas, Green	100%	Ton	2000	73.6	18.3	21.7
Poplars for Pumpwood	100%	Ton	2000	0.3	0.2	0.1

Other Crops

Crop	% DM	Yield Units	lb/Unit	Removal per Acre		
				N lbs/unit	P2O5 lbs/unit	K2O lbs/unit
Artichoke	100%	Ton	2000	54.0	22.1	51.0
Arugla	100%	Ton	2000	166.4	47.7	177.8
Asparagus	100%	Ton	2000	124.0	29.8	91.0
Bean, Green	100%	Ton	2000	57.6	17.4	50.4
Bean, Lima	100%	Ton	2000	72.5	20.8	37.5
Beet root	100%	Ton	2000	36.9	16.9	60.0
Bok Choy	100%	Ton	2000	120.0	42.4	151.8
Broccoli	100%	Ton	2000	106.7	33.6	87.0
Brussels Sprouts	100%	Ton	2000	77.7	22.6	66.9
Cabbage	100%	Ton	2000	54.9	15.1	84.7
Cane Berries	100%	Ton	2000	27.4	7.2	26.0
Carrot	100%	Ton	2000	26.7	16.8	64.9
Cauliflower	100%	Ton	2000	80.0	26.4	106.9
Celery	100%	Ton	2000	44.2	22.0	125.3
Collards	100%	Ton	2000	85.3	12.2	59.4
Cucumber	100%	Ton	2000	40.0	19.5	89.8
Eggplant	100%	Ton	2000	44.0	18.9	66.0
Endive	100%	Ton	2000	69.3	21.4	126.1
Fennel	100%	Ton	2000	49.6	28.6	42.5
Flax	100%	Ton	2000	63.0	31.6	21.1
Garlic	100%	Ton	2000	50.0	17.1	23.6
Hazelnuts	100%	Ton	2000	50.5	14.0	17.2
Hemp	100%	Ton	2000	39.6	9.2	41.3
Herbs	100%	Ton	2000	58.7	15.7	107.6
Hops	100%	Ton	2000	666.7	305.5	428.3
Jicama	100%	Ton	2000	23.0	8.2	36.1
Kale	100%	Ton	2000	70.4	17.1	71.8
Kohlrabi	100%	Ton	2000	60.4	23.4	93.7
Leek	100%	Ton	2000	28.2	9.4	25.5
Lettuce	100%	Ton	2000	83.2	21.1	122.9
Melon	100%	Ton	2000	28.8	7.8	74.5
Millet	100%	Ton	2000	38.6	15.8	1.8
Mustard Seed	100%	bu	58	same as rapeseed		
Mustard Plant	100%	Ton	2000	same as rapeseed removed		
Oats	100%	Ton	2000	49.3	22.1	10.3
Okra	100%	Ton	2000	64.0	28.9	73.0
Olives	100%	Ton	2000	same as fruit trees		
Parsnip	100%	Ton	2000	19.2	16.3	45.2
Pepper, Sweet	100%	Ton	2000	41.1	14.4	67.1
Pistacio	100%	Ton	2000	69.6	22.7	25.6
Pumpkin	100%	Ton	2000	40.0	25.2	102.4
Quinoa	100%	Ton	2000	50.3	24.9	14.8
Radish	100%	Ton	2000	38.4	16.5	111.8
Rhubarb	100%	Ton	2000	48.0	10.7	115.7
Rutabaga	100%	Ton	2000	38.4	26.6	81.2
Safflower	100%	Ton	2000	55.1	31.4	17.6
Soybean	100%	Ton	2000	46.3	8.5	15.3
Spinach	100%	Ton	2000	116.0	28.1	168.1
Squash, Butternut/ winter	100%	Ton	2000	22.9	10.8	60.6
Squash, summer	100%	Ton	2000	64.0	26.7	78.3
Squash, Zucchini	100%	Ton	2000	96.0	36.7	149.4
Strawberry	100%	Ton	2000	24.0	10.9	50.0
Sunflower Oil	100%	Ton	2000	same as sunflower seed		
Sunflower Seed	100%	Ton	2000	55.6	53.6	11.9
Tomato	100%	Ton	2000	53.3	17.6	83.1
Tamatillos	100%	Ton	2000	53.3	17.6	83.1
Turnips	100%	Ton	2000	37.3	19.9	71.1