SENATE TAXATION
EXHIBIT NO. 6
DATE 2.10.11
BILL NO. HB132

WRS

WESTERN RANCH SUPPLY CO.

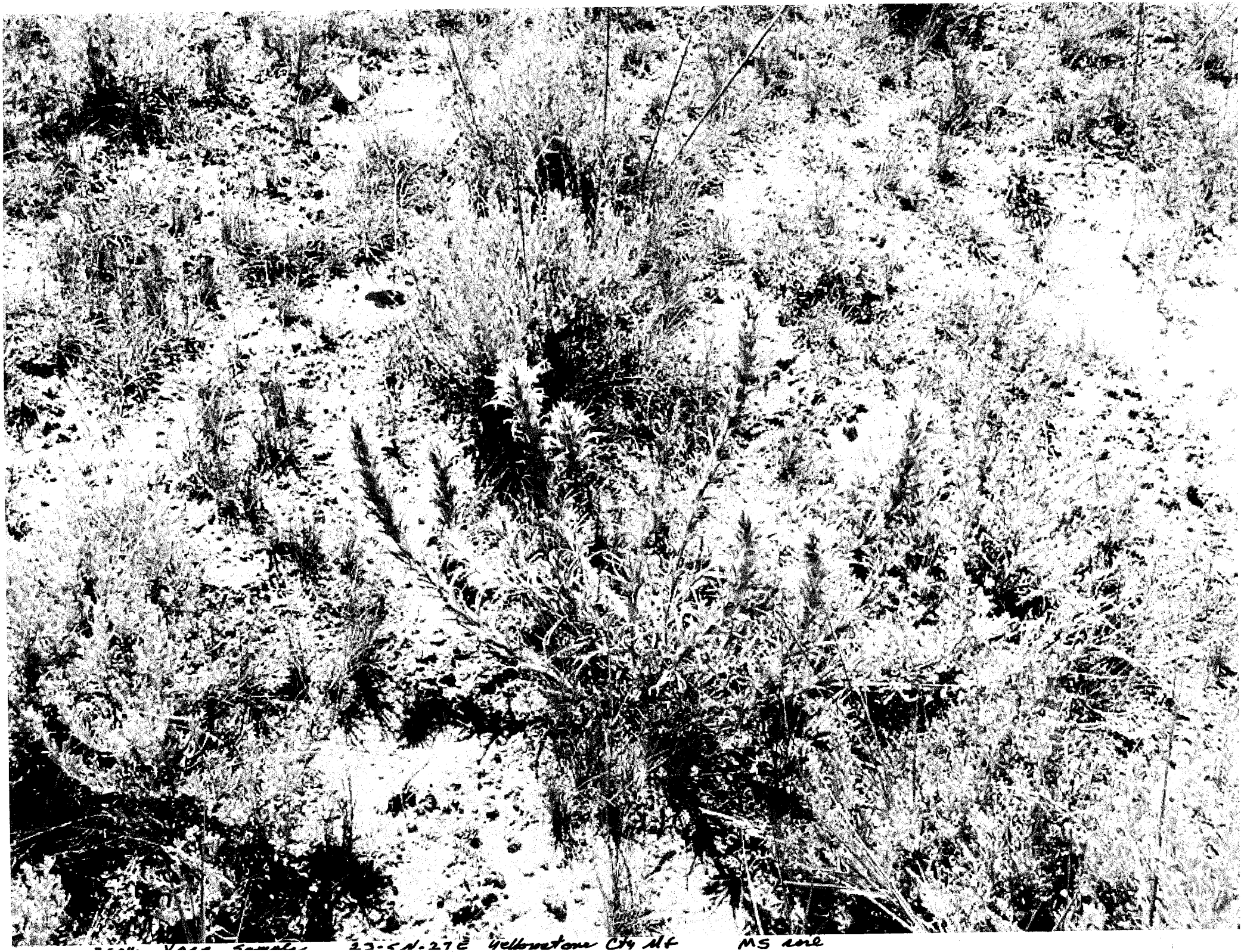
- Presents -

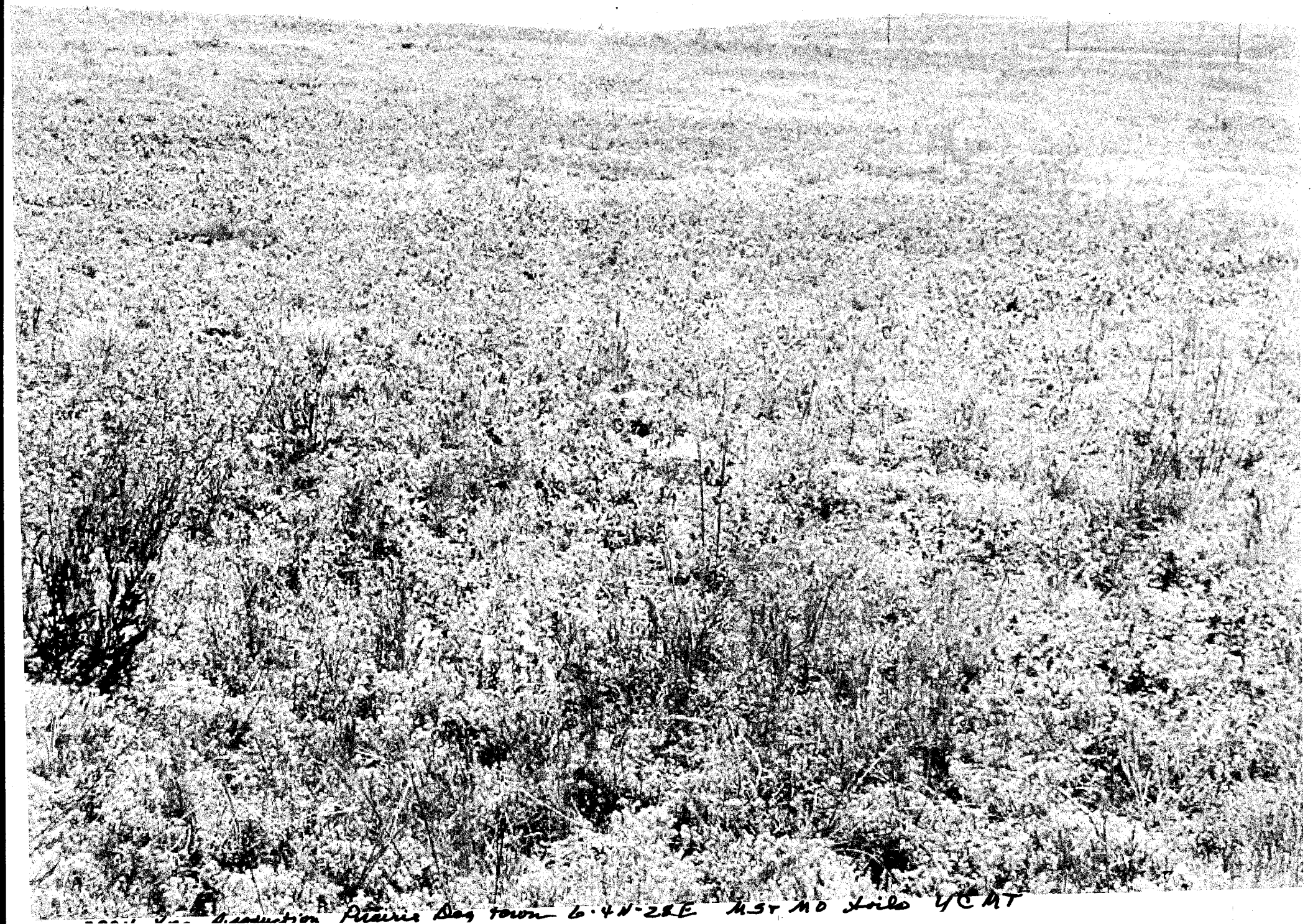
"Earl"

EARL...

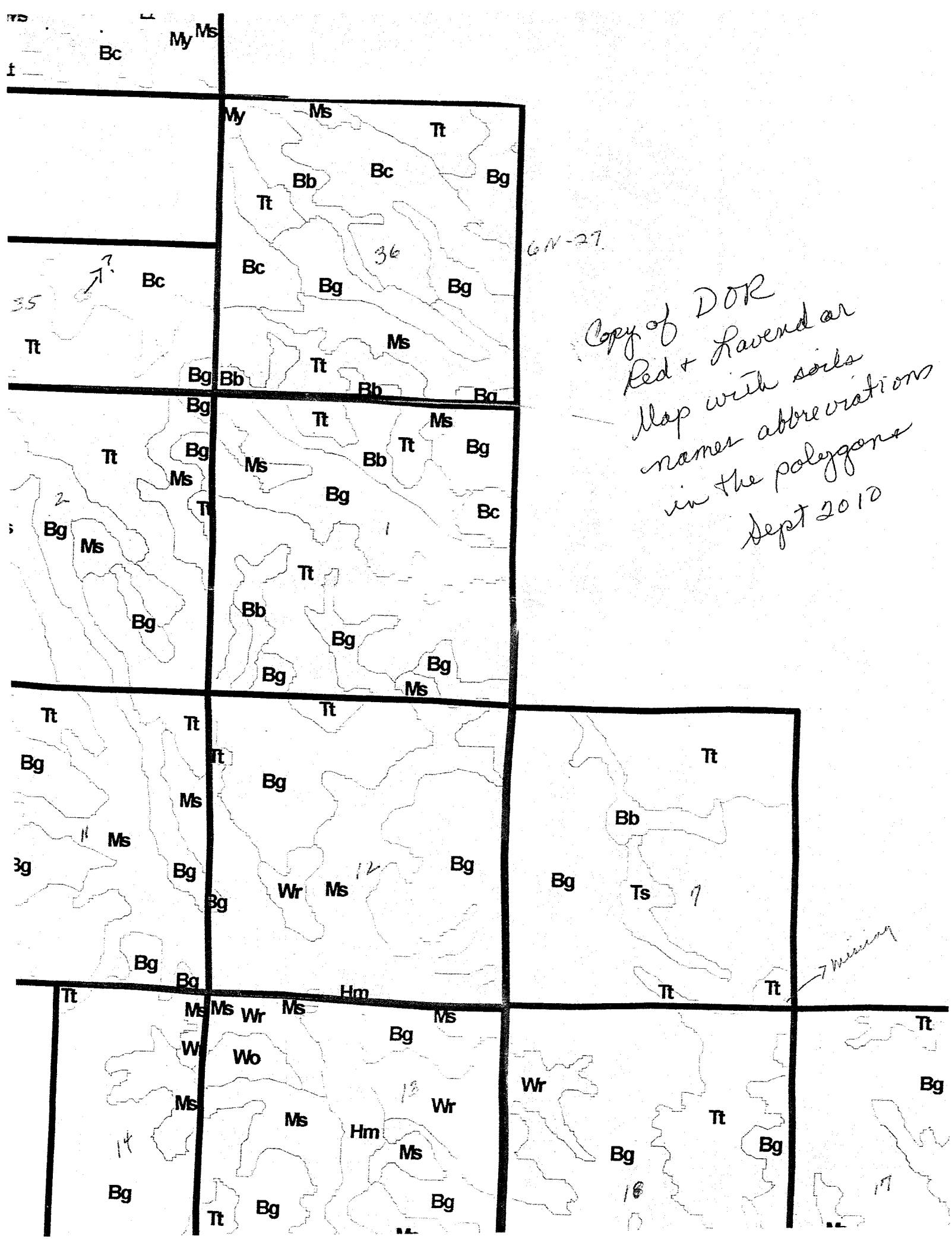
"YOU CAN ALWAYS TELL A COWBOY THAT COMES FROM NORTH OF THE YELLOWSTONE.. THEY'RE SCARED TO DEATH OF WATER"

Big Dry Syndicate

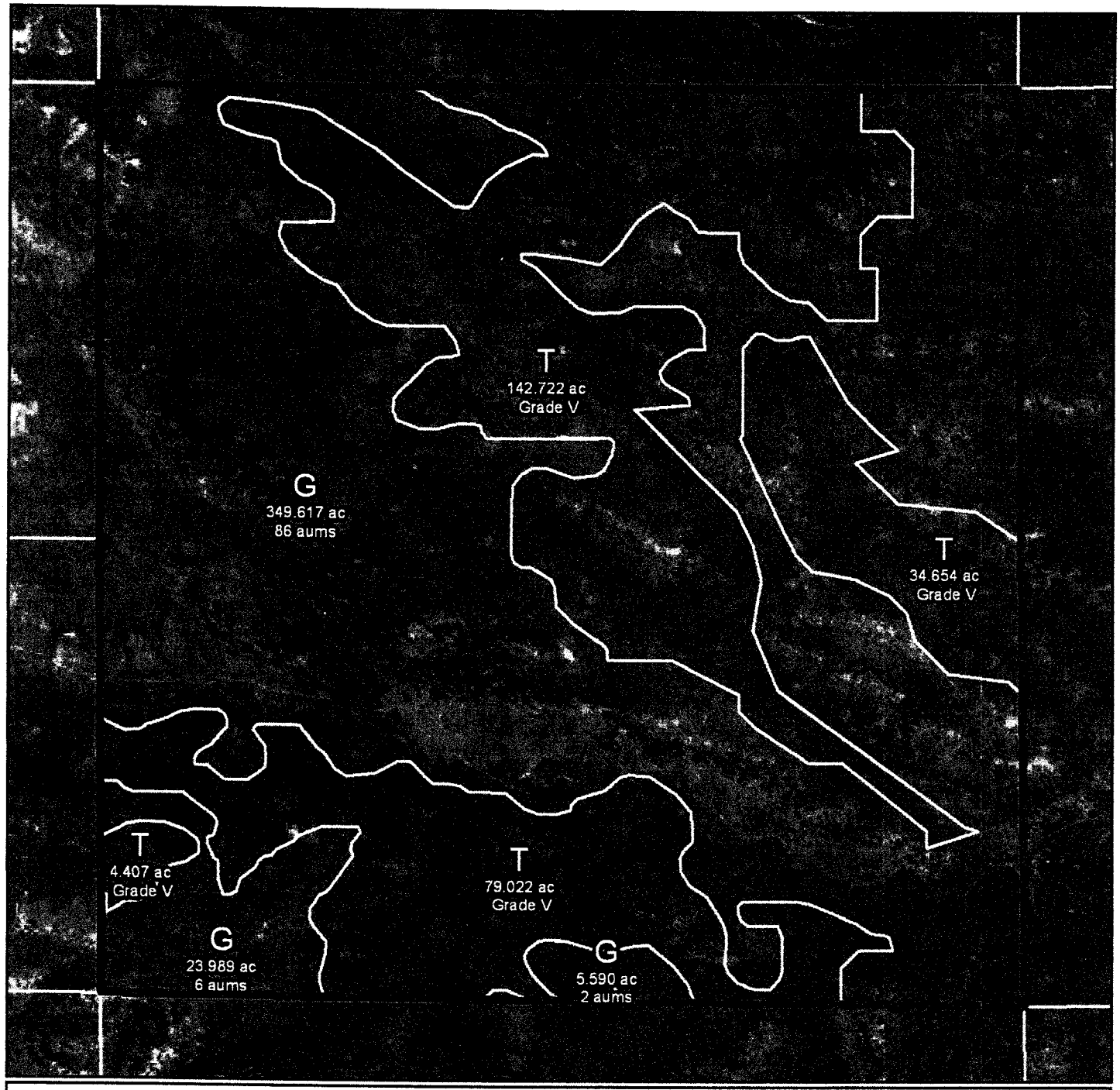

23-6N-27E Yellowstone Cty MT MS one


Production Prairie Dog town 6-4N-28E MST MO Soils 4/C MT

Shale outcrop - steep slopes
4700 ft elevation 34-6N-17E


Bc
My
Ms
Tt
Bb
Bg
36
GN-27
Copy of DOR
Red + Lavender
Map with soils
names abbreviations
in the polygons
Sept 2012
Wr
Wo
Hm
Ts
7 missing

Montana Department of Revenue - 2009 Reappraisal Classification - Yellowstone County



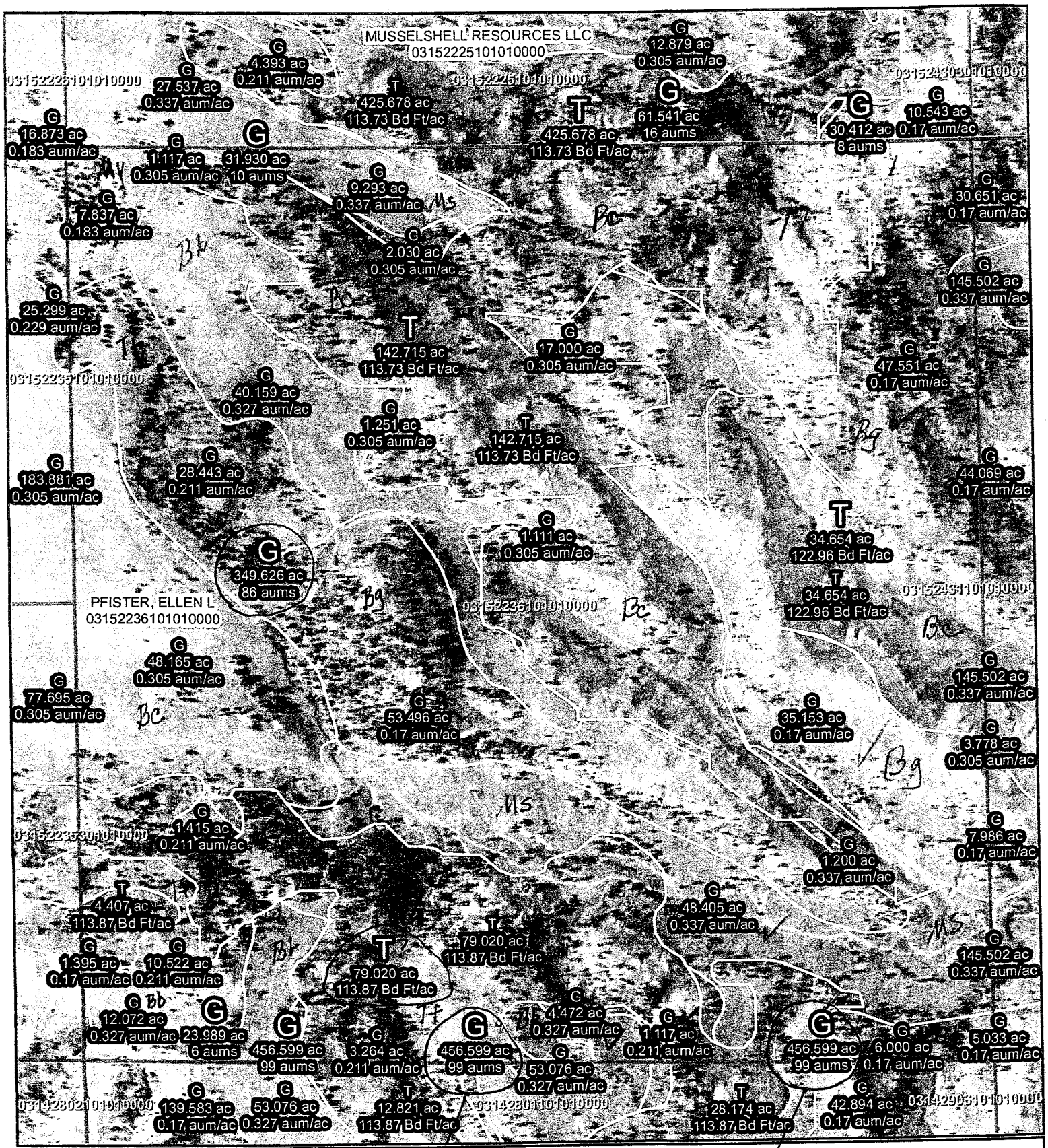
Owner:	Pfister, Ellen L	Total Grazing Acres: (G):	379.196
Parcel ID:	03152236101010000	Total Timber Acres: (T):	260.804
Twnshp/Rng/Sec:	T06 N R27 E S36		
		Total Parcel Acreage:	**640.000**

94 AUMs - 09
88 " 10

Section 36 T 2 N R 27 E

Montana Department of Revenue - Tax Year 2010 Classification - Yellowstone County

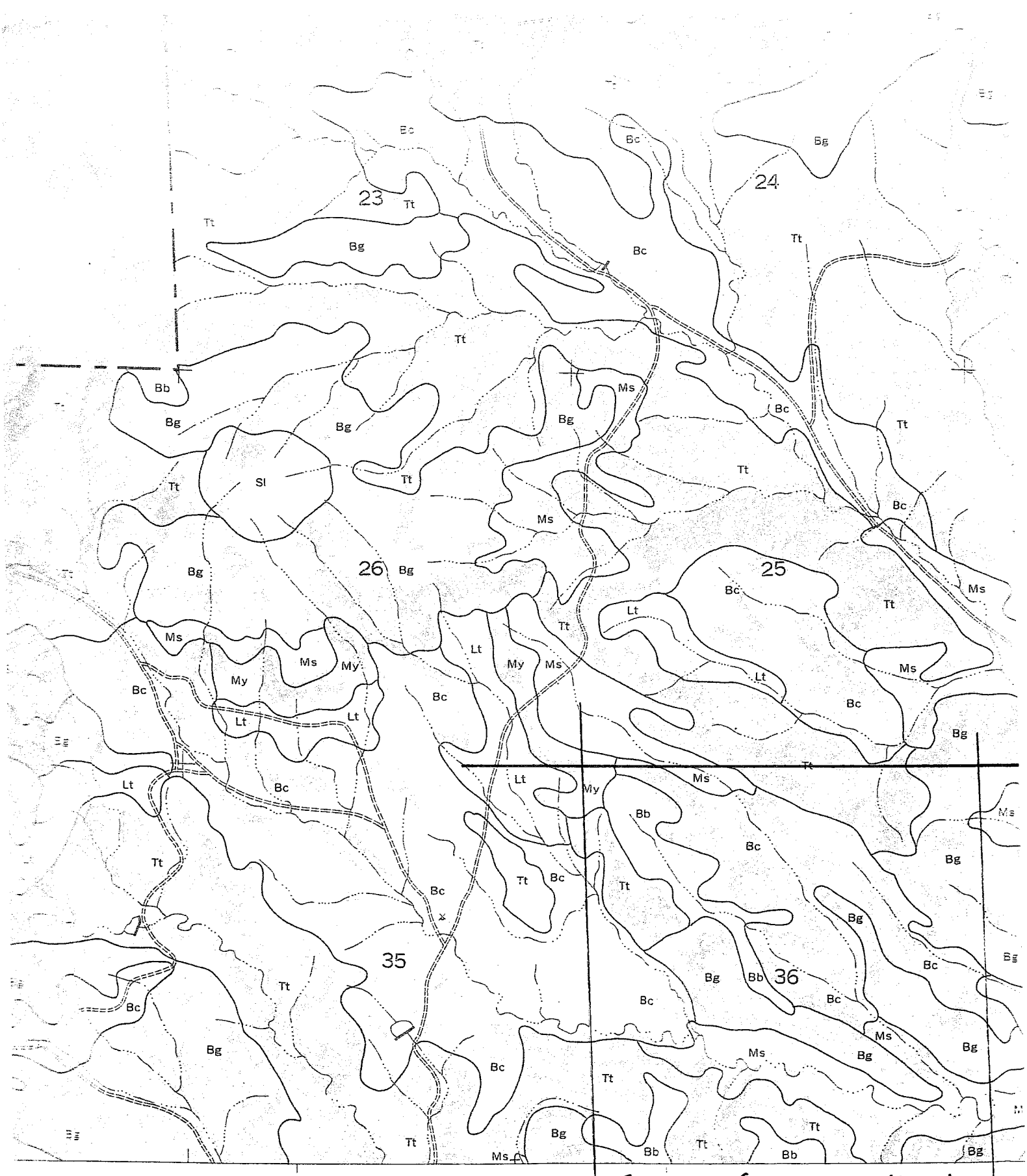
1:8,909



Farmsteads | Ag Parcel Boundary | Land Use | Productivity

Land Use Symbols:
G: Grazing F: Fallow H: Hay C: Continuously Cropped T: Forest
I/F : Flood Irrigated I/S: Sprinkler Irrigated I/P: Pivot Irrigated

Disclaimer: The data displayed on this map does not constitute a legal survey. Inaccuracies exist with both the mapped parcel data and the CAMA data. When seeking the definitive description of real property, consult the deed recorded at the local county courthouse.



Section 36, T6N, R17E
Yellowstone County

Soil types from 1972 Yellowstone County Soil Survey by NRCS derived by ground truthing and examination of aerial photographs

This tract is at least ¼ miles in any direction from a public road.

USDA Natural Resources Conservation Service

Web Soil Survey

Contact Us | Download Soils Data | Archived Soil Surveys | Soil Survey Status | Glossary | Preferences | Logout | Help

A A A

Area of Interest (AOI) | Soil Map | Soil Data Explorer | Shopping Cart (Free)

View Soil Information By Use: All Uses

Printable Version | Add to Shopping Cart

Intro to Soils | Suitabilities and Limitations for Use | Soil Properties and Qualities | Ecological Site Assessment | Soil Reports

Search

Ecological Sites

Open All | Close All

All Ecological Sites

View All Ecological Sites Info

View Options

Dominant Ecological Site Map

Ecological Sites by Map Unit Component Table

Basic Options

Ecological Site Type: Rangeland

View All Ecological Sites Info

R046XC506MT — Shallow (Sw) RRU 46-C 13-19" p.z.

- This Ecological Site
- Tall and Medium Grasses/Forbs/Shrubs
- Medium and Short Grasses, Sedge, and Increaser Forbs
- Sedges, Mid and Short Increaser Grasses, Increaser Forbs, Fringed Sagewort, Creeping Juniper
- Short Grasses, Half Shrubs, Weedy Forbs, Annuals, Shrub and Cactus

R058AC040MT — Silty (Si) RRU 58A-C 11-14" p.z.

- This Ecological Site
- Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs
- Plant Community 2A: Medium and Short Grasses and Sedges/ Half-shrubs
- Plant Community 2B: Medium and Short Grasses and Sedges/ Shrubs and Half-shrubs
- Plant Community 3: Short and Medium Grasses/ Half-shrubs and Shrubs
- Plant Community 4: Short and Medium Grasses and Sedges/ Half-shrubs
- Plant Community 5: Short Grasses/ Half-shrubs/ Cactus/ Annual Grasses and Forbs
- Plant Community 6: Short Grasses/ Shrubs and Half-shrubs/ Cactus/ Annual Grasses and Forbs

R058AC041MT — Clayey (Cy) RRU 58A-C 11-14" p.z.

- This Ecological Site
- Plant Community 1: Tall and Medium Grasses/Forbs/Shrubs (HCPC)
- Plant Community 2A: Medium and Short Grasses and Sedges/Shrubs and Half Shrubs
- Plant Community 2B: Medium and Short Grasses
- Plant Community 3: Short Grasses/Shrubs and Half Shrubs
- Plant Community 4: Short Grasses/Half Shrubs/Biennial Forbs
- Plant Community 5: Short Grasses/ HalfShrubs/ Cactus/Annual Grasses and Forbs

R058AC042MT — Sandy (Sy) RRU 58A-C 11-14" p.z.

- This Ecological Site
- Plant Community 1: Tall and Medium Grass/ Forbs/ Shrubs (HCPC)
- Plant Community 2: Medium and Short Grasses and Sedges/ Half-shrubs
- Plant Community 3: Short and Medium Grasses and Sedges/ Half-shrubs

Map — Dominant Ecological Site — Rangeland

Scale (not to scale)

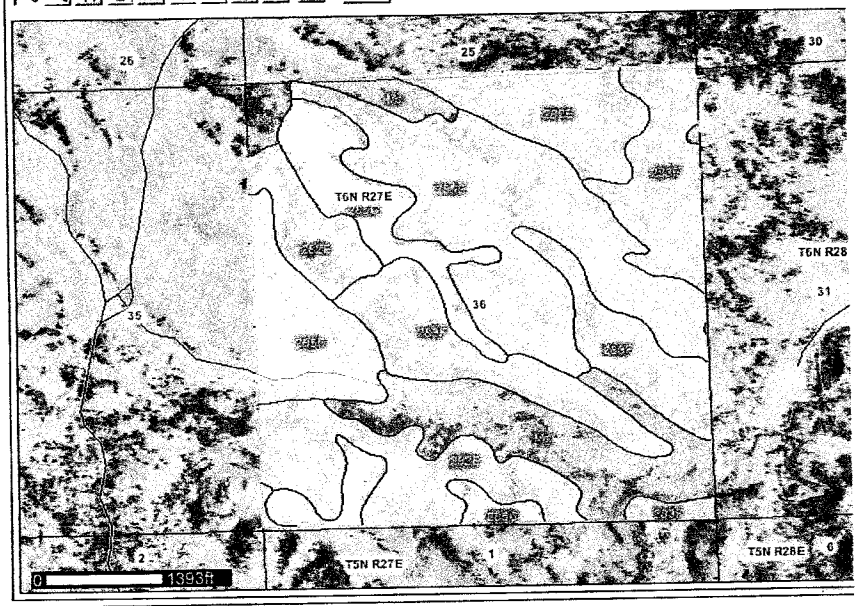
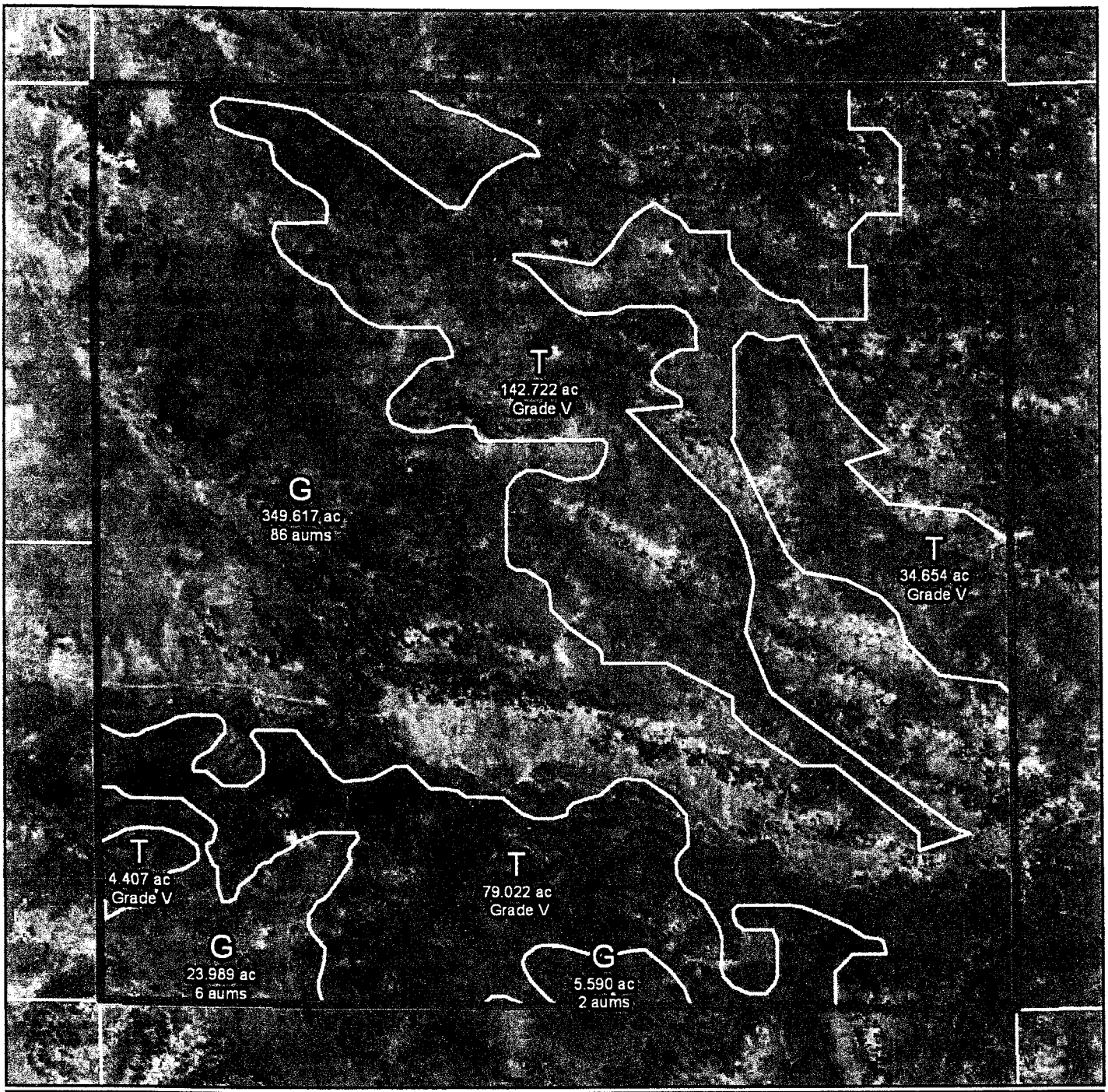


Table — Ecological Sites by Map Unit Component — Rangeland

Yellowstone County, Montana

Map unit symbol	Component name (percent)	Ecological site	Acres in AOI	Percent of AOI
282E	Cabba (45%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.	144.8	22.4%
	Ridge (35%)			
	Rock outcrop (8%)			
	Doney (5%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
	Wayden (5%)	R058AE393MT — Shallow Clay (SwC) RRU 58A-E 15-19" p.z.		
	Macar (2%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
283F	Cabba (60%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.	145.9	22.5%
	Rock outcrop (25%)			
	Doney (5%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
	Ridge (5%)			
	Wayden (5%)	R046XC506MT — Shallow (Sw) RRU 46-C 13-19" p.z.		
285C	Doney (55%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.	64.6	10.0%
	Cabba (35%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.		
	Dast (5%)			
	Macar (5%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
285D	Cabba (45%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.	194.7	30.1%
	Doney (40%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
	Barvon (5%)			
Totals for Area of Interest			**647.4**	**100.0%**

Montana Department of Revenue - 2009 Reappraisal Classification - Yellowstone County



Owner: Pfister, Ellen L

Parcel ID: 03152236101010000

Twnshp/Rng/Sec: T06 N R27 E S36

Total Grazing Acres: (G): 379.196

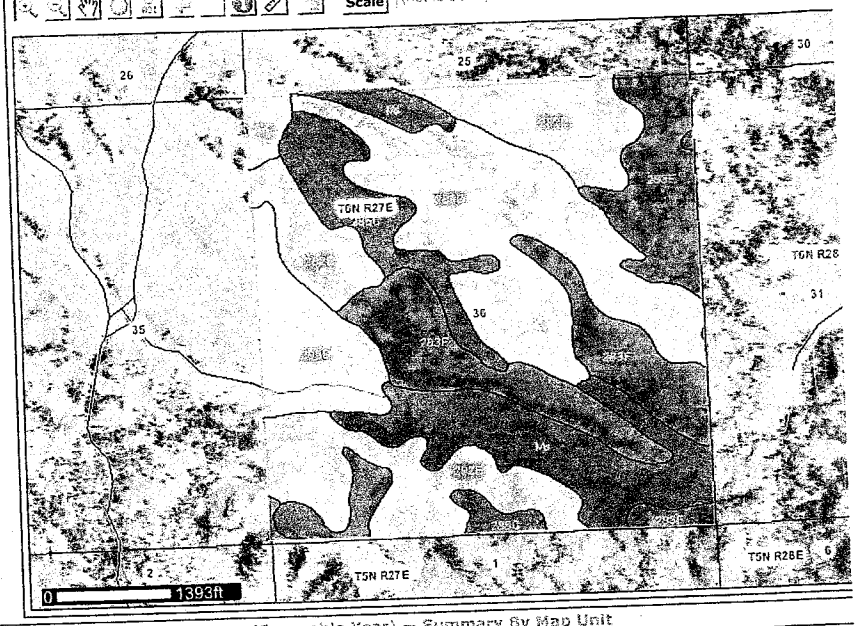
Total Timber Acres: (T): 260.804

Total Parcel Acreage: 640.000

94 AUMs - 09
88 " 10

Map — Range Production (Favorable Year)

Scale (not to scale)



Tables — Range Production (Favorable Year) — Summary By Map Unit

Summary by Map Unit — Yellowstone County, Montana

Map unit symbol		Map unit name	Rating (pounds per acre per year)				Acres in AOI	Percent of AOI	
282E	26.21	Cabba-Ridge complex, 8 to 25 percent slopes	845	724	603	635	144.8	22.4%	.181
283F	22.214	Cabba-Rock outcrop complex, 8 to 45 percent slopes	710	615	520	567.5	145.9	22.5%	.155
285C	22.867	Doney-Cabba loams, 2 to 8 percent slopes	1730	1440	1150	1295	64.6	10.0%	.353
285D	66.198	Cabba-Doney loams, 4 to 15 percent slopes	1632	1360	1132	~~1775~~ 1246	194.7	30.1%	.340
Lt		Lohmiller-Elso complex, 4 to 15 percent slopes	1310	980	695	837 (0.0)	1232.5	0.0%	.228 ~~.189~~
Ms	29.702	McRae-Bainville loams, 7 to 15 percent slopes	1800	1465	1000	~~1232.5~~	88.4	13.7%	.336
My	1.628	Midway-Shale outcrop complex	970	790	550	670	8.9	1.4%	.183
	169.159	**Totals for Area of Interest**					647.4	100.0%	

Description — Range Production (Favorable Year)

Total range production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of a -dry vegetation. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. Yields are adjusted to a common percent of air-dry moisture content.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produce on rangeland are closely related to the kind of soil. Effective management is based on the relationship betwe the soils and vegetation and water.

Rating Options — Range Production (Favorable Year)

Units of Measure: pounds per acre per year
Aggregation Method: Weighted Average
Component Percent Cutoff: *None Specified*
Tie-break Rule: Higher
Interpret Nulls as Zero: Yes

USDA Natural Resources Conservation Service

Web Soil Survey

Contact Us | Download Soils Data | Archived Soil Surveys | Soil Survey Status | Glossary | Preferences | Logout | Help

Area of Interest (AOI) | Soil Map | Soil Data Explorer | Shopping Cart (Free)

View Soil Information By Use: All Uses

Printable Version | Add to Shopping Cart

Intro to Soils | Suitabilities and Limitations for Use | Soil Properties and Qualities | Ecological Site Assessment | Soil Reports

Search

Ecological Sites

Open All | Close All

All Ecological Sites

View All Ecological Sites Info

View Options

Dominant Ecological Site Map

Ecological Sites by Map Unit Component Table

Basic Options

Ecological Site Type: Rangeland

View All Ecological Sites Info

R046XC506MT — Shallow (Sw) RRU 46-C 13-19" p.z.

- This Ecological Site
- Tall and Medium Grasses/Forbs/Shrubs
- Medium and Short Grasses, Sedge, and Increaser Forbs
- Sedges, Mid and Short Increaser Grasses, Increaser Forbs, Fringed Sagewort, Creeping Juniper
- Short Grasses, Half Shrubs, Weedy Forbs, Annuals, Shrub and Cactus

R058AC040MT — Silty (Si) RRU 58A-C 11-14" p.z.

- This Ecological Site
- Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs
- Plant Community 2A: Medium and Short Grasses and Sedges/ Half-shrubs
- Plant Community 2B: Medium and Short Grasses and Sedges/ Shrubs and Half-shrubs
- Plant Community 3: Short and Medium Grasses/ Half-shrubs and Shrubs
- Plant Community 4: Short and Medium Grasses and Sedges/ Half-shrubs
- Plant Community 5: Short Grasses/ Half-shrubs/ Cactus/ Annual Grasses and Forbs
- Plant Community 6: Short Grasses/ Shrubs and Half-shrubs/ Cactus/ Annual Grasses and Forbs

R058AC041MT — Clayey (Cy) RRU 58A-C 11-14" p.z.

- This Ecological Site
- Plant Community 1: Tall and Medium Grasses/Forbs/Shrubs (HCPC)
- Plant Community 2A: Medium and Short Grasses and Sedges/Shrubs and Half Shrubs
- Plant Community 2B: Medium and Short Grasses
- Plant Community 3: Short Grasses/Shrubs and Half Shrubs
- Plant Community 4: Short Grasses/Half Shrubs/Biennial Forbs
- Plant Community 5: Short Grasses/ HalfShrubs/ Cactus/Annual Grasses and Forbs

R058AC042MT — Sandy (Sy) RRU 58A-C 11-14" p.z.

- This Ecological Site
- Plant Community 1: Tall and Medium Grass/ Forbs/ Shrubs (HCPC)
- Plant Community 2: Medium and Short Grasses and Sedges/ Half-shrubs
- Plant Community 3: Short and Medium Grasses and Sedges/ Half-shrubs

Map — Dominant Ecological Site — Rangeland

Scale (map is scale)

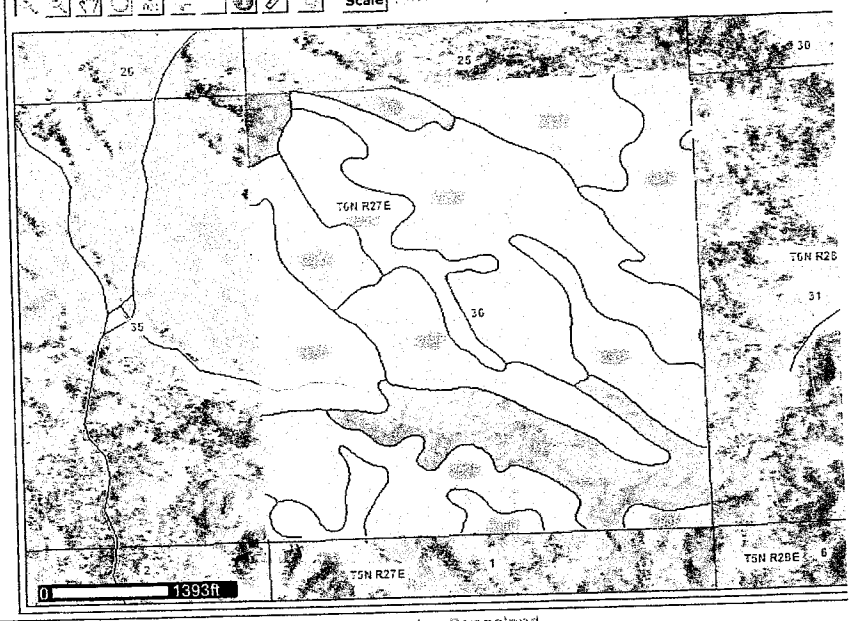


Table — Ecological Sites by Map Unit Component — Rangeland

Yellowstone County, Montana

Map unit symbol	Component name (percent)	Ecological site	Acres in AOI	Percent of AOI
282E	Cabba (45%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.	144.8	22.4%
	Ridge (35%)			
	Rock outcrop (8%)			
	Doney (5%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
	Wayden (5%)	R058AE393MT — Shallow Clay (SwC) RRU 58A-E 15-19" p.z.		
	Macar (2%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
283F	Cabba (60%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.	145.9	22.5%
	Rock outcrop (25%)			
	Doney (5%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
	Ridge (5%)			
	Wayden (5%)	R046XC506MT — Shallow (Sw) RRU 46-C 13-19" p.z.		
285C	Doney (55%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.	64.6	10.0%
	Cabba (35%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.		
	Dast (5%)			
	Macar (5%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
285D	Cabba (45%)	R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z.	194.7	30.1%
	Doney (40%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
	Barvon (5%)			
Totals for Area of Interest			**647.4**	**100.0%**

Plant Community 4: Short Sedges and Grasses/ Half-Shrubs/ Cactus/ Annual Grasses

R058AC046MT — Silty-Steep 11-14" p.z. Deleted. Refe Bainville

No plant community data available for this ecological site. For more information, please contact your local NRCS office.

R058AC047MT — Clayey-Steep (CyStp) RRU 58A-C 11-14" p.z. Deleted. Refer to site: R058A Elso

No plant community data available for this ecological site. For more information, please contact your local NRCS office.

R058AE392MT — Shallow (Sw) RRU 58A-E 15-19" p.z. Lohmiller

No plant community data available for this ecological site. For more information, please contact your local NRCS office.

R058AE393MT — Shallow Clay (SwC) RRU 58A-E 15-19" p.z.

No plant community data available for this ecological site. For more information, please contact your local NRCS office. Wayden

R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.

No plant community data available for this ecological site. For more information, please contact your local NRCS office. Rowan or Macar

Did DOR contact the Yellowstone Cty NRCS office for production figures.

Yellowstone County, Montana

Map unit symbol	Component name (percent)	Ecological site	Acres in AOI	Percent of AOI
	Macar (5%)	R058AE394MT — Silty (Si) RRU 58A-E 15-19" p.z.		
	Wayden (5%)	R046XC506MT — Shallow (Sw) RRU 46-C 13-19" p.z.		
Lt	Lohmiller (45%)	R058AC041MT — Clayey (Cy) RRU 58A-C 11-14" p.z.	0.0	0.0%
	Elso (35%)	R058AC041MT — Clayey (Cy) RRU 58A-C 11-14" p.z.		
	Rock outcrop (10%)			
	Heldt (5%)	R058AC041MT — Clayey (Cy) RRU 58A-C 11-14" p.z.		
	Midway (5%)	R058AC047MT — Clayey-Steep (CyStp) RRU 58A-C 11-14" p.z. Deleted. Refer to site: R058A		
Ms	McRae (45%)	R058AC040MT — Silty (Si) RRU 58A-C 11-14" p.z.	88.4	13.7%
	Bainville (35%)	R058AC040MT — Silty (Si) RRU 58A-C 11-14" p.z.		
	Worland (15%)	R058AC042MT — Sandy (Sy) RRU 58A-C 11-14" p.z.		
	Fort Collins (5%)	R058AC041MT — Clayey (Cy) RRU 58A-C 11-14" p.z.		
My	Midway (50%)	R058AC047MT — Clayey-Steep (CyStp) RRU 58A-C 11-14" p.z. Deleted. Refer to site: R058A	8.9	1.4%
	Rock outcrop, shale (25%)			
	Bainville (10%)	R058AC046MT — Silty-Steep 11-14" p.z. Deleted. Refe		
	Lohmiller (10%)	R058AC041MT — Clayey (Cy) RRU 58A-C 11-14" p.z.		
	Elso (5%)	R058AC047MT — Clayey-Steep (CyStp) RRU 58A-C 11-14" p.z. Deleted. Refer to site: R058A		
Totals for Area of Interest			**647.4**	**100.0%**

FOIA | Accessibility Statement | Privacy Policy | Non-Discrimination Statement | Information Quality | USA.gov | White House

1972 - all range sites are listed as in excellent condition

Species well suited to irrigated soils are caragana, honeysuckle, lilac, chokecherry, American plum, skunkbush sumac, buffaloberry, sandcherry, Nanking cherry, Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Colorado blue spruce, Rocky Mountain juniper, Douglas-fir, Scotch pine, American elm, purple willow, white willow, golden willow, dogwood, and cottonwood.

Species well suited to dryland soils are caragana, honeysuckle, lilac, chokecherry, American plum, skunkbush sumac, buffaloberry, sandcherry, Nanking cherry, Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Colorado blue spruce, Rocky Mountain juniper, Douglas-fir, and Scotch pine.

WINDBREAK SUITABILITY GROUP 3

The soils in this group are deep clays and moderately deep loams and clays that are underlain by shale or gravel and sand, moderately deep sandy loams that are underlain by sandstone, and very gravelly soils that have a limy substratum. All these soils are well drained. Slopes are 0 to 15 percent, the available water capacity is low, and the permeability is slow. Only hardy species can be planted in nonirrigated soils. Tree rows should be planted 20 feet apart.

Species suited to irrigated soils are caragana, honeysuckle, lilac, chokecherry, skunkbush sumac, sandcherry, Nanking cherry, Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Rocky Mountain juniper, Scotch pine, American plum, purple willow, buffaloberry, dogwood, American elm, white willow, golden willow, cottonwood, Colorado blue spruce, and Douglas-fir.

Species suited to dryland soils are caragana, honeysuckle, lilac, chokecherry, skunkbush sumac, sandcherry, Nanking cherry, Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Rocky Mountain juniper, and Scotch pine.

WINDBREAK SUITABILITY GROUP 4

This group consists of shallow clay and sandy loam soils over loose gravel or bedrock. The soils contain more than 50 percent gravel or have an alkaline claypan at a depth of about 6 inches. Slopes are 0 to 15 percent. Only the hardiest trees and shrubs grow on these soils. Trees grow slowly and should be planted in rows 20 feet apart.

Species suited to irrigated soils are caragana, skunkbush sumac, sandcherry, Nanking cherry, Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, Rocky Mountain juniper, Scotch pine, honeysuckle, lilac, chokecherry, American plum, purple willow, buffaloberry, dogwood, green ash, Colorado blue spruce, and Douglas-fir.

Species suited to dryland soils are caragana, skunkbush sumac, sandcherry, Nanking cherry, Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, Rocky Mountain juniper, and Scotch pine.

WINDBREAK SUITABILITY GROUP 5

Lohmiller soils, seeped, 0 to 2 percent slopes, are the only soils in this group. These soils are moderately saline.

Species suited to irrigated soils are skunkbush sumac, purple willow, buffaloberry, Russian-olive, white willow, golden willow, cottonwood, Rocky Mountain juniper, honeysuckle, lilac, chokecherry, American plum, and Siberian crabapple.

Species suited to dryland soils are skunkbush sumac, purple willow, buffaloberry, Russian-olive, white willow, golden willow, cottonwood, and Rocky Mountain juniper.

Use and Management of the Soils for Range[3]

In this subsection the soils of the county are placed in range sites. These sites and their vegetation are described. Also, yields of forage are estimated for each site.

About 80 percent of Yellowstone County is rangeland. Most of this rangeland is rolling to steep and occurs on dissected uplands that border the major drainageways. Crops can be grown on about 10 to 15 percent of this land, but most areas formerly cultivated have been reseeded to range.

About 20 percent of the rangeland consists of loamy, silty, and clayey soils that are 20 to 36 inches deep over soft shale or loose gravel and have slopes of less than 20 percent. On these soils forage plants grow fairly well. About 14 percent of the rangeland consists of soils that are 36 inches deep over shale or gravelly sand and have slopes of less than 15 percent. On these soils forage plants grow very well. About 28 percent consists of steep soils less than 20 inches deep over shale, sandstone, or gravel. On these soils forage plants grow fairly well or poorly.

Sandy soils of varying depth over sandstone make up about 9 percent of the rangeland. These soils have slopes of less than 20 percent and are well suited to forage plants.

Clay soils make up about 14 percent of the rangeland. About 5 percent of the clay soils are more than 20 inches deep and have slopes of less than 20 percent. About 9 percent of the clay soils are steep and less than 20 inches deep over shale. Runoff is rapid, and forage plants grow poorly.

Gravelly, loamy soils that are 10 to 20 inches deep over loose, gravelly sand make up about 5 percent of the rangeland. On these soils forage plants grow poorly.

Barren shale, rockland, and riverwash make up about 5 percent of the rangeland. These are scattered areas of steep, eroded soils on which forage plants grow very poorly.

Saline and alkaline soils of all textures make up about 5 percent of the rangeland. These soils occur mainly in the stream valleys and have slopes of less than 8 percent. They are poorly suited to forage plants.

Range sites and condition classes

A range site is a kind of rangeland that differs from another kind in its ability to produce a significantly different kind or amount of native vegetation. Some permanent characteristic of the soil, such as depth, texture, salinity, or wetness, is given in the name of a range site to indicate its capacity for forage production. The precipitation zone in which the site is located also may be given. For example, "Sandy, 10- to 14-inch precipitation zone," is a range site designation.

Annual precipitation is about 11 to 14 inches in the northern half of the county and about 13 to 16 inches in

[3] Prepared by STERLE DALE, range conservationist, Soil Conservation Service.

☆ Forage - Webster dictionary = food for domestic animals.

(1)

2,000 pounds of herbage per acre. In a dry year the yield is as low as 1,200 pounds per acre.

Hu

OVERFLOW, 10- TO 14-INCH PRECIPITATION ZONE

This site consists of deep, nearly level, clayey and loamy soils on uplands. These soils receive run-in water that collects in potholes and small lake basins. They are more than 60 inches deep. Permeability is slow to very slow.

The climax vegetation is 20 percent tall grass, 60 percent mid grass, 10 percent short grass, 5 percent perennial forbs, and 5 percent woody plants. The decreaser plants are slender wheatgrass and green needlegrass. The increaser plants are western wheatgrass, needle-and-thread, blue grama, and saltgrass.

Where this site is in poor condition, the dominant plants are foxtail barley, cheatgrass brome, and Japanese brome.

This Overflow range site provides green forage longer than do the adjacent rangelands that do not receive run-in water. To prevent trampling and overgrazing, it is advisable to fence areas that are large enough to justify the expense.

Where this site is in excellent condition, the total annual air-dry yield when moisture is average is about 1,800 pounds of herbage per acre. In a dry year the yield is as low as 1,500 pounds per acre.

OVERFLOW, 15- TO 19-INCH PRECIPITATION ZONE

Grail soils, 2 to 15 percent slopes, are the only soils in this range site. These soils have a silty clay and silty clay loam surface layer. They occur on gravel terraces. In some areas the soils are flooded mainly in spring.

The climax vegetation is 20 percent tall grass, 60 percent mid grass, 5 percent short grass, 5 percent perennial forbs, and 10 percent woody plants. The decreaser plants are western wheatgrass, green needlegrass, and bearded wheatgrass. The increaser plants are western wheatgrass, needle-and-thread, and forbs.

Where this site is in poor condition, the dominant plants are increaser and invader plants such as cheatgrass brome and Japanese brome.

This range site provides green forage well into the growing season. Because livestock prefer to graze on this site, fencing to prevent overgrazing is desirable.

Where this range site is in excellent condition, the total annual air-dry yield when moisture is average is about 2,800 pounds of herbage per acre. In a dry year, the yield is as low as 2,400 pounds.

Book .322-Ar Web .433

SANDS, 10- TO 14-INCH PRECIPITATION ZONE

Apron loamy fine sands are the only soils in this range site. These deep, sloping to moderately steep soils occur on uplands. They are underlain by soft sandstone.

The climax vegetation is 40 percent tall grass, 45 percent mid grass, 5 percent short grass, 5 percent perennial forbs, and 5 percent woody plants. The decreaser plants are prairie sandreed, sand bluestem, little bluestem, and Indian-ricegrass. The increaser plants are needle-and-thread, sand dropseed, and blue grama.

Where this range site is in poor condition, the dominant plants are cheatgrass brome, Japanese brome, annual eriogonum, and other short-lived perennials and annuals.

Soil blowing is the greatest hazard because close grazing and trampling deprive the soils of adequate cover vegetation. Deferred grazing is the only way to prevent range deterioration. Overgrazed areas recover rapidly because adequate water is available for plant growth.

Soils that have been cultivated for a number of years respond well to reseeding. However, preparing seedbeds on these sites may deprive the soil of cover sufficient to prevent soil blowing. If the condition of a site is not bad, natural plant succession is a more suitable method of restoring range condition than reseeding. Soils that have not been cultivated respond better to good grazing management than to reseeding.

Where this site is in excellent condition, the total annual air-dry yield when moisture is average is about 1,500 pounds of herbage per acre. In a dry year the yield is as low as 1,100 pounds per acre.

AS 331 Gh; Wo Book .260

SANDY, 10- TO 14-INCH PRECIPITATION ZONE

This range site consists of deep and moderately deep, gently to strongly sloping, sandy loam, fine sandy loam, and sandy clay loam soils.

The climax vegetation is 20 percent tall grass, 65 percent mid grass, 10 percent short grass, and 5 percent perennial forbs. The decreaser plants are prairie sandreed, little bluestem, and Indian ricegrass. The increaser plants are western wheatgrass, needle-and-thread, sand dropseed, and blue grama.

Where this site is in poor condition, the dominant plants are short grass and invader plants such as cheatgrass brome, Japanese brome, wooly Indian-wheat, tumblegrass, and false buffalograss.

Proper range use is necessary to maintain range condition. Leaving the range ungrazed one season in three to five improves the forage. Well-placed fences and water sites insure good distribution of livestock over the range.

These soils can be reseeded if the seedbed is in excellent condition, if a suitable drill is used, and if native species are planted. The risk of soil blowing in seedbeds is high.

Where this site is in excellent condition, the total annual air-dry yield when moisture is average is about 1,200 pounds of herbage per acre. In a dry year the yield is as low as 900 pounds per acre.

SANDY, 15- TO 19-INCH PRECIPITATION ZONE

Yegen sandy loams are the only soils in this range site. These are deep, nearly level to strongly sloping soils that absorb water easily.

The climax vegetation is 15 percent tall grass, 65 percent mid grass, 5 percent short grass, 10 percent perennial forbs, and 5 percent woody plants. The decreaser plants are sand bluestem, little bluestem, and prairie sandreed. The increaser plants are Idaho fescue, needle-and-thread, and sand dropseed.

Where this site is in poor condition, the dominant plants are small, low-vigor increasers and invaders such as cheatgrass brome, Japanese brome, and various broadleaved annuals and biennials.

Soil blowing is the greatest hazard on these soils. Deferred grazing helps to maintain adequate cover vegetation. These soils can be reseeded.

Where this site is in excellent condition, the total annual air dry yield when moisture is average is about 2,200

The frost-action potential affects the suitability of soils for road construction and building sites. A soil that has high frost action, or frost heave, is not suitable for these uses.

Interpretations of engineering properties of the soils

In table 5 the soils of Yellowstone County are rated according to their suitability for engineering uses. Also listed in this table are soil features that affect specified engineering practices and structures. The ratings given for bearing capacity are estimates and should not be assigned specific values.

The suitability of the soils as a source of topsoil, sand, gravel, or road fill is rated *good*, *fair*, *poor*, and *unsuitable*. Topsoil is fertile material, generally rich in organic matter, that is used to topdress roadbanks, parks, gardens, and lawns. Sand is material suitable for use in concrete or as other construction material. Gravel consists of particles larger than sand, but it also is material suitable for use in construction. Road fill is material used for embankments that support the subbase and base courses below the surface course of a road. Suitability of the soil as a source of road fill depends largely on the texture of the soil and the natural content of water. Soils that are highly plastic and that have a high natural content of water generally are rated poor.

Among the soil features affecting the locations of highways are erodibility, shrink-swell potential and plasticity, flooding, ponding, and depth to bedrock.

Some of the soil features affecting use of soils for reservoirs and embankments for farm ponds are susceptibility to seepage, the sealing potential of the soil material, depth to a high water table, depth to bedrock, stability, permeability, shrink-swell potential, and compactibility. Susceptibility to soil blowing also affects embankments.

Agricultural drainage is affected by natural drainage, permeability, texture and structure, flooding, and stability of ditchbanks.

Land leveling, which is required in some places before irrigation is successful, depends largely on slope and depth to bedrock. Soils that are suitable for irrigation are well drained, but they contain enough fine material to have good available water capacity.

Soil features that affect terraces and diversions are slope, depth to bedrock, erodibility, texture, and permeability.

Waterways require soils that support fast-growing cover plants and that are not subject to erosion. Special care is needed to establish vegetation on soils that have low available water capacity and low fertility.

Building sites require soils that have a low shrink-swell potential, that are stable, that are not flooded or ponded, and that do not have a seasonal high water table.

Suitability of the soil material for sewage disposal fields is affected by permeability, slope, a seasonal high water table, and susceptibility to flooding.

A sewage lagoon is a shallow lake used to hold sewage for the time required for bacterial decomposition. The soil used for sewage lagoons is required to act as the floor of the impounded area and as a dam. The requirements for the dam are the same as those given for a farm pond embankment in table 5. Soils on the floor of a lagoon should be impervious to seepage, have little slope, and have little or no organic matter. An impervious floor is especially important where shallow wells are nearby.

408-101—72——6

Descriptions of the Soils

This section describes the soil series and mapping units in Yellowstone County. The approximate acreage and proportionate extent of each mapping unit are given in table 6.

The procedure in this section is first to describe the soil series and then the mapping units in the series. Thus, to get full information on any one mapping unit, it is necessary to read the description of the unit and also the description of the soil series to which it belongs. The description of each mapping unit contains suggestions on how the soil can be used and managed. The description of a soil series mentions features that apply to all the soils in the series. Differences among the soils of one series are pointed out in the descriptions of the individual soils or are indicated in the soil name. Unless otherwise stated, the descriptions of all mapping units in this section are for moist soils. As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. For example, Riverwash is a miscellaneous land type and does not belong to a soil series; nevertheless, it is listed in alphabetic order along with the series.

An essential part of each soil series is the description of the soil profile, that is, the sequence of layers beginning at the surface and continuing downward to the depth beyond which roots of most plants do not penetrate. Each soil series contains a short description of a soil profile that has characteristics or ranges of characteristics within the ranges set for the series. Also given for the soil series is a much more detailed description of a profile representative of the series. Scientists, engineers, and others can use this detailed description in making highly technical interpretations.

Absarokee Series

The Absarokee series consists of well-drained, gently sloping to sloping, moderately fine textured soils. These soils formed on smooth uplands in material weathered from underlying hard shale or sandstone. The native vegetation is grasses, forbs, and scattered shrubs. Elevation ranges from 3,600 to 4,800 feet. The annual precipitation is 14 to 16 inches, the mean annual temperature is 44° F., and the frost-free season is about 115 days. These soils are associated with Maginnis and Amherst soils.

In a typical profile, the surface layer is grayish-brown loam about 3 inches thick. In cultivated areas this layer is mixed with the dark grayish-brown clay loam upper part of the subsoil to form a dark grayish-brown clay loam plow layer about 6 inches thick. The plow layer is medium to high in organic-matter content. The subsoil, about 18 inches thick, is dark grayish-brown and light yellowish-brown clay and pale-brown very channery clay loam. The substratum is light yellowish-brown very channery clay loam. Hard platy sandstone is at a depth of about 33 inches.

zons and from 35 to 75 percent in the C&R horizon. Depth to hard shale is 15 to 20 inches.

Amherst clay loam, 7 to 15 percent slopes (Ao).—This soil occurs on knolls, ridges, and the sides of drainageways on the uplands south of the Yellowstone River. The surface is smooth, and slope is dominantly 10 percent. Along the drainageways where slopes are more than 12 percent, stones as much as 15 inches in diameter are on the surface in some places. Included with this soil in mapping are spots of Maginnis soils.

This soil is well drained and has moderate permeability and rapid runoff. The available water capacity is 2 to 3 inches. The risk of water erosion is moderate. Stony spots in cultivated fields are droughty and difficult to seed.

About two-thirds of this soil is used for dryfarming, and the rest is used for grazing beef cattle. (Capability unit IVe–3, dryland; Silty range site, 15- to 19-inch precipitation zone)

Amherst-Maginnis channery clay loams, 4 to 7 percent slopes (Ap).—This complex occurs on smooth wide ridges between shallow drainageways and in narrow bands along deep drainageways. Slopes are dominantly 4 percent. The complex is 65 to 75 percent Amherst clay loam and 25 to 35 percent Maginnis channery clay loam. Each of these soils has a profile similar to that described as typical for its series. Cultivated areas of these soils have more shale and sandstone fragments on the surface than uncultivated areas. These fragments cover more than 50 percent of the surface in some spots of Maginnis soil. These spots of Maginnis soil are droughty, and the high percentage of fragments makes dryfarming difficult.

These soils are used mainly for dryfarming. Soils on the Crow Indian Reservation are used mostly for range. (Capability unit IVe–3, dryland; Silty range site, 15- to 19-inch precipitation zone)

Apron Series

The Apron series consists of deep, somewhat excessively drained, sloping to moderately steep soils on uplands. These soils formed in materials weathered from calcareous, light yellowish-brown sandstone. The native vegetation is sand reedgrass, yucca, skunkbush sumac, ricegrass, and needle-and-thread. Elevation ranges from 3,000 to 3,900 feet. Annual precipitation is 11 to 14 inches, the mean annual temperature is 45 to 47° F., and there are 115 to 130 frost-free days. These soils are associated with Worland and Travessilla soils in the northeast quarter of the county.

In a typical profile, the surface layer is light brownish-gray light fine sandy loam 2 inches thick. It is directly underlain by a substratum of pale-brown fine sandy loam and pale-yellow loamy very fine sand. Depth to soft or weakly consolidated sandstone is 60 inches.

Permeability is rapid, and the available water capacity is 5 to 7 inches. The risk of soil blowing is high. The organic-matter content is low, and the fertility is low to moderate.

These soils are used mostly for grazing beef cattle.

Typical profile of Apron fine sandy loam, 4 to 7 percent slopes, 575 feet west and 990 feet north of the center of section 31, T. 7 N., R. 31 E.:

A1—0 to 2 inches, light brownish-gray (10YR 6/2) light fine sandy loam, dark grayish brown (10YR 4/2) when moist; upper one-half inch very weak, medium, platy structure; below that depth weak, medium, crumb structure; soft when dry, friable when moist, nonsticky and nonplastic when wet; calcareous; pH 7.5; abrupt, smooth boundary.

C1—2 to 8 inches, pale-brown (10YR 6/3) light fine sandy loam, dark grayish brown (10YR 4/2) when moist; very weak, coarse, prismatic structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; moderately calcareous; pH 8.0; diffuse boundary.

C2—8 to 14 inches, pale-brown (10YR 6/2) fine sandy loam, brown (10YR 5/3) when moist; massive; slightly hard when dry, friable when moist, nonsticky and nonplastic when wet; strongly calcareous; pH 8.5; diffuse boundary.

C3—14 to 27 inches, pale-yellow (2.5Y 7/3) fine sandy loam, light yellowish brown (2.5Y 6/4) when moist; massive; slightly hard when dry, friable when moist, nonsticky and slightly plastic when wet; some sandstone fragments less than ½ inch in diameter; very strongly calcareous; pH 8.5; diffuse boundary.

C4—27 to 60 inches, pale-yellow (2/5Y 7/3) loamy very fine sand, light yellowish brown (2.5Y 6/4) when moist; massive; soft when dry, friable when moist, nonsticky and nonplastic when wet; very strongly calcareous; pH 8.5.

The A horizon ranges from 10YR to 2.5Y in hue. In value this horizon is 5 or 6 when dry and 4 or 5 when moist. Chroma is 2 or 3. The A and C horizons range from fine sandy loam to loamy very fine sand. In some areas a few soft sandstone fragments occur in the lower C horizon.

Apron loamy fine sand, 4 to 7 percent slopes (Ar).—This soil occurs on undulating sandstone uplands in the north-central part of the county. Except for the surface layer of loamy fine sand, the profile of this soil is typical for the series. Included in mapping are 1- to 2-acre blowouts that have low sand dunes on their east side. The risk of soil blowing is very high. Drainageways are indistinct, and runoff is very slow.

This soil is used for grazing beef cattle. (Capability unit IVe–2, dryland; Sands range site, 10- to 14-inch precipitation zone)

Apron fine sandy loam, 4 to 7 percent slopes (As).—This soil occurs on undulating sandstone uplands in the northern half of the county. Individual areas range from 40 to 250 acres in size. This soil has the profile described as typical for the series.

Included with this soil in mapping are some Worland soils on crests of narrow ridges and on the sides of deep drainageways. Also included are spots of Apron loamy fine sand on gentle slopes on the east side of shallow blowouts that are scattered across the landscape. These blowouts are about a half acre in size. The risk of soil blowing is high to very high. Drainageways are indistinct, and surface runoff is slow. Cultivated and overgrazed areas have lost several inches of surface soil.

This soil is used mainly for grazing beef cattle. Areas once dryfarmed have been seeded to pasture and hay crops. (Capability unit IVe–2, dryland; Sandy range site, 10- to 14-inch precipitation zone)

Apron-Travessilla loamy fine sands, 7 to 15 percent slopes (At).—These soils occur on sandstone uplands that have wide ridges, low hills, and sandstone ledges and outcrops 10 to 20 feet thick. The complex is only in the northern half of the county. Slopes are dominantly 8 percent. The steepest slopes occur on the sides of drain-

of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES: As explained in the section "How This Survey Was Made," the series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and arrangement in the profile. A series is given the name of a geographic location near the place where that series was first observed and mapped.

General Nature of the County

This section discusses the physiography and drainage, ground water sources, climate, natural resources, settlement and farming, and industry, markets and transportation of the county. Statistics for population and agriculture are from reports by the U.S. Bureau of the Census and the Department of Agriculture.

Physiography and Drainage

Yellowstone County lies in an unglaciated part of the Missouri Plateau, which is the northern part of the Great Plains Province. It is underlain by sedimentary rocks, chiefly sandstone and shale. The topography is the result of differential erosion that followed the folding and faulting of these rocks.

Elevation ranges from 2,680 feet above sea level on the Yellowstone River near Custer to 4,700 feet on Eldrige Mesa in the Bull Mountains. Local relief is generally less than 600 feet, except in the Bull Mountains, and changes in elevation generally are gradual.

The topography of the county can be divided into the Bull Mountain upland, the plains, the lake basins, the zone of faulting, the terraces, and the Yellowstone River valley.

A small part of the Bull Mountains is included in Yellowstone County. This part is rugged and has a maximum local relief of less than 2,000 feet. The climate is semiarid. Runoff after heavy rains causes severe erosion on the nearly horizontal beds of sandstone, soft shale, and coal. Streams flow intermittently and carry a large volume of water when rains are heavy. Because slopes are steep, the streams also carry large amounts of silt. Because the coalbeds have burned, the rocks at high elevations have fused into natural brick. This red clinker, or scoria brick, crops out above and below the coalbeds.

The largest part of the county is plains. The plains are rolling and dissected. Sandstone and shale crop out. The shale weathers faster than the sandstone and forms rimrocks, steep-sided coulee walls, and rough ridges. Areas where the shale is thickest are more rolling and dissected than other areas. This is because the cover of plants is sparse, runoff is rapid, and erosion is severe.

The lake basins in the northwestern part of the county are undrained or poorly drained depressions containing temporary lakes that vary in size. The largest in the county is the 15,000-acre Comanche Flat south of Broadview. The Comanche Flat lies 650 feet above the Yellowstone River and drains southward. General uplift along the Huntley fault zone, which crosses the Comanche Flat near Acton in an east-west direction, may have reduced the gradient of the river. This uplift combined with general uplift in the Pryor and Beartooth Mountains during the Tertiary period helped to downcut the river and to dam up the Comanche Flat.

The Huntley fault zone, generally less than 7 miles wide, crosses the county through Huntley in the east to Acton in the west. The faults cut northeastward across the fault zone at about a 45° angle. Each fault is generally less than 5 miles long and has a displacement of less than 500 feet. Along the fault zone are broken and irregular beds, sandstone scarps, and buttes. The fossil beds southwest of Acton are in this zone.

Large areas in the county are covered with gravelly alluvium. This alluvium occurs along the Yellowstone River Valley and in areas south of the valley. In the valley two terraces show signs that there were periods of uplift and periods of relative stability. The lowest terrace is about 125 feet above the Yellowstone River and contains gravel to a depth of 25 to 50 feet. This terrace is represented by the Billings Bench east of Billings. The highest terrace is 600 to as much as 1,100 feet above the river. It occurs south of the river, south of Huntley and Ballantine, and along the entire length of Pryor Creek. The highest terraces are associated with former drainage systems at much higher elevation and may date from the Oligocene epoch, about 30 million years ago. The highest terraces may be associated with the ancient valley of the Shoshone River, or they may be remnants of the Yellowstone River Valley from a period when the river flowed at a much higher elevation than it does today. The Shoshone River once flowed northward through Pryor Gap but since has been partly replaced by the Pryor Creek drainage system.

The Yellowstone River Valley ranges from a few hundred yards to about 12 miles in width and lies 100 to 500 feet below the surrounding upland plain. The width of the valley is determined by the resistance of the bedrock to erosion. The valley is broader over shale than over the harder sandstone. East of Billings the river has cut around the resistant Eagle Sandstone, which now forms prominent rimrocks on both sides of the valley. Eagle Sandstone, on which Billings Airport is located, lies 500 feet above the river.

All of Yellowstone County is drained by the Yellowstone River and its tributaries. The river flows northeastward through a fairly steep-walled valley. It ranges from a few hundred feet to more than half a mile in width, and it always carries a large volume of water. The maximum flow recorded at Billings between 1928 and 1958 was 64,800 second-feet, and the minimum flow was 430 second-feet. The only tributaries of the river that carry water the year round are Clarks Fork and Pryor Creek. The headwaters of Clarks Fork are in the Beartooth and Absaroka Mountains, and the headwaters of Pryor Creek are in the Pryor Mountains.

408-101—72——9

Webster: arid = without moisture - dry, barren
semi arid = party (arid) without moisture
aspect = position

It consists of black shale, brown sandy shale, and heavy sandstone that is primarily of marine origin. This formation yields little or no water.

Mowry Shale.—Mowry Shale lies below the Frontier Formation and is 180 to 325 feet thick. It consists of thin-bedded sandstone and shale. Weathered outcrops of Mowry Shale are silver-gray in color. Mowry Shale does not yield potable water.

Thermopolis Shale.—Thermopolis Shale consists of a lower layer of sandy shale about 275 feet thick, a middle layer of stream-deposited sandstone 10 to 30 feet thick, and an upper layer of black or dark blue-gray shale 400 to 460 feet thick. In valleys the lower and upper layers of shale are separated by sandstone benches. The sandstone is a potential source of oil but does not yield potable water.

Cloverly Formation.—The Cloverly Formation is 150 to 350 feet thick and is of fresh water origin. It crops out at an elevation of about 3,800 feet on the northern slopes of the Pryor Mountains. Most wells drilled in the valley below yield an ample amount of potable water.

Morrison Formation.—The Morrison Formation is about 200 feet thick. It dates from the Jurassic Age and is of fresh-water origin. It crops out in only a few areas of the county and is not an important source of water.

Older rocks.—Older sedimentary rocks that are more than 3,000 feet thick can be reached by drills. Those that contain or consist of sandstone have good permeability and are suitable sources of water.

Climate

The climate of Yellowstone County is affected by a complex topography of mountains, foothills, and valleys. The county is situated in the west-central part of the Yellowstone River Valley and east and north of mountainous areas. The main valley drains generally northeastward through the county, but slopes and drainageways in some parts of the county go in almost all directions. Elevation ranges from about 2,200 feet above sea level where the Yellowstone River leaves the county east of Custer to more than 5,000 feet along parts of the southern boundary. Elevation rises rapidly in the southwestern part of the county to the highest peaks in Montana, about 50 miles beyond the border. To the south elevation is about 10,000 feet in the Big Horn Mountains along the Wyoming State line.

Data on temperature and precipitation in the county are given in table 8. Temperatures are higher in summer and milder in winter in the Yellowstone River Valley than elsewhere in the county. Precipitation in the valley is less than 14 inches and is as low as 11 inches near Custer on the eastern border.

In the uplands north and south of the main valley, precipitation is about 15 inches. It is nearly 20 inches in the areas of Bull Mountain and Pryor Mountain. The temperatures are lower and the growing season is shorter than in the valley.

Cold fronts from the north affect the eastern part of the county, but do not reach the western part. Consequently, winter in the east and at higher elevations is more severe than in the western valley region near Billings.

The length of the growing season varies little in cultivated areas throughout the county. The frost-free season averages 129 days between the last freezing temperature in spring on about 15 May and the first in fall on about 22 September.

Figure 7 shows the percentage of probability that specified freezing temperatures will occur at Ballantine after a given date in spring. Figure 8 shows the percentage of probability that these temperatures will occur before a given date in fall.

Warm, dry chinook winds that blow down the sides of mountains move northeastward through the county and make winters relatively mild. In downtown Billings the average temperature in January is 35.2° F., which is 10° higher than at stations 100 miles east or west of the county. Over a 25-year period at Billings Airport, there was an average of 43 days per year when the temperature remained below 32° F. all day, and 16 days per year when the temperature fell below 0° F. during the day. A low of −53° F. has been recorded at the Huntley Experiment Station, but winter temperatures seldom drop below −20 to −25° F.

Average temperatures are lower outside the main valley. Broadview was an average of 2.5° colder than Billings in the winter of 1956–57, and eastern sections of the county are affected by cold air from the north that does not reach the western sections.

On about 92 days a year precipitation is 0.01 inch or more, and nearly 70 percent of the annual precipitation falls during the growing season. May and June are the wettest months. Both have about 11 days when precipitation is 0.01 inch or more. This is favorable for crop growth. More precipitation falls in June than falls in July and August combined. This means that in most years hay and small grains can be harvested during July and August without much interruption by wet weather.

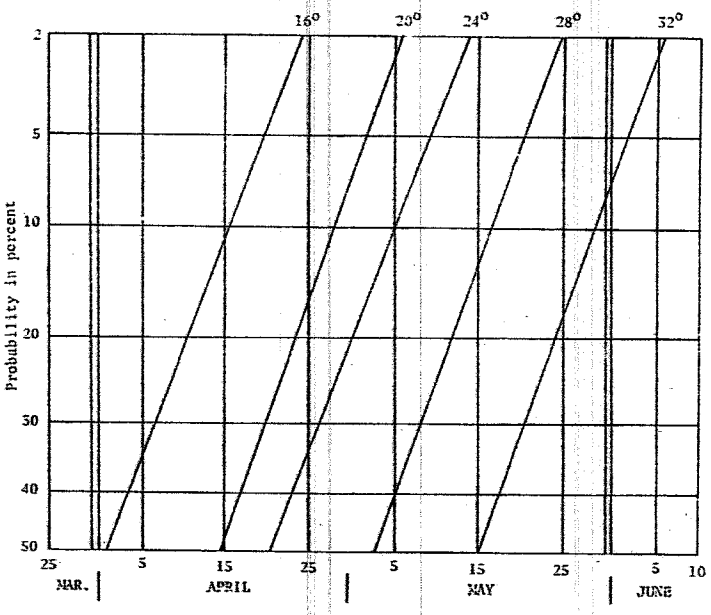


***Figure 7.*—Percentage of probability that a temperature of 16°, 20°, 24°, 28°, and 32° will occur at Ballantine after given dates in spring.**

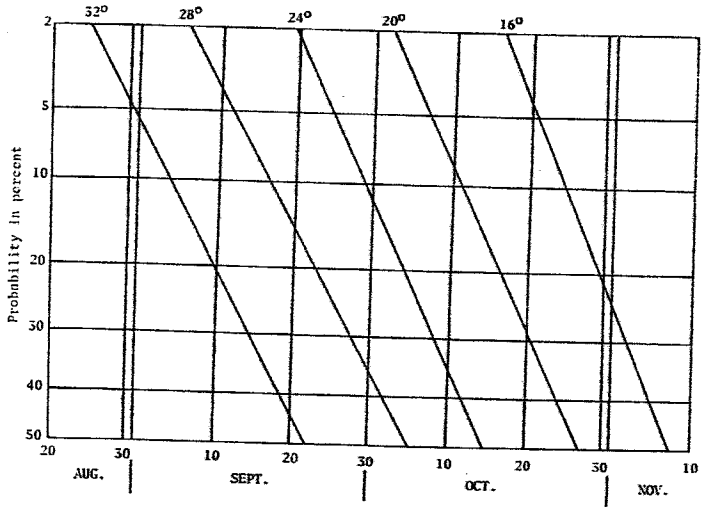


Figure 8.—**Percentage of probability that a temperature of 16°, 20°, 24°, 28°, and 32° will occur at Ballantine before given dates in fall.**

A second peak of precipitation occurs in September and October, and it improves the germination and early growth of winter wheat, the major dryfarmed crop.

The highest summer temperatures occur in the Yellowstone River Valley. The temperature reaches 100° F. a few days every year, and a high of 110° F. has been recorded at Ballantine. The maximum afternoon temperature in July is 88 to 91° F., but the temperature drops below 60° F. at night. Hot spells in July and August can affect most dryfarmed crops, but irrigated crops are less vulnerable.

No more than twice in 10 years are seasons dry enough to harm dryfarmed crops. In a 50-year period, the Huntley Experiment Station recorded 10 years having an annual precipitation of less than 10 inches, but the total precipitation in the months of May and June, the most important for summer crops, remained high even during the dry years.

About 31 thunderstorms occur each year, 16 of which are in June and July. Hail during thunderstorms damages crops or property in some parts of the county every year.

Heavy snowstorms are rare. About 19 days a year have more than 1 inch of snow. March, the snowiest month, has 4 days on which 1 inch or more of snow falls. Annual snowfall in the Yellowstone River Valley averages about 40 inches a year, but probably twice this amount falls at elevations of 4,500 feet or more.

The prevailing winds in the county blow toward the northeast. At Billings windspeed averages 9.6 miles per hour in August and 12.9 miles per hour in December. Windspeed is faster in winter because the chinook or drainage winds blow for days at a time. These winds make winter temperatures milder throughout the county.

Gusty winds accompany summer thunderstorms, and about once every 10 years a tornado occurs somewhere in the county. The tornadoes usually are small.

At Billings Airport through a 20-year period, the sun shone 62 percent of the possible time throughout the year. July (78 percent) and August (76 percent) are the sunniest months, and November and December (47 percent) are the cloudiest. These conditions prevail throughout the county.

Tests at Huntley using evaporation pans showed that about 40 inches of water are lost by evaporation from April through September. The loss is considerably greater in the windier sections of the county. Evaporation from lakes or reservoirs averages 28 inches of water from April through September, but varies from about 22 inches during cool, wet years to as much as 40 inches during hot, dry years.

At Billings Airport the relative humidity has a high of 77 percent during June at about 5:00 a. m., and a low of 32 percent during August at about 5:00 p. m. On clear, dry summer afternoons the relative humidity may drop

TABLE 8.—*Temperature and precipitation*

Month	Temperature [1]			Precipitation		
	Average daily maximum	Average daily minimum	Mean daily temperature	Billings Airport [2]	Huntley Experiment Station [2]	Average snowfall [3]
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*
January	32.5	10.6	23.2	0.61	0.35	6.8
February	36.1	13.1	25.7	0.62	0.41	7.1
March	44.4	22.0	33.7	1.01	0.66	8.9
April	59.4	32.9	46.0	1.45	1.16	4.0
May	69.5	42.7	56.8	2.08	1.96	0.5
June	76.9	50.1	65.1	2.61	2.66	0.2
July	88.3	56.4	74.7	0.89	0.80	0
August	85.9	53.8	71.9	0.83	0.81	0
September	73.6	44.6	60.4	1.26	1.22	0.6
October	61.7	35.1	49.5	1.01	0.86	2.5
November	46.4	23.6	35.1	0.67	0.51	4.7
December	36.5	15.3	28.4	0.59	0.46	6.9
Year	59.2	33.3	47.5	13.68	11.88	42.2

[1] Average of temperatures at Billings Airport and the Huntley Experiment Station.

[2] Average monthly precipitation based on data for the period 1935–64.

[3] Based on snowfall at Ballantine through a period of 21 years.

North of River should be 2" less = 9.88 to 10.88

30 yr Rainfall along river 11.88

Bull Mountain Land Alliance
A local affiliate of the Northern Plains Resource Council
13838 Hwy 87 N, Shepherd MT 59079
406-947-2151, charter@midrivers.com

February 10, 2011

To the members of the Senate Taxation Committee,

In our part of Montana, the state's new grazing land valuation procedures can estimate production capacity at 2.5 TIMES OR MORE than the levels recommended by the NRCS, BLM or prudent private land stewards!

The Department of Revenue appears to have arrived at their numbers by using soil types without adjusting adequately for important precipitation and range condition variables.

We are writing in support of the productivity adjustment reforms (attached) to HB 132 being proposed to the Senate Taxation Committee on February 10. Unfair and unrealistic grazing land production capacity determinations have serious unintended consequences: from undermining economic viability for many operations to overstocking and impaired wildlife habitat.

Here is an illustration of how the Department arrives at unrealistic production capacity determinations by inappropriate use of NRCS soils information without applying companion technical guide range condition and precipitation zone factors. For example, northeastern Yellowstone County lies within the Central Sedimentary Plains area of Montana (MLRA58A). Average annual rainfall in the open country is generally 11 inches or less, and rangeland in relatively good shape is only rated at about a 50% similarity index to "Historic Climax" on forage production. Given these parameters, NRCS would recommend a stocking rate of .13 aum/acre or less. If the grazing land condition is instead rated at 100% similarity to "Historic Climax" and an average annual rainfall of 14 inches assumed, the recommended stocking rate would rise to .46 aum/acre--which is 2.5 TIMES HIGHER than is realistic! The NRCS information used in this example is available at: www.mt.nrcs.usda.gov/technical/ecs/range/ecolsites/MLRA58A .

Similarly, productivity ratings for dryland hay acreage need to be adjusted to reflect realistic precipitation conditions. The experience of dryland hay producers in northeastern Yellowstone County is that average tonnage is below .4 Ton per acre. Much of the bench lands in Carbon County only average .75 Ton per acre long term.

Please vote to amend HB 132 to include these important assessment reform provisions.

Sincerely,

Jeanne Charter, Secretary
Bull Mountain Land Alliance

MCA 15-7-101--(2) (b) The Department of Revenue must keep available to the public a listing of the maps, plats, forms, electronic media sources, books of record, appraisal and valuation manuals, as well as the methods used by the Department of Revenue to derive the classifications, appraisals, and AUM RATINGS used in classification for tax purposes. The public shall have access to those official records of the state, to the methods used to derive the classifications and to the land's associated productivity under that agricultural use.

(c) The appraisal manuals for agricultural and forest lands must be available at the county assessor's office, or the Department of Revenue may post those manuals on the Department of Revenue's web site.

MCA 15-7-102---Review and appeal of contested classification. 6(b) NEW. The Department of Revenue must provide and disclose to the taxpayer the exhibits and information that the department intends to use at the contested hearing at least 30 days before the hearing is scheduled. If the taxpayer prevails at the county tax appeal board, the Department of Revenue shall not appeal the decision. If the Department of Revenue prevails at the county tax appeal board level, the taxpayer may appeal to the state tax appeal board, whose findings are final subject to the right of review in the courts.

Finish section with current language.

MCA 15-7-103 NEW---(3) (a) Land classified as agricultural land or forest land must be subclassified according to soil type and productive capacity adjusted for local precipitation zone based on data available and local knowledge.

(b) NEW---Land classified as grazing land must be subclassified according to soil type and theoretical productive capacity adjusted to local precipitation zone, forage palatability for domestic livestock, and using a similarity index between poor to average as average range conditions determined by available data, by on-site ground truth reviews and local knowledge from other sources. Review of aerial photography is not a substitute for an on-site review or ground truth work.

(c)NEW---All non-grazable lands such as alkaline (alkali), saline seep, quicksand, blow out, or rockland must be valued as non-productive lands.

MCA 15-7-139---NEW IDEA—Include with property tax statement a notice to each taxpayer that the Department of Revenue may enter property for the purpose of appraising or auditing property, containing at a minimum the information in 15-7-139 (3) (b) (i), (ii), (iii) and the information that the Landowner/Taxpayer must respond within 30 days if he wishes to require any of the following conditions set out in the current code. INCLUDE a provision that for reappraisal purposes DOR personnel must meet with the landowner or his representative at inspection, and DOR must have written evidence of its visit to the property

.MCA 15-7-201—NEW IDEAS

Increase the management expenses to 50% in the income formula for grazing land.

Disclose sources of public available information used to determine net income.

HB 132 passed in the house raises cow size from 1,000 lbs to 1200 lbs.

15-7-201---Agricultural Advisory Board---appointed by the Legislature. NEW IDEAS

1. Ag advisory board is a standing committee for each appraisal cycle---6 year term.
2. Qualifications for board member
    a. Knowledgeable in ag and ag economics
    b. Geographically diverse in residence
    c. Includes one member of the MSU-Bozeman College of Ag staff

3. Duties:

Hold hearings across the state if requested by taxpayers or to provide information to the committee to ascertain the following: Information required for the advisory report to DOR, which report shall have a majority report and a minority report from those committee members who may wish to submit one. The advisory report shall contain the information required by statute.

MCA 15-44-103 NEW IDEA

Strike out the language "and furnish other associated agricultural uses..." where found in this section. At the very least the method which DOR is using to mix a site's forestry potential and its possible other associated agricultural uses needs clarification.

Ellen L. Pfister

From: "Paul McKenzie Tree Farm" <paulmckenzie@mttreefarm.org>
Date: Tuesday, February 08, 2011 3:17 PM
To: "'Ellen L. Pfister'" <epg@midrivers.com>
Subject: RE: Timber Assessments by the state

Ms. Pfister,

I am sorry to hear of your plight with the DOR. Property tax reappraisal has been a serious challenge for many landowners across the state, placing them in the difficult situation of disproving the DOR appraisal process. The forestland reappraisal process has been difficult to fully understand even for professional foresters!

Similarly to agricultural lands, forestlands are based on "productivity" or the capacity of land to grow trees. This system of productivity was set up quite a while ago and is probably the fairest way to tax forestlands rather than on current standing volumes or some other measure. The difficulty comes in the administration of the program! In the 2009 legislature, we were successful through HB 658 in directing the DOR to develop a Forestland Taxation Advisory Committee to help the department administer the productivity program. The makeup of the committee was established in the legislation, unfortunately, we did not include a timeline for convening the committee. To our dismay, the DOR determined on their own that it was not necessary to convene the committee until the end of the next reappraisal process. Our intention was for the committee to be formed early in the reappraisal process so we could work collaboratively with the DOR throughout the reappraisal process, rather than at the end with only an opportunity to review the work already done by the DOR. You may have heard our testimony on HB132 early in January, while the changes proposed in this bill were not substantial with respect to Forestland taxation, we did raise the issue of the committee. Subsequent to this hearing, we understand that the DOR has reconsidered the timeline for the formation of the committee and hopefully it will be formed in late 2011 or early 2012. We feel that this advisory committee is the only way for landowners to have meaningful input into the productivity calculations and the valuation process.

As far as the determination if a parcel is forest land or not, the DOR developed an "improved" process in 2009. The minimum rate of tree growth to qualify land as forest lands has traditionally been 25 cubic feet of wood per acre per year. These growth rates are determined by very complex growth and yield models that were commissioned by the DOR and developed by the University of Montana. The models take into account a lot of information from soils types to precipitation to determine what the potential growth rates are for various parcels. The DOR then verified the classification using the aerial photography they sent you. Especially in eastern Montana where forestlands are marginally productive and in areas with extensive wildfire activity, I have heard about multiple mis-classifications. That being said, just because a parcel does not currently have trees on it, if it is capable of growing 25 cubic feet per acre per year, it should still be classified forestland. In many ways this makes sense, especially considering areas where trees have been recently harvested or burned in a wildfire, but the property will continue to grow trees. One of the phenomenon's that is taking place in some of our drier sites is after a wildfire, the property does not come back to trees, but rather to grass or shrubs. In this case, the forestland designation may be incorrect. Unfortunately, it is up to you as the landowner to disprove the DOR designation. It may require taking DOR folks out on the ground or your hiring a consulting forester to help prove your case. Both of which unfortunately either cost time or money.

The second factor in the re-appraisal process is the valuation element. That is where they take the annual growth and put a value on it. This is the basis for your taxable value on the forest land. Once again, this is a very complex process of assessing value of the trees and cost of growing, harvesting and selling them. Especially in eastern Montana, the costs of harvesting and transportation to market are starting to exceed the value of the logs. This will create some very difficult issues for the DOR in the future, more reason for having the advisory committee in place.

I wish I had an easy answer on how to understand the classification and valuation process. There

is no easy answer. It is important for the DOR and the legislature to hear your experiences. While I still feel that the productivity method is the best way to fairly appraise forestlands values, the current process needs oversight and input from landowners and others outside of the DOR. I urge you to ask the DOR when they plan on convening the committee and how you can have input into that process.

I doubt I made this issue any clearer. I do not have plans to be in Helena on the 10th, but would welcome a phone call if you wish to discuss this further.

Sincerely,
Paul R. McKenzie
Lands & Resource Manager
F.H. Stoltze Land & Lumber Co.
406-892-7012

From: Ellen L. Pfister [mailto:epg@midrivers.com]
Sent: Tuesday, February 08, 2011 1:44 PM
To: Paul McKenzie
Subject: Timber Assessments by the state

Dear Mr. McKenzie:

A year or so ago, you sent me a complimentary copy of Montana Tree Farm News with an article "Forestland Taxation---2009 Reappraisal, What it means to you". I tore it out and kept it, rereading it several times since.

My neighbors and I have gotten engaged in a grazing land tax protest, which we won at the Yellowstone County Tax Appeal level and was, of course, appealed by the DOR. After I read you article I was confused over timber assessments and have remained confused. This ranch has historically had timber (such as it was). More of that timber has gone up in smoke than was ever harvested. We had a major, major fire in l984 (very little of that has resprouted due to drought) and another major fire in 2008. In 2009 the County sent us areal photographs with alleged timbered areas. The photos were dark, and I couldn't tell much about them. In 2010 they sent us more and different photos as part of the tax protest information that we received. The timber is different in the 2010 photos, but one can at least see the individual trees on the ground. I can't tell the difference where they are saying there is timber and where there is not. It looks like a drunken assessment to me.

I see that the DOR got introduced HB 132 as a "housekeeping measure". HB 132 looks like it makes it harder to see what DOR is doing on their assessment process. I was interested to see the MCA section with definitions regarding timber completely stricken. I also read the hearing in 2009 which Stoltz, Stimpson, and your organization attended on the new timber rules. What is going on with this?

It is been difficult enough with the grazing reassessment, but when the timber is factored in on top of the grazing, it becomes unbearable difficult even arriving at how much land is being assessed, let along for what.

I plan to be in Helena the morning of Feb. 10 at the Senate Taxation Committee hearing at 8 AM. It might be possible to visit at that time. Ellen Pfister

1972 Range sites in excellent condition
now morphed into ecological sites for
Web Soil survey

Silty may be a "loamy" ecological site

Thin loamy
Thin sandy

285C+81B (1)
182D+~~311B~~ 285D (2)
283F, 285F, 246, ~~265E~~ (3)
354B

Soil Name + type	Abbrev	Capability	Range site	Production Yields from 1972 Soil survey High	Med	Low	AUM/Ac	St Tx dry matter and stock DOS	AUM/Ac	Pasture AUM/Ac
As fine sandy loam 4-7%	As	IV e-2	sandy	1200	1050	900	0.286	1212.5	0.331	0.303125
Arvada-bone silty clay loam 0-1%	Ax	VII s-2	clayey	1200	1000	800	0.273		0.222	
Bainville loam 2-7%	Bb	IV e-4	silty	1200	1000	800	0.273	1197.5	0.327	0.299375
Bainville loam 7-15%	Bc	VI e-4	silty	1200	1000	800	0.273	1118	0.305	0.2795
Bnvile-elso-shale compx 15-25%	Bf	VI e-4	thin silty	900	750	600	0.2049	796	0.217	0.199
Bnvile-rockoutcropcompx 15-45%	Bg	VI e-4	thin silty	900	750	600	0.2049	623	0.17	0.156
Bnvile-Worland compx 4-7%	Bl	IV e-4	sandy	1200	1050	900	0.286	1167.5	0.319	0.291875
Bone silty clay1-6% slopes	BU									
Cushman-Bainville loam 4-7%	Ch	III e-5	silty	1200	1000	800	0.273	1125	0.307	0.28125
Elso clay loam 4-7%	Ec	IV e-4	clayey	1200	1000	800	0.273	788	0.215	0.197
Elso clay loam 7-15%	El	VI e-4	clayey	1200	1000	800	0.273	785	0.214	0.19625
Elso-Lohmiller compx 15-35%	Es	VI e-4	thin clayey	900	750	600	0.2049	743.5	0.203	0.185875
Glenberg fine sandy loam 1-4%	Gh	IV e-2	sandy ok	1200	1050	900	0.286	1300	0.355	0.325
Haverson silty clay loam 1-3%	He	III e-5	clayey	1200	1000	800	0.273	1516	0.414	0.379
Haverson &Lohmiller soils 0-4%	Hl	VI w-2	silty	1200	1000	800	0.273	1532	0.419	0.38375
Haverson&Lohmiller cl 0-35% channeled	Hm	VI e-1	silty	1200	1000	800	0.273	1358	0.371	0.3395
Lambert 7-35%slope	Ld	VI 3-1	silty	1200	1000	800	0.273	1109	0.303	0.27725
Lohmiller silty,clay,loam3-7%slp	Ln	III e-5	clayey	1200	1000	800	0.273		0.341	
Lohmiller-Elso cmplx 4-15%slp	Lt	IV e-4	clayey ok	1200	1000	800	0.273	837.5	0.229	0.209375
McRae loam 1-4%slp	Mn	III e-5	silty -	1200	1000	800	0.273	1281.5	0.35	0.320375
McRae loam 4-7%slp	Mo	III e-5	silty - ok	1200	1000	800	0.273	1246.5	0.341	0.311625
McRae loam 7-15% slp	Mr	IV e-4	silty -	1200	1000	800	0.273	1245.5	0.337	0.311375
McRae-Hysham loam 1-3%slpp	Mu	III e-5	silty -	1200	1000	800	0.273	962.5	0.263	0.22105
Midway-Razor clay loam 4-7%slp	Mw	IV e-4	clayey - steep	1200	1000	800	0.273	920	0.251	0.23
Midway-shaleoutcrop cmplx	My	VI e-4	thin clayey - steep 7e	900	750	600	0.2049	670	0.183	0.1675
Shale outcrop (Lismas 168 shale)	Sl	VII s-3		100			0.027		0.043	
Razor clay loam 2-7% slope	Ra	III e-5	clayey ok	1200	1000	800	0.273			
Toluca clay loam 4-7% slope	Tm	III e-5	silty -	1200	1000	800	0.273		0.306	
Travessilla loam 4-7% slope	Ts	VI e-3	shallow limey	800	650	500	0.177	809	0.221	0.20225
Travessilla loam 7-15% slope	Tt	VI e-3	shallow limey	800	650	500	0.177	771.5	0.211	0.192875
Worland fine sandy loam 2-7%	Wo	IV e-2	sandy ok	1200	1050	900	0.286	1215.5	0.322	0.30875
Worland-Travessilla finesndyloams 7-15%	Wr	IV e-1	sandy70% limey 30%	1200	1050	900	0.286			
Wormser-Worland sandy loams 4-7%	Ww	III e-7	sandy	800	650	500	0.177	1102	0.301	0.2755
McRae-Bainvilleloam 7-15%	Ms	IV e-4	silty ok [sandy r clay]	1200	1050	900	0.286	1216.5	0.331	0.304125

282E, 282D, 283C, 383C, 281D, 245F, 246, 255C ← Travessilla loam 7-15% slope

Blackshep Twilight complex 4-25% ← 458E