

ADC NORTH CENTRAL UNIT FACILITY- IZARD COUNTY

Wastewater Treatment Plant
Route 5 Hwy 5 North
Calico Rock, Arkansas

2022 ANNUAL BIOSOLIDS REPORT Biosolids Land Application Site

For

Arkansas Department of Correction
P. O. Box 8707
Pine Bluff Arkansas 71611

McClelland Consulting Engineers, Inc

MCE Project Number 22-5794
April 26, 2023



North Central Unit WWTP-Izard County Annual Biosolids Report 2021

The North Central Unit (NCU) Facility submitted waste management plan (WMP) for its biosolids land application sites on June 25, 2019. Subsequently, a biosolids land application permit for the facility was issued March 16, 2020 and became effective April 1, 2020 with expiration date, March 31, 2025. The biosolids land application permit number is 5124-WR-2. The permit requires an annual monitoring and reporting of certain biosolids characteristics including total volume of land applied biosolids and nitrogen application rate. Soil parameters such as electrical conductivity, cation exchange capacity (CEC), pH, and soil adsorption ratio are also required to be monitored and reported annually. Whereas the 40 CFR Part 503 regulated metals are required to be analyzed for the field soil once every five years. Details of the important parameters for both soil and biosolids are succinctly presented in the permit, 5124-WR-2 Part I.

However, the facility did not measure biosolids characteristic parameters for 2020 and 2021, neither necessary soil parameters were measured for these years. The only available data for the NCU biosolids was the total volume of land applied biosolids. The manner in which data were measured and recorded might have introduced considerable errors. For instance, some data were reported in number of beds, some in liquid tanks, and some in cubic yard, all in the same collecting period, and the application fields were not clearly defined. Efforts were made to properly apply the available data. Nevertheless, data collected and recorded in inconsistent ways are bound to have some errors, regardless of the efforts to properly apply such data.

Data Analysis – Loading

In **2022**, biosolids were applied to Field-1 through each month of the year. From January 2022 through December 2022 a total of number of 50 days were used for land application of Field-1. Shown in the aerial map are the locations of Field-1, with the corresponding geographic coordinates of 36° 10' 19.69" N, 92° 9' 5.06" W. Approximately 1,875 cubic yards of biosolids were applied on Field-1 and it was determined that this equates to 3.3 dry tons/acre-year; assuming 3% solids per volume of liquid biosolids.

*In **2021**, biosolids were applied to both Field-1 and Field-2 all through the months of the year. Biosolids were applied on Field-2 from January to April 2021 for a total number of 38 days. The total number of days in which biosolids were applied on Field-1 was 73 days from May to December 2021. Shown in the aerial map are the locations of Field-1 and Field-2, with the corresponding geographic coordinates of 36° 10' 19.69" N, 92° 9' 5.06" W and 36° 10' 0.63" N, 92° 8' 40.4" W, respectively. Approximately 950 cubic yards of biosolids were applied on field 2 for the 2021 period; whereas 1,741 cubic yards were applied on Field-1. It was determined that 29.10 lb/d of dry solids (DS) were applied on*

Field-2 based on the assumption that 0.65 percent was solids. In like fashion, 1,741 cubic yards translate to 53.3 lb/d DS for Field-1.

Agronomic loading rate

The site is covered with cover crops: 75 percent fescue and 25 percent natural pasture grasses. Thus, the biosolids nitrogen required for the field is 148 lb/acre. The agronomic loading (ALR) is defined as:

$$\text{ALR} = \frac{\text{Biosolids nitrogen needed for crop, lb/acre}}{\text{PAN in biosolids}}$$
$$\text{ALR} = \frac{148 \text{ lb/acre}}{\text{PAN}}$$

Where PAN is the plant available nitrogen

Biosolids Loading Rate

2022

Biosolid loading rate (BLR) is the amount of biosolids applied on a land application site that is not necessarily based on ALR, usually reported annually. The land application area for Field-1 is 20 acres.

$$\text{BLR} = \frac{\text{Quantity of biosolids applied}}{\text{Area}}$$

Where the quantity of biosolids is in ton and the area in acres.

1.) Field-1

$$\text{BLR1} = \frac{66.39 \text{ tons}}{20 \text{ acres}}$$

$$\text{BLR1} = 3.3 \text{ ton/acre}$$

2021

Biosolid loading rate (BLR) is the amount of biosolids applied on a land application site that is not necessarily based on ALR, usually reported annually. The land application areas for Field-1 and Field-2 are, respectively 20 and 23 acres.

$$\text{BLR} = \frac{\text{Quantity of biosolids applied}}{\text{Area}}$$

Where the quantity of biosolids is in ton and the area in acres.

2.) Field-1

$$\text{BLR1} = \frac{9.72 \text{ tons}}{20 \text{ acres}}$$

$$\text{BLR1} = 0.50 \text{ ton/acre}$$

3.) Field-2

$$\text{BLR2} = \frac{5.31 \text{ tons}}{23 \text{ acres}}$$

$$\text{BLR2} = 0.23 \text{ tons/acre}$$

The agronomic loading rates (ALRs) for both Field-1 and Field-2 reported in the prevailing waste management plan (WMP) were essentially the same, 2.43 ton/acre. In addition, it was determined in the WMP that it would take approximately the same number of years, 1523 to reach their cumulative limits. With BLRs of 0.50 ton/acre and 0.23 ton/acre, respectively, for Field-1 and Field-2 these would add insignificant amounts of 40 CFR Part 503 regulated metals to the respective application fields.

Summary

2022

See attachments for the WWTP sludge removal volumes and locations, and is for U of A Division of Agriculture's soil conditions report that is comprised of nutrient and metal data describing the existing soil conditions for march 2022. In 2022 BLR was 66.39 tons applied to 20 acres for a 3.3 dry tons/acre BLR to Field-1.

2021

Although essential biosolids characteristics data were not monitored and reported, the regulated metals that might had been added to the soils of Field-1 and Field-2 were insignificant. This is supported by the notion that the biosolids loading rates for the 2021 period were considerably lower than the agronomic loading rate, the limiting loading rate given in the existing WMP.

Efforts should be directed in the future towards improving data collection, and reporting.

Soil Test Report For:

Sgt. Kenny Morehead 870-373-0219
10 Prison Circle
Calico Rock, AR 72519

Marianna Soil Test & Research Laboratory

008 Lee 214

Marianna, AR 72360

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Izard (870) 368-4323

Sample ID 00352270

Lab ID 28122

Date Processed 3/3/2022

Field ID Pas. 1

The University of Arkansas is an equal opportunity/affirmative action institution

Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	6.5				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	40	80	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	331	662	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	1.9	3.8	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	14	28	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	704	1408	Estimated CEC (ECEC)				7 cmolc/kg
Magnesium (Mg)	87	174	Organic Matter				%
Iron (Fe)	98	196	Estimated Soil Texture				Silt Loam
Manganese (Mn)	43	86	Base Saturation	67	Ca	46.1	% of ECEC
Copper (Cu)	0.3	0.6			Mg	9.5	% of ECEC
Boron (B)	0.2	0.4			K	11.1	% of ECEC
Nitrate (NO3-N)					Na	0.6	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	30	0	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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Sample ID 00352269

Lab ID 28112

Date Processed 3/3/2022

Field ID Pas. 2

The University of Arkansas is an equal opportunity/affirmative action institution

Previous Crop: Pasture (212)

Acres: 10

Field Levelled in last 4 years:

Irrigation Water Source:

Lime Applied in last 4 years: No

Nutrient Management Plan:

Soil pH & Nutrient Availability Index

4.0 - 5.0

5.1 - 6.0

6.1 - 7.0

7.1 - 8.0

8.1 - 9.0

Strongly Acidic

Medium Acidic

Slightly Acidic

Slightly Alkaline

Strongly Alkaline

Soil pH

6.8

Mehlich III Nutrient

Units

Soil Test Level

ppm

lbs/acre

Very Low

Low

Medium

Optimum

Above Optimum

Phosphorus (P)

27

54

< 16 ppm

16 - 25 ppm

26 - 35 ppm

36 - 50 ppm

> 50 ppm

Potassium (K)

105

210

< 61

61 - 90

91 - 130

131 - 175

> 175

Zinc (Zn)

1.9

3.8

< 1.6

1.6 - 2.5

2.6 - 4.0

4.1 - 8.0

> 8.0

Mehlich III Nutrient

ppm

lbs/acre

Other Soil Properties

Units

Sulfate-S (SO4-S)

5

10

Electrical Conductivity (EC)

µmhos/cm

Calcium (Ca)

815

1630

Estimated CEC (ECEC)

7

cmolc/kg

Magnesium (Mg)

84

168

Organic Matter

%

Iron (Fe)

89

178

Estimated Soil Texture Silt Loam

Manganese (Mn)

200

400

Base Saturation

67

Ca

53.9

% of ECEC

Copper (Cu)

0.5

1.0

Mg

9.3

% of ECEC

Boron (B)

0.3

0.6

K

3.6

% of ECEC

Nitrate (NO3-N)

Na

0.3

% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	40	60	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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10 Prison Circle
Calico Rock, AR 72519

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Sample ID 00352268
Lab ID 28121
Date Processed 3/3/2022
Field ID Pas. 3

The University of Arkansas is an equal opportunity/affirmative action institution

Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	5.9				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	45	90	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	100	200	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	3.0	6.0	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	10	20	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	470	940	Estimated CEC (ECEC)				6 cmolc/kg
Magnesium (Mg)	56	112	Organic Matter				%
Iron (Fe)	128	256	Estimated Soil Texture				Sandy Loam
Manganese (Mn)	67	134	Base Saturation				51
Copper (Cu)	0.9	1.8		Ca	38.6	% of ECEC	
Boron (B)	0.3	0.6		Mg	7.7	% of ECEC	
Nitrate (NO3-N)				K	4.2	% of ECEC	
				Na	0.4	% of ECEC	

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	30	60	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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Sample ID 00352267
Lab ID 28116
Date Processed 3/3/2022
Field ID Pas. 4

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Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	5.9				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	67	134	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	96	192	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	5.4	10.8	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	15	30	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	700	1400	Estimated CEC (ECEC)				7 cmolc/kg
Magnesium (Mg)	100	200	Organic Matter				%
Iron (Fe)	141	282	Estimated Soil Texture				Silt Loam
Manganese (Mn)	189	378	Base Saturation	61	Ca	46.0	% of ECEC
Copper (Cu)	1.8	3.6			Mg	11.0	% of ECEC
Boron (B)	0.3	0.6			K	3.2	% of ECEC
Nitrate (NO3-N)					Na	0.4	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	0	60	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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Sample ID 00352266
Lab ID 28124
Date Processed 3/3/2022
Field ID Pas. 5

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Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index		4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
		Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	7.4					

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	38	76	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	93	186	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	3.8	7.6	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	7	14	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	590	1180	Estimated CEC (ECEC)				6 cmolc/kg
Magnesium (Mg)	168	336	Organic Matter				%
Iron (Fe)	130	260	Estimated Soil Texture				Silt Loam
Manganese (Mn)	118	236	Base Saturation				76
Copper (Cu)	0.5	1.0	Ca	48.1	% of ECEC		
Boron (B)	0.3	0.6	Mg	22.8	% of ECEC		
Nitrate (NO3-N)			K	3.9	% of ECEC		
			Na	0.7	% of ECEC		

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	30	60	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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Sample ID 00352265
Lab ID 28111
Date Processed 3/3/2022
Field ID Pas. 6

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Previous Crop: Pasture (212)	Acres: 10
Field Leveled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	7.2				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	5	10	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	62	124	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	0.7	1.4	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	6	12	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	967	1934	Estimated CEC (ECEC)				9 cmolc/kg
Magnesium (Mg)	310	620	Organic Matter				%
Iron (Fe)	68	136	Estimated Soil Texture				Silt Loam
Manganese (Mn)	196	392	Base Saturation	79	Ca	50.2	% of ECEC
Copper (Cu)	0.6	1.2			Mg	26.8	% of ECEC
Boron (B)	0.2	0.4			K	1.7	% of ECEC
Nitrate (NO3-N)					Na	0.5	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	120	100	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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Calico Rock, AR 72519

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Sample ID 00352264

Lab ID 28120

Date Processed 3/3/2022

Field ID Pas. 7

The University of Arkansas is an equal opportunity/affirmative action institution

Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	6.9				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	112	224	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	166	332	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	8.0	16.0	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units	
Sulfate-S (SO4-S)	8	16	Electrical Conductivity (EC)				µmhos/cm	
Calcium (Ca)	943	1886	Estimated CEC (ECEC)				8 cmolc/kg	
Magnesium (Mg)	98	196	Organic Matter				%	
Iron (Fe)	152	304	Estimated Soil Texture				Silt Loam	
Manganese (Mn)	80	160	Base Saturation		71	Ca	55.6	% of ECEC
Copper (Cu)	0.6	1.2				Mg	9.6	% of ECEC
Boron (B)	0.3	0.6				K	5.0	% of ECEC
Nitrate (NO3-N)						Na	0.3	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	0	40	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

Sgt. Kenny Morehead 870-373-0219
10 Prison Circle
Calico Rock, AR 72519

Marianna Soil Test & Research Laboratory
008 Lee 214
Marianna, AR 72360
(870) 295-2851

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lizard (870) 368-4323
Sample ID 00352263
Lab ID 28118
Date Processed 3/3/2022
Field ID Pas. 8

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Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	6.5				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	105	210	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	200	400	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	2.8	5.6	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	10	20	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	840	1680	Estimated CEC (ECEC)				7 cmolc/kg
Magnesium (Mg)	85	170	Organic Matter				%
Iron (Fe)	188	376	Estimated Soil Texture				Silt Loam
Manganese (Mn)	33	66	Base Saturation	69	Ca	52.8	% of ECEC
Copper (Cu)	0.3	0.6			Mg	8.9	% of ECEC
Boron (B)	0.3	0.6			K	6.5	% of ECEC
Nitrate (NO3-N)					Na	0.3	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	0	0	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

Sgt. Kenny Morehead 870-373-0219
10 Prison Circle
Calico Rock, AR 72519

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Sample ID 00352262

Lab ID 28206

Date Processed 3/3/2022

Field ID Pas. 9

The University of Arkansas is an equal opportunity/affirmative action institution

Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index		4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
		Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	5.3					

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	35	70	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	101	202	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	3.0	6.0	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	27	54	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	203	406	Estimated CEC (ECEC)				6 cmolc/kg
Magnesium (Mg)	37	74	Organic Matter				%
Iron (Fe)	371	742	Estimated Soil Texture				Sandy Loam
Manganese (Mn)	20	40	Base Saturation	26	Ca	16.6	% of ECEC
Copper (Cu)	0.6	1.2			Mg	5.0	% of ECEC
Boron (B)	0.3	0.6			K	4.2	% of ECEC
Nitrate (NO3-N)					Na	0.4	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	40	60	0	0	0	4000	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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10 Prison Circle
Calico Rock, AR 72519

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lizard (870) 368-4323
Sample ID 00352261
Lab ID 28110
Date Processed 3/3/2022
Field ID Pas. 10

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Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	6.8				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	78	156	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	256	512	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	7.5	15.0	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units	
Sulfate-S (SO4-S)	10	20	Electrical Conductivity (EC)		10		µmhos/cm	
Calcium (Ca)	1052	2104	Estimated CEC (ECEC)		10		cmolc/kg	
Magnesium (Mg)	239	478	Organic Matter				%	
Iron (Fe)	195	390	Estimated Soil Texture		Silt Loam			
Manganese (Mn)	64	128	Base Saturation	76	Ca	50.3	% of ECEC	
Copper (Cu)	1.9	3.8			Mg	19.1	% of ECEC	
Boron (B)	0.4	0.8			K	6.3	% of ECEC	
Nitrate (NO3-N)					Na	0.4	% of ECEC	

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	0	0 -	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

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10 Prison Circle
Calico Rock, AR 72519

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Sample ID 00352260
Lab ID 28109
Date Processed 3/3/2022
Field ID Pas. 11

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Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	6.5				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	78	156	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	300	600	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	6.9	13.8	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	12	24	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	1137	2274	Estimated CEC (ECEC)				11 cmolc/kg
Magnesium (Mg)	258	516	Organic Matter				%
Iron (Fe)	203	406	Estimated Soil Texture				Silt Loam
Manganese (Mn)	65	130	Base Saturation	78	Ca	51.0	% of ECEC
Copper (Cu)	1.7	3.4			Mg	19.3	% of ECEC
Boron (B)	0.5	1.0			K	6.9	% of ECEC
Nitrate (NO3-N)					Na	0.4	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	0	0	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

Soil Test Report For:

Sgt. Kenny Morehead 870-373-0219
10 Prison Circle
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Sample ID 00352259
Lab ID 28119
Date Processed 3/3/2022
Field ID Pas.12

The University of Arkansas is an equal opportunity/affirmative action institution

Previous Crop: Pasture (212)	Acres: 10
Field Levelled in last 4 years:	Irrigation Water Source:
Lime Applied in last 4 years: No	Nutrient Management Plan:

Soil pH & Nutrient Availability Index	4.0 - 5.0	5.1 - 6.0	6.1 - 7.0	7.1 - 8.0	8.1 - 9.0
	Strongly Acidic	Medium Acidic	Slightly Acidic	Slightly Alkaline	Strongly Alkaline
Soil pH	6.9				

Mehlich III Nutrient	Units		Soil Test Level				
	ppm	lbs/acre	Very Low	Low	Medium	Optimum	Above Optimum
Phosphorus (P)	34	68	< 16 ppm	16 - 25 ppm	26 - 35 ppm	36 - 50 ppm	> 50 ppm
Potassium (K)	110	220	< 61	61 - 90	91 - 130	131 - 175	> 175
Zinc (Zn)	0.8	1.6	< 1.6	1.6 - 2.5	2.6 - 4.0	4.1 - 8.0	> 8.0

Mehlich III Nutrient	ppm	lbs/acre	Other Soil Properties				Units
Sulfate-S (SO4-S)	4	8	Electrical Conductivity (EC)				µmhos/cm
Calcium (Ca)	422	844	Estimated CEC (ECEC)				5 cmolc/kg
Magnesium (Mg)	95	190	Organic Matter				%
Iron (Fe)	73	146	Estimated Soil Texture				Sandy Loam
Manganese (Mn)	26	52	Base Saturation	62	Ca	40.6	% of ECEC
Copper (Cu)	1.9	3.8			Mg	15.2	% of ECEC
Boron (B)	0.2	0.4			K	5.4	% of ECEC
Nitrate (NO3-N)					Na	0.3	% of ECEC

Methods: Soil pH and EC in 1:2 soil-water volume mixture; nutrients other than NO3-N extracted with Mehlich-3 determined by ICAP; Nitrate extracted with Al2(SO4)3 and determined by electrode; ECEC by cation summation; organic matter by weight loss on ignition.

Comments: Unit of lbs/acre assumes the sample depth represents a plow layer weighing 2 million pounds.

Code	Name	N	P ₂ O ₅	K ₂ O	SO ₄ -S	Zn	B	Lime	
212	Mixed Cool and Warm-Season Grass	60	40	60	0	0	0	0	lb/acre

Crop 1 Notes:

To favor cool-season grasses, apply N in late winter. To favor warm-season grasses, do not apply N until May 1. For higher production, topdress 50 lb N/Acre after every 4-6 weeks of grazing or as needed.

Crop 2 Notes:

Crop 3 Notes:

