

WV Envirothon 5th Topic Scenario: 2018

Range Management, Livestock Grazing, and Multiple Use

INTRODUCTION:

Proper range/pasture management is essential for long term sustainability of grasslands and pasture areas. Grazing of these areas by domesticated animals is essential to supplying food for people around the world and the use of federal rangelands for grazing is essential for the economic well-being of many American ranchers. However, while grazing provides many benefits and can be a useful tool to control vegetation, if improperly managed, it may lead to undesirable effects on vegetation or other important resources within the grazed areas.

The possible negative impacts of grazing have caused the use of Federal Lands for this purpose to be a controversial topic. This controversy largely stems from the fact that federally owned land has many diverse uses and, as a multiple use resource, has many different people interested in the land for very different reasons. Management of federal lands must always address multiple uses such as grazing, public access, recreation, timber management, and other uses, while maintaining the integrity of other important resources and ecosystem services. The effects of grazing impacts on these resources must be evaluated so that positive effects are maximized while harmful effects are avoided or mitigated. Monitoring plans coupled with Adaptive Management strategies can be used to insure grazing viability and maintain rangeland health over extended periods of use.

Multiple use management can be challenging. Often, work which improves one resource may prove detrimental to others. Projects that improve one user experience may hinder another or cause unacceptable resource damage. Therefore, all projects must be well thought out with the positive impacts weighed against the negative impacts. It helps to have private and public resources available to help plan and fund project work to enhance and protect the resources within these special areas.

SCENARIO:

The Karst Sinks allotment is a 993 acre tract of federally owned land surrounded by privately owned property. Elevations of the property range from 3350 feet to 4400 ft. The allotment is comprised of various vegetation types ranging from grasses to mature timber.

Suitability for pasture: Of the 993 acres, approximately 370 acres are currently suitable pasture area. Over the past 40 years, brush encroachment has caused a loss of pasture area resulting in a corresponding decrease in permitted animal units on the allotment. There are currently no properly functioning structural improvements (such as division fences or water development) on the allotment. The area is grazed as a single pasture unit by cow/calf pairs. Existing fence conditions are poor and are not likely to hold sheep, goats, or yearling steers but are marginally functional for holding cow/calf pairs, bulls, or horses. There are many sources of water in the allotment and livestock water directly from springs and creeks. The forage quality of the grass varies from poor to excellent throughout the allotment. Slope, water availability, and forage quality all influence how the cattle distribute

themselves, so some areas are grazed and trampled more heavily than others. A map of pasture condition is provided in the resource materials, and dominant vegetation types are listed in vegetation below.

Terrain: The terrain is nearly level on the ridge tops, saddle areas, and stream bottoms, with side slopes ranging from gently sloping to very steep (3-55%). Approximately 225 acres has a slope of less than 15%, with an additional 542 acres having a slope of 15-35%. The remainder of the allotment has a slope of greater than 35%. Areas of rock outcrop are present in some areas. Topographic maps and a slope survey are available in the resource materials.

Soils: Soils have developed from limestone and high base red clay shale parent materials, and indicate that the area was historically red spruce forest. A soil map is provided in the resource materials.

Vegetation: The majority of grasses on the allotment are introduced cool season grasses such as bluegrass and orchardgrass mixed with native grasses and forbs. Areas shown on the pasture condition map as poor consist mainly of unimproved native grass stands, forbs and brushy material. Areas shown as excellent are improved pastures of clover, bluegrass, orchardgrass and timothy making up more than 90% of the vegetative mass. Good and moderate designated areas have some amounts of bluegrass and clover making up between 75% and 90% of the vegetation.

The allotment and private ground around the Karst Sinks allotment has known occurrences of the non-native invasive species meadow knapweed and a lesser degree of introduced thistles. Knapweed has been identified on approximately 40 acres in the Northeastern portion of the allotment. This area was previously a very productive pasture area, and is shown as excellent and good pasture areas on the allotment pasture condition map. However, Meadow Knapweed now represents approximately 25% of the vegetative mass in this area. Several other areas in the allotment have lesser amounts of knapweed and the problem seems to be spreading rapidly.

Steeper slopes are comprised of various types of cover including native grass stands, hawthorn thickets of various densities and mature hardwood forests. The area identified as Cunningham Knob on the map supports young stands of immature red spruce understory with an overstory consisting of mature mixed hardwood forest on its top and along its northern face.

State of the forested areas: The majority of this allotment was originally spruce forest, but completely cleared and was used as pasture as late as the 1930s. There is local interest in restoring spruce forest on portions of the allotment. Currently, the steep slopes are now dominated with mature hardwood forests consisting of birch, black cherry, white ash, beech, and sugar maple. The understory on the north and west facing slopes of Cunningham Knob have immature red spruce in varying quantities. The majority of the beech in the area has been identified as having beech bark disease and is sending up dense thickets of root sprouts in many areas. However, some healthy disease resistant beech has been noted in surveys of the area. Emerald ash borer has been noted in nearby areas but has not yet been documented in the allotment. Areas of mature forest are bordered with younger hardwoods (predominantly maples) over-topping dying hawthorn trees. These hawthorn trees are producing little to no vegetation due to the shading by taller trees. As you progress from these areas toward the open pastures, the age of the growth decreases and trees are mostly productive hawthorn of varying densities. Vegetation under the hawthorn consists of a small amount of grass, goldenrod, and young hawthorn trees. These areas are rarely grazed by cattle, but can be excellent wildlife habitat.

Water and aquatic resources: The allotment is situated in the geographic area known as “the Sinks of Gandy”. The “Sinks” area is dominated by the caves and drainage associated with karst limestone. Due to the karst topography, there are multiple seeps at various locations within the allotment. Streams on the north and east sides of the allotment feed into nearby Gandy creek while streams on the western half of the allotment flow into the Laurel Fork. Both streams are noted as popular fishing streams and both have viable Native Brook Trout Populations. In addition to native trout, the stream exiting the allotment on the North Western Corner is documented as having a population of Candy Darters. It was also noted on the last field inspection that the banks of several streams in the allotment are showing signs of erosion from repeated use by cattle for water access. In addition to the streams, several springs are being used for watering, resulting in bank destabilization near the spring sources. A topographic map of the area is provided with water resources and candy darter population locale indicated in the resources.

INSTRUCTIONS

In this scenario, you are a group of specialists employed by the U.S. Forest Service. Your titles are Fisheries Biologist, Soil Scientist, Timber Management Specialist, Rangeland Management Specialist, and Wildlife Biologist. Your District Ranger has requested that you review the Karst Sinks allotment and provide input as to how management of the area can be improved. The ranger has asked that you create a complete allotment management plan that considers the following:

1. Identifies resource concerns in the area and recommends possible project work to mitigate negative resource impacts and/or to improve existing resource conditions.
2. Maintain the area as an open grazing allotment and maximize the number of animals grazing the area while minimizing detrimental impacts to identified resource concerns.
3. Lists the multiple use values and ecosystem services provided by the Karst Sinks allotment and the surrounding area.
4. Include details in your management plan to address the interests of as many of the stakeholders (listed below) as possible. Include at least three interests beyond grazing value.
5. Consider the triple bottom line (people, planet, profit OR societal, ecological, economical) in all aspects of your plan. For example: What are the social implications of logging? Grazing? Are major developments economically feasible? Will developments or harvest negatively impact ecological function? Societal benefit?
6. Think long-term and use the principles of adaptive management to allow for potential natural and human-driven changes in circumstances over time.

STAKEHOLDERS

Stakeholders have a vested interest in the area, but might also be able to provide assistance in developing projects that you recommend. Some of their concerns are listed, but you will need to research some stakeholders to learn what their concerns might be and how they can help you.

- WV Department of Natural Resources-has shown a particular interest in this allotment and wishes to retain hawthorn in the area as possible, citing that it is an exceptional food source for wildlife.
- US Fish and Wildlife Service- similar concerns as WVDNR, as well as interest in maintaining water quality for fisheries and endangered species
- WV Forestry Association and WV Division of Forestry
- WV Conservation Agency
- WV Department of Environmental Protection Water Resources Division
- Grassland Steering Committee
- Local hunters utilize this area frequently for Turkey, Grouse, Woodcock, Black Bear, and White-tailed deer hunting.
- Hikers and bird watchers
- Ruffed Grouse Society – Have helped with habitat creation projects
- Central Appalachian Spruce Restoration Initiative – specialize in red spruce restoration work.
- Wild Turkey Federation – Have seed and lime to increase clover and bunch grass in wildlife openings.
- Natural Resource Conservation Service (NRCS)- focus on soil management and can provide information about grazing, erosion, developing and protecting water resources
- Trout Unlimited
- WV Cattlemen’s association, including the current Permittee on the allotment and local potential future permittees
- Neighboring landowners- The allotment is surrounded on all sides by privately owned land. The neighboring land is open and is used for cattle grazing from early May through mid-November. Neighboring landowners have complained about the condition of the shared fence on the allotment. Cattle are grazed on all the neighboring properties and over the last couple of years cattle have been traveling through the perimeter fences both ways.
- West Virginia Invasive Species working group
- West Virginia Native Plant Society- concerned about seeding non-native grass species, especially smooth brome and fescues.

NOTABLE POINTS

- A map of the area is provided.
- Soil tests were taken on the allotment in 2014. Results have been attached. Soil analysis of area shows that this allotment was historically a red spruce forest.
- The rights to graze these areas are validated through a permit agreement between the owner of the livestock and the land management agency for a fee paid to the agency by the livestock owner. This permit states the number of animals that are allowed to graze, the area that is allowed to be grazed, the amount of time that the area can be grazed, and the fee that is to be paid for the right to graze. These fees can be paid in cash to the National Treasury or can be offset by providing work on the allotment that is of equal value to the fees required. This type of work is called a Fee Credit Agreement, and is often used to improve structures within the allotment areas.

- Currently 31 cow/calf pairs and 1 bull are permitted to graze the allotment from May 15 - October 15th. However, there are no documents in the range files that show how the numbers were calculated. Also, vegetation reports from the past few years show that the desired 70% utilization of grass has not been attained. The average weight of cattle on the allotment is 1200 lb and are therefore 1.2 animal units (AU) each. Bulls average 1600 lb (1.6 AU). To find the total amount of animal unit months currently allowed, multiply the total AU by the length of the grazing period in months.
 - The local NRCS office has provided you with a pasture capacity worksheet to help you determine and document a proper head count for the desired utilization rate (located in resource materials).
 - You may consider changes to the grazing season, rotational grazing, brush clearing, and other techniques to maximize stocking rates while limiting impacts.

POTENTIAL RESOURCES

(please feel free to find additional resources, but make sure they are trustworthy!)

Adaptive management resources:

<http://rangelands.ucdavis.edu/outreach/adaptive-management-of-rangelands-science-practice-and-partnership-2/>

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/ceap/?&cid=stelprdb1045811>

<http://azrangelands.org/presentations/Winter%202017/ForestServiceAdaptiveManagementPoliciesandImplementation2017.pdf> -

Calculating stocking rates and creating grazing plans: <http://oneplan.org/Range/RangeCapacity.asp>

Rangeland inventory, monitoring, and evaluation - <https://globalrangelands.org/inventorymonitoring>

Interseeding guide - <https://store.extension.iastate.edu/Product/pm1097-pdf>

Importance of Spruce Systems - <http://pages.geo.wvu.edu/~geol659/tnauman/index.html>

Candy Darter - <https://efotg.sc.egov.usda.gov/references/Public/WV/candy.pdf>

Candy Darter - <https://www.federalregister.gov/documents/2017/10/04/2017-21351/endangered-and-threatened-wildlife-and-plants-proposed-threatened-species-status-for-the-candy>

CASRI - <http://applcc.org/cooperative/organizations/central-appalachian-spruce-restoration-initiative-1>

NRCS EQIP Program - <https://www.nrcs.usda.gov/wps/portal/nrcs/main/wv/programs/financial/equip/>

U.S. Forest Service Rangelands - <https://www.fs.fed.us/rangelands/>

Sequestration of Carbon in Soils - <https://www.esa.org/esa/wp-content/uploads/2012/12/carbonsequestrationinsoils.pdf>

https://www.researchgate.net/publication/277775130_Soil_Chemical_and_Microbial_Properties_in_a_Mixed_Stand_of_Spruce_and_Birch_in_the_Ore_Mountains_Germany-A_Case_Study

Grassland and rangeland management - <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/spi/scpi-home/managing-ecosystems/management-of-grasslands-and-rangelands/grasslands-how/en/>

Global issues and Range Management - http://rangelands.org/pdf/Global_Issue_Paper.pdf

Global issues and Range Management - <http://www.date.hu/acta-agraria/2002-08i/mannetje.pdf>

Effects of water quality on Beef Production - <https://edis.ifas.ufl.edu/pdffiles/AN/AN18700.pdf>

Water needs and quality effects on cattle - <https://www.uaex.edu/publications/pdf/FSA-3021.pdf>

Liming effects on soil - https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053252.pdf

Warm Season Grasses in WV - <https://efotg.sc.egov.usda.gov/references/Public/WV/pmc-nwsg.pdf>

Warm and cool season grass pastures - <http://onpasture.com/2015/10/26/cool-and-warm-season-grasses-make-for-better-pastures/>

WV Fencing Laws (Chapter 19 article 17 of the WV Code - <http://www.legis.state.wv.us/WVCODE/Code.cfm?chap=19&art=17>

Monongahela National Forest Programmatic agreement for Forest Plan – <https://www.fws.gov/northeast/endangered/tebo/PDFs/MNF%20LRMP%20Programmatic.pdf>

Monongahela National Forest – Forest Management Plan - https://www.fs.usda.gov/detail/mnf/landmanagement/planning/?cid=FSM9_011361

LEARNING OBJECTIVES

Through preparation, research and creation of their oral presentation, students will be able to:

1. Differentiate management of pasture lands in WV from that of rangelands in western North America? How are they similar?
2. Describe the interrelationships between the environment, natural resources, and the different natural resource management strategies of rangelands
3. Identify stakeholders in rangeland management and their perspectives/concerns.
4. Identify and address the major natural resource areas and associated concerns--soils/land use, aquatic ecology, forestry/plant communities and wildlife--as they relate to the scenario.
5. Define adaptive management as a technical approach and list its objectives in rangeland management.
6. Research and address relevant political considerations: (regulations, mandates, impact on political system/community)
7. Understand the “triple bottom line” concept as applied to rangelands. Address ecological, social, and economic concerns.
8. Research and present a viable, sustainable solution to the problems presented.

CUNNINGHAM KNOB

993 ACRE ALLOTMENT WITH 370 PASTURE ACRES

Candy Darter

Access Road

SPRING

SPRING

SPRING

SPRING

Spruce Understory
with multiple seeps in area

SPRING

GREENBRIER
POTOMAC

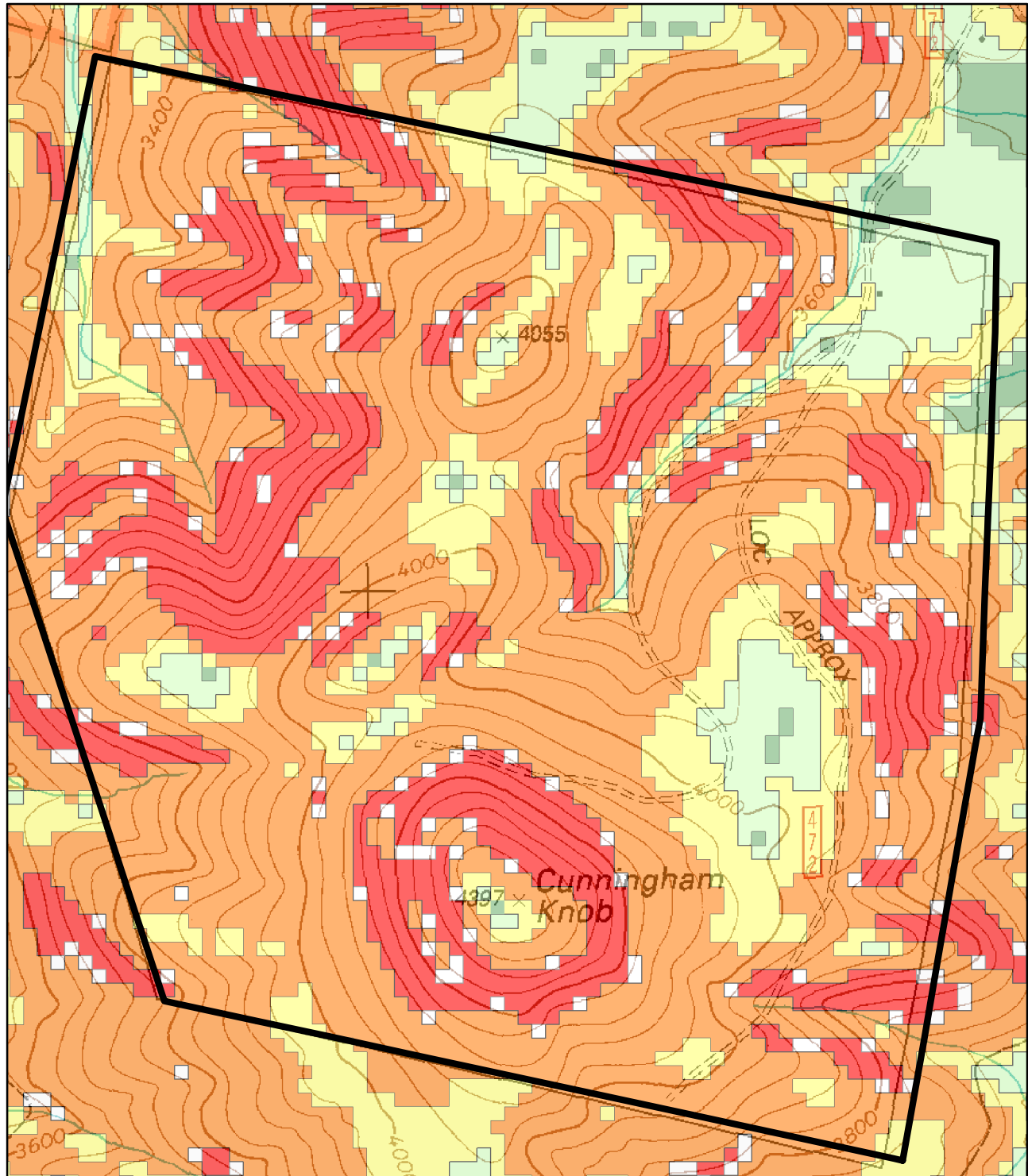
BM
3535

Sinks of Gandy

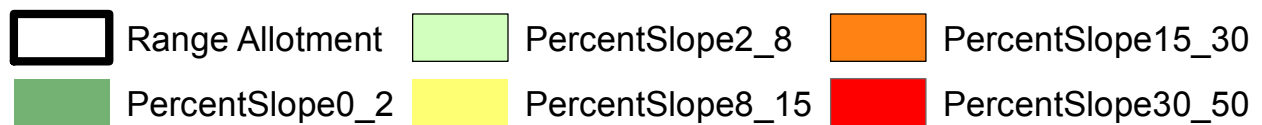
RD
RD

Cunningham
Knob

CUNNINGHAM KNOB SLOPE SURVEY



Legend



CURRENT ALLOTMENT PASTURE CONDITIONS

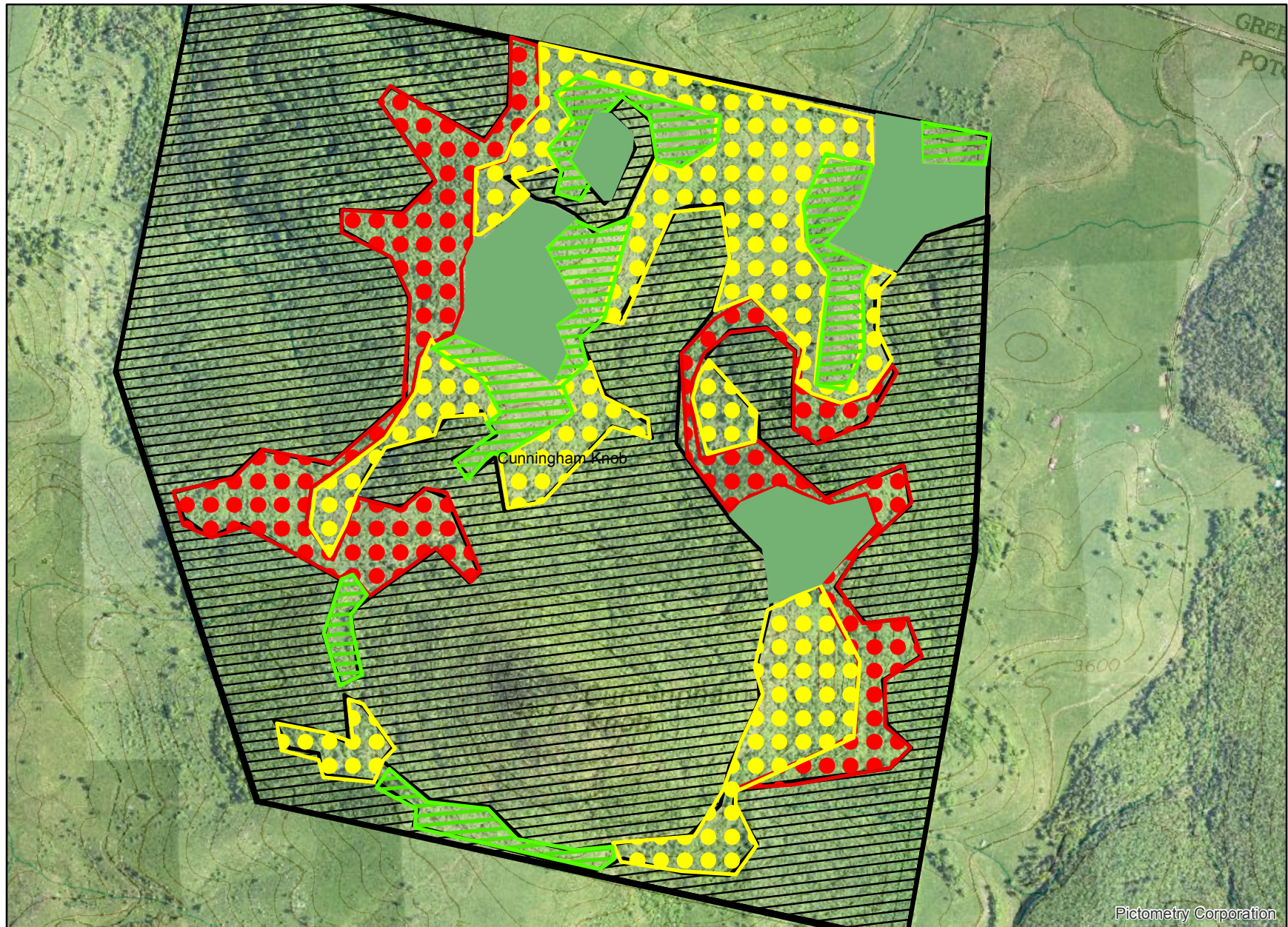
Open excellent pasture = 65 Acres

Heavy Hawthorn Poor Pasture = 99 Acres

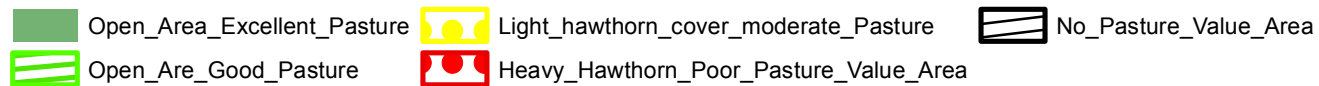
Open Good Pasture = 63 Acres

Mature Timber/ No Pasture Value = 623 Acres

Light Hawthorn moderate Pasture = 143 Acres



Legend



WORKSHEET - ESTIMATING CARRYING CAPACITY/STOCKING RATE - CONTINUOUS GRAZING

Allotment Name

DATE PREPARED

Prepared By

STEP ONE - ESTIMATE POUNDS OF LIVELWEIGHT/FARM

The formula is:

(Annual Forage Production (see table 1) X Acres of the Farm divided by

(Average Daily intake (see table 2) X Length of Grazing Season)

$$\left(\begin{array}{c} \text{lbs. DM/AC} \\ \text{(see table 1)} \end{array} \right) \times \begin{array}{c} \text{Ac/Farm} \\ \text{(viable pasture acres)} \end{array} \Bigg/ \left(\begin{array}{c} \text{Intake} \\ \text{table 2} \end{array} \right) \times \begin{array}{c} \text{Days} \end{array} = \frac{\#DIV/0!}{\text{Lbs. of Liveweight/Farm}}$$

Table 1. Annual Forage Production

Forage Type	Stand Condition ¹		
	Pounds DM/AC ²		
	Fair	Good	Excellent
Unimproved Pasture	300-600	600-1200	-----
Bluegrass/clover	600-1500	1500-2400	2400-3000
Tall Grass/legume	1200-2400	2400-3600	3600-4800
Tall Fescue	1200-2400	2400-3600	3600-4800
Alfalfa or Red Clover	1800-2400	2400-3000	3000-3600
Other			

Table 2. Average Daily Intake (lbs. DM/lb. Liveweight/Day)

ANIMAL	INTAKE
Growing Animals	0.03
Cow/Calf ³	0.03
Dry Cows	0.02
Bulls	0.025
Sheep/lambs ³	0.04
Dry Ewes	0.02
Other	

¹ **Fair** stand condition has less than 75% of ground covered. Plant species present are considered desirable species

Good stand condition has 75-90% of ground covered. Plant species present are considered desirable species

Excellent stand condition exceeds 90% of ground covered. Plant species present are considered desirable species

² Pounds of Dry Matter per Acre have been adjusted to account for seasonal growth and utilization rate

³ Calves are included in forage demand for cows; lambs are included in forage demand for sheep

STEP TWO - ESTIMATE NUMBER OF ANIMALS

The formula is:

Total Liveweight/Farm / Average weight of one animal

#DIV/0!

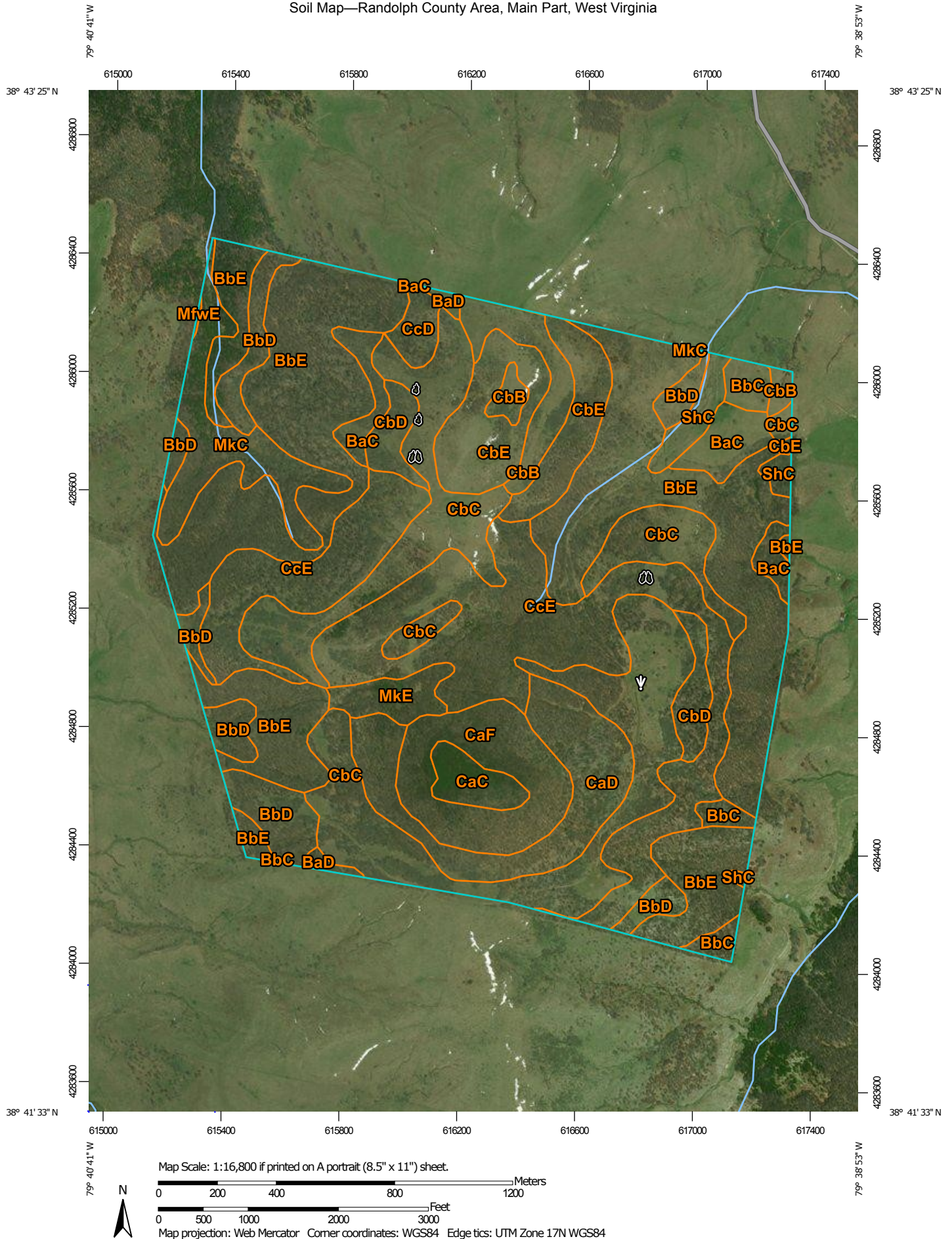
Lbs. Liveweight/Farm /

Average Animal WT. =

#DIV/0!


Carrying Capacity of Allotment

Soil Map—Randolph County Area, Main Part, West Virginia



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Randolph County Area, Main Part, West Virginia

Survey Area Data: Version 12, Oct 6, 2017

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

Date(s) aerial images were photographed: Apr 24, 2011—Feb 8, 2017

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

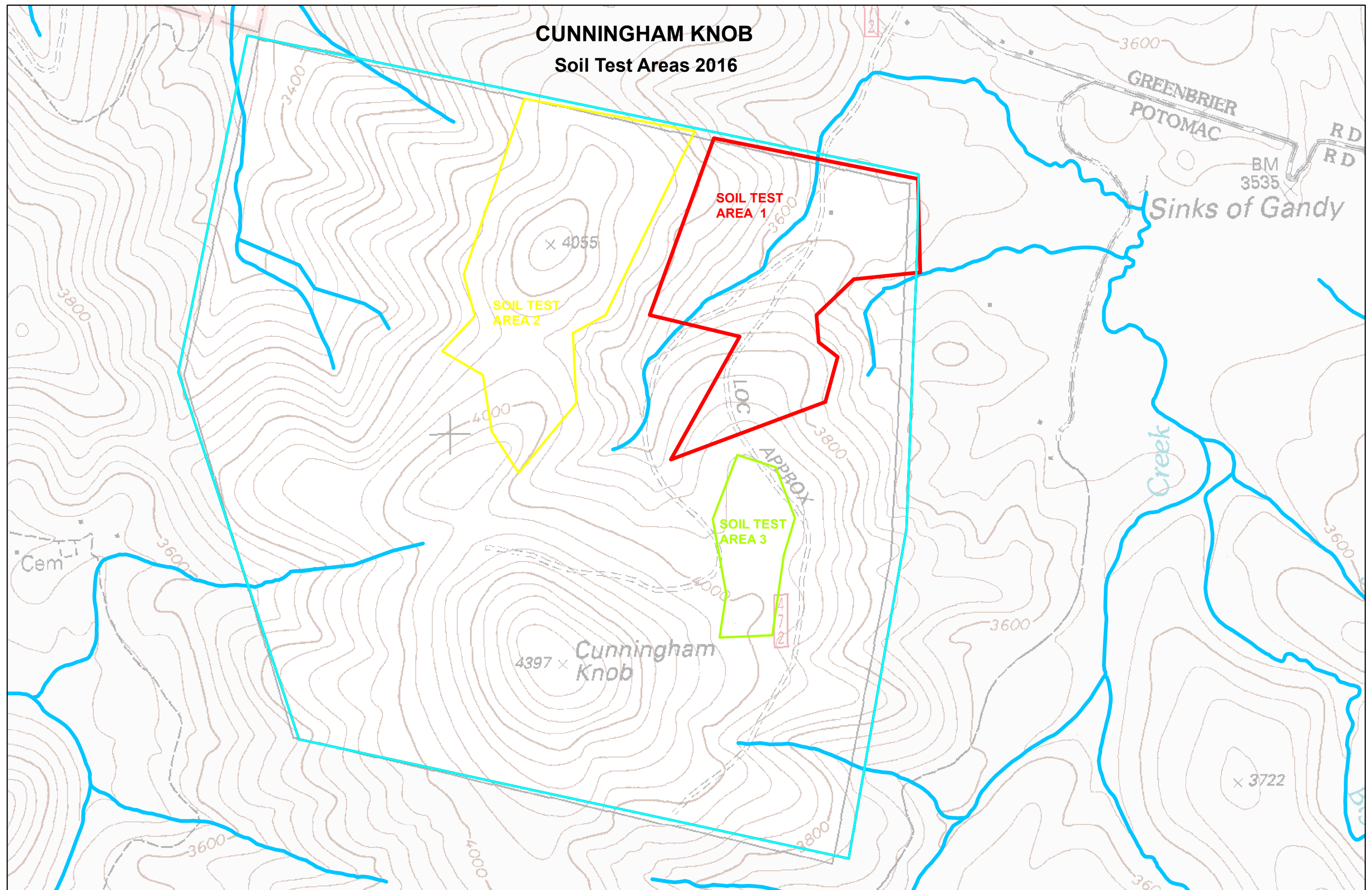
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BaC	Belmont silt loam, 8 to 15 percent slopes	25.9	2.6%
BaD	Belmont silt loam, 15 to 25 percent slopes	3.5	0.3%
BbC	Belmont stony silt loam-Rock outcrop complex, 3 to 15 percent slopes	13.2	1.3%
BbD	Belmont stony silt loam-Rock outcrop complex, 15 to 25 percent slopes	49.4	4.9%
BbE	Belmont stony silt loam-Rock outcrop complex, 25 to 35 percent slopes	276.7	27.7%
CaC	Calvin channery silt loam, 3 to 15 percent slopes	11.6	1.2%
CaD	Calvin channery silt loam, 15 to 25 percent slopes	54.4	5.4%
CaF	Calvin channery silt loam, 35 to 70 percent slopes	46.5	4.7%
CbB	Calvin silt loam, high base substratum, 3 to 8 percent slopes	26.6	2.7%
CbC	Calvin silt loam, high base substratum, 8 to 15 percent slopes	176.7	17.7%
CbD	Calvin silt loam, high base substratum, 15 to 25 percent slopes	19.6	2.0%
CbE	Calvin silt loam, high base substratum, 25 to 35 percent slopes	52.8	5.3%
CcD	Calvin stony silt loam, high base substratum, 15 to 25 percent slopes	7.8	0.8%
CcE	Calvin stony silt loam, high base substratum, 25 to 35 percent slopes	172.2	17.2%
MfwE	Mandy-Wildell complex, 15 to 35 percent slopes, very stony	0.3	0.0%
MkC	Meckesville stony silt loam, 3 to 15 percent slopes	37.3	3.7%
MkE	Meckesville stony silt loam, 15 to 35 percent slopes	12.6	1.3%
ShC	Shouns silt loam, 3 to 15 percent slopes	12.2	1.2%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Totals for Area of Interest		999.1	100.0%

CUNNINGHAM KNOB

Soil Test Areas 2016



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SAMPLE DETAILS

Sample ID: Cunningham Knob Section 1

Sample Date	3/9/2016	Previous Crop	
LAB ID	16-1891	Soil Name	
Limed in last 12Months	No	Soil Texture	Clay
Area (Acre)	100	Tillage Method	No-Till

LAB TEST RESULTS

Nutrients	Values	Rating					
Soil pH	5	L.R.: 4.2		LOW	MEDIUM	HIGH	V HIGH
P2O5(Lbs/A)	41	MEDIUM	P2O5				
K2O(Lbs/A)	224	HIGH	K2O				
Ca(Lbs/A)	3472	HIGH	Ca				
Mg(Lbs/A)	145	MEDIUM	Mg				

Nutrients	K	Ca	Mg	H	Total[CEC], BS(K+Ca+Mg)
MEQ/100	0	9	1	8	18
%Sat	2	49	4	47	55

RECOMMENDATIONS FOR CROP: GRASS PASTURE (less than 30% legume)

Aglime	3 T/A GROUND LIME
Fertilizer - N (Lbs/Acre)	50 - 200
Fertilizer - P2O5 (Lbs/Acre)	80
Fertilizer - K2O (Lbs/Acre)	60

SUGGESTIONS

The above recommendations are for a yield goal of 3-4 Tons/Acre and assume a soil pH corrected to 6.5. Nitrogen (N) applications depend on the desired yield goal. Use any fertilizer or approved organic material that will supply the plant nutrients recommended.

Your county agent can suggest locally available fertilizers to suit the recommendation. Apply 50 Lbs/A of N by itself or with a complete fertilizer in late winter. An additional 50 Lbs/A of n can be applied after each cutting if desired. Retest your soil each fall.

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SAMPLE DETAILS

Sample ID: Cunningham knob section 2

Sample Date	3/9/2016	Previous Crop	
LAB ID	16-1887	Soil Name	
Limed in last 12Months	Yes	Soil Texture	Silty Loam
Area (Acre)	99	Tillage Method	No-Till

LAB TEST RESULTS

Nutrients	Values	Rating					
Soil pH	5.4	L.R.: 1.9		LOW	MEDIUM	HIGH	V HIGH
P2O5(Lbs/A)	16	LOW	P2O5	<div></div>			
K2O(Lbs/A)	155	HIGH	K2O	<div></div>			
Ca(Lbs/A)	2624	HIGH	Ca	<div></div>			
Mg(Lbs/A)	194	MEDIUM	Mg	<div></div>			

Nutrients	K	Ca	Mg	H	Total[CEC], BS(K+Ca+Mg)
MEQ/100	0	7	1	4	11
%Sat	2	58	8	34	68

RECOMMENDATIONS FOR CROP: GRASS PASTURE (less than 30% legume)

Aglime	2 T/A GROUND LIME
Fertilizer - N (Lbs/Acre)	50 - 200
Fertilizer - P2O5 (Lbs/Acre)	120
Fertilizer - K2O (Lbs/Acre)	60

SUGGESTIONS

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SAMPLE DETAILS

Sample ID: Cunningham Knob section 3

Sample Date	3/9/2016	Previous Crop	
LAB ID	16-1884	Soil Name	
Limed in last 12Months	No	Soil Texture	Clay
Area (Acre)	23	Tillage Method	No-Till

LAB TEST RESULTS

Nutrients	Values	Rating					
Soil pH	6.7	L.R.: 0		LOW	MEDIUM	HIGH	V HIGH
P2O5(Lbs/A)	50	MEDIUM	P2O5				
K2O(Lbs/A)	175	HIGH	K2O				
Ca(Lbs/A)	7467	VERY HIGH	Ca				
Mg(Lbs/A)	158	MEDIUM	Mg				

Nutrients	K	Ca	Mg	H	Total[CEC], BS(K+Ca+Mg)
MEQ/100	0	19	1	0	20
%Sat	2	96	4	0	102

RECOMMENDATIONS FOR CROP: GRASS PASTURE (less than 30% legume)

Aglime	NONE
Fertilizer - N (Lbs/Acre)	50 - 200
Fertilizer - P2O5 (Lbs/Acre)	80
Fertilizer - K2O (Lbs/Acre)	60

SUGGESTIONS

The above recommendations are for a yield goal of 3-4 Tons/Acre and assume a soil pH corrected to 6.5. Nitrogen (N) applications depend on the desired yield goal. Use any fertilizer or approved organic material that will supply the plant nutrients recommended.

Your county agent can suggest locally available fertilizers to suit the recommendation. Apply 50 Lbs/A of N by itself or with a complete fertilizer in late winter. An additional 50 Lbs/A of n can be applied after each cutting if desired. Retest your soil each fall.