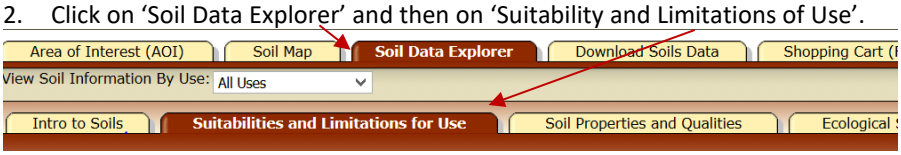
Rangeland Plan Assignment 3 – Grazing Resources

Setting an appropriate stocking rate is an important decision for rangeland management. In this 3rd installment of the Range Plan Assignment, you will set determine the amount of forage on your management unit (AOI selected in Range Plan 1), consider restrictions to grazing, and set an initial stocking rate.

1st → Estimate Biomass Production

Calculate the average annual **biomass production on your management unit**. The easiest way to do this is to go to Web Soil Survey. (*Visit youtu.be/IVBh2aaBgS8 to see a video that overviews this procedure).

1. Load your management Unit AOI. (i.e., URL created in 1st assignment).
2. Click on 'Soil Data Explorer' and then on 'Suitability and Limitations of Use'.



3. Cut and paste the information related to Rangeland Forage Production into an excel spreadsheet. Make three sheets or columns: Unfavorable, Normal, and Favorable year.
4. Multiply acres for each Soil Map Unit (SMU) by average production (lbs/acre) for each SMU to get total production per SMU.
5. Sum the amount of forage from each SMU to get a total pounds of forage produced on the Management Unit.
6. Divide total forage produced (pounds) by total acres for the management unit to get average production (lbs/acre) for an unfavorable, normal, and favorable year.

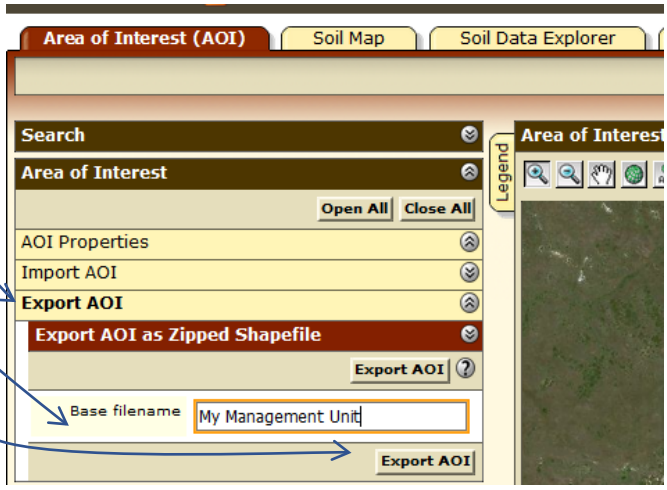
** Average biomass production in **unfavorable** year = 758,294 total pounds & 572 lbs/acre

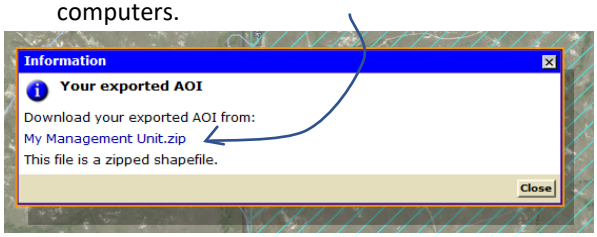
** Average biomass production in **normal** year = 1,062,240 total pounds & 801 lbs/acre

** Average biomass production in **favorable** year = 1,366,577 total pounds & 1,031 lbs/acre

2nd → Consider Limitations for Use – Examine the geography of your management unit with reference to animals that will graze the land. Use Google Earth Pro to complete this exploration which will allow you to locate the corners of your management unit and visualize topographic and hydrologic features.

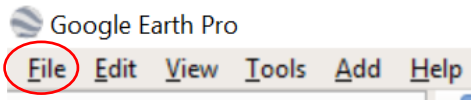
1. If you do not have **Google Earth Pro** on your computer, download this free app for desktop at: https://www.google.com/earth/desktop/.
2. Revisit URL (web link) to the Area of Interest (AOI) in **Web Soil Survey** for the management unit you created in the first Rangeland Plan Assignment. Copy the URL to a web browser and open your AOI.
3. Select Export AOI under AOI Properties (left menu).
4. Click export AOI as Zipped Shapefile.
5. Enter a name for your "Base Filename"
6. Click Export AOI
7. A box in the center of your screen will appear. Click on the zip file & save in a folder on your computers.





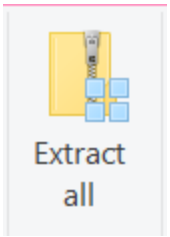
Rangeland Plan Assignment 3 – Grazing Resources

Open **Google Earth Pro.**

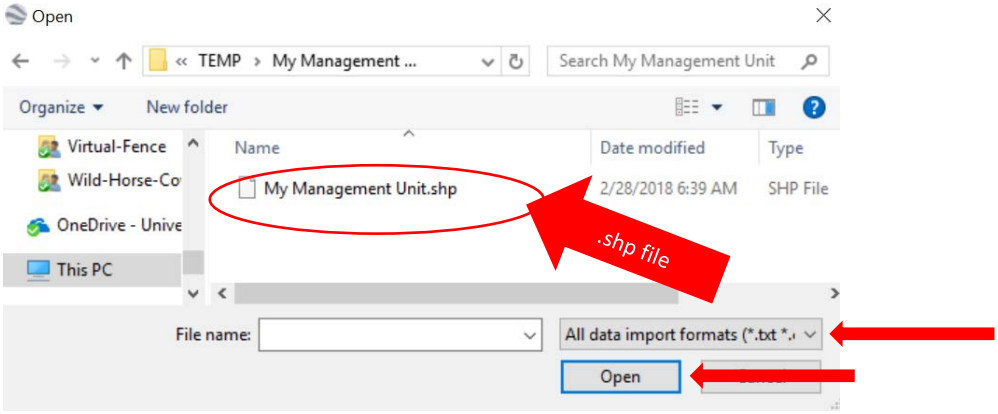


8. Under → File Menu in Google Earth Pro select → import

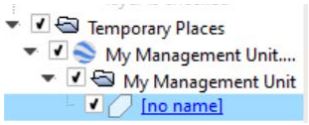
9. The file you are looking for is a *.shp file. It will be in a zipped folder. You may need to "Unzip" the folder or "Extract" the files and save the file somewhere on your computer.



10. In the Import menu, choose the *.shp you saved on your computer from WebSoilSuvey.



11. In Google Earth, click the name of your management unit in Temporary Places. This will put a red polygon on you map. Right click on the polygon → **Properties** → **Style, Color** tab → select **Outlined** in dropdown under Area.



12. Examine creeks, slopes, roads and other features that may affect grazing animals on your management unit. Unfortunately, GooglEarth cannot show you wells or developed spring exist on your land.

*What **geographic features** on your management unit may limit access to forage for grazing animals you selected (species/breed/type)? Make a ballpark estimate of the pounds of forage that will not be available in a **Normal Year** because of topographic features.*

** I examined the Dry Creek Management Unit on the ground and in Google Earth Pro. There are several steep banks along Dry Creek that would be in accessible to some breeds of cattle and horses, though these areas should be accessible to sheep, goats, and wild ungulates. These steep slopes contribute very little vegetation to the available biomass on the Dry Creek unit.

No current reduction due to topography.

Rangeland Plan Assignment 3 – Grazing Resources

*Does **availability of water** restrict access to certain areas given animal species/breed/type you selected? (Remember some animals can travel farther from water than others). You may know or can assume that there are some wells or pipelines that expand accessible water on your management unit. Describe the location of wells that you know or assume currently exists. Will you need to consider development of water sources? Make a ballpark estimate of the pounds of forage that will not be available in a **Normal Year** because of limited access to water.*

**Dry Creek is a perennial stream in the South, House, Spring, East and Dry Creek Pastures, in dry years it is classified as intermittent in the North Pasture. About 20% of the area on the east side of the Dry Cree Unit is more than 1 mile from water and has water only from intermittent streams.

*** Based on these topographic and hydrologic restrictions, what is total biomass production available in a **normal year?** 212,425 total pounds.*

No reduction for topography. About 20% of the 1,326 acres has limited access to water. Therefore, I will reduce initial stocking by (265.2 acres × 801 lbs/acre) = 212,425 total pounds in a normal year.

3rd → **Calculate Forage Supply**

The forage supply is the amount of total biomass production that you will designate as available forage.

Biomass Production (lbs/acre) × Proper Use Factor (%) = Forage Supply (lbs/acre)

Describe what a reasonable Proper Use Factor (%) for this area might be reasonable. Guidelines can be gained from published research. Such information is available in Table 1 of the paper we read in this class called An Approach for Setting Stocking Rates (Holechek 1988)

The Dry Creek Unit is in the Northern Mixed Prairie. In the review by Holechek it was recommended that moderate use of 40-50% of plants of biomass from key forage plants could be utilized and on a sustained basis. I will be bit conservative in setting the initial stocking rate a apply a proper use factor of 40%

*** What Proper Use Factor would you apply to your management unit? **40 %***

*** Average production available forage in normal year = **(1,062,240 - 212,425) * .4 = 339,926 total pounds***

- *1,062,240 pounds total production*
- *212,425 to account for area not accessible because it is too far from water*
- *4 for 40% proper use factors*

4th → Determine Grazing Season

One way to set a grazing season is to consider an expected annual growth curve for the major plants or plant communities on your management unit. If your management unit has well described ecological site descriptions, you can use Web Soil Survey to find a growth curve for plant communities on your management unit.

1. Click on the "Soil Data Explorer" tab. Click on "Ecological Site Assessment" tab.

Rangeland Plan Assignment 3 – Grazing Resources

2. Click on the major ecological sites on your management unit in menu on left side. Then, click on major plant community and display a "Plant Growth Curve" like this:

Tables — Western Wheatgrass/Kentucky Bluegrass/Big Bluestem Plant Community

Plant Growth Curve

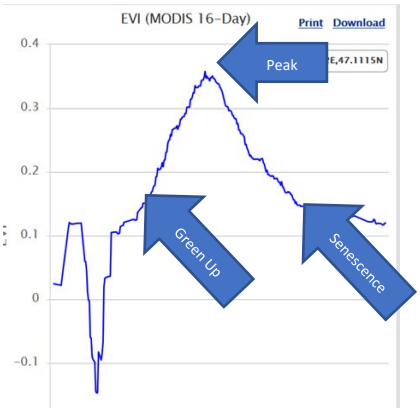
Growth Curve Name
Missouri Slope, Native Grasslands, Cool-season Dominant

Growth Curve Description
Cool-season, mid-grass dominant

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0%	0%	3%	8%	24%	45%	10%	3%	5%	2%	0%	0%

Another way to ascertain the growth curve of the plant community on your management unit is with remote sensing data.

1. Visit the Climate Engine created by researchers at the University of Idaho at: http://app.climateengine.org/.
2. Click "**Make Graph**" on left menu. Move the marker on the map to the location of your management unit.
   - Select the following:
     - Native Time Series
     - One Variable analysis
   - Under Variable 1 select:
     - Type = Remote Sensing
     - Dataset = MODIS Terra/Aqua 16-Day
     - Variable = EVI (Enhanced Vegetation Index)
     - Computer Resolution (Scale): = 500 m
   - Under Time Period select:
     - Custom Data Range
     - Start 01-Jan through 31-Dec of 5 years.
     - Choose any 5 years you like between 2000 and 2017.
     - Click "Get Time Series"
   - For each year try to determine the following:
     - Time of "Green Up" – Look for a date when there is a rapid increase in EVI.
     - Peak Season – Look for a date when EVI is at maximum peak
     - Start of senescence – Look for a date when EVI starts to level out
   - Note: This is more of an art than a science. Try to think conceptually to suggest a date for: Green-up, Peak Greenness, Senescence.



Describe a reasonable grazing season for your management unit based on the season during which green forage occurs on your site and consider climate data described in the Range Plan 1 assignment

I obtained a growth curve from the Ecological Site Description in Web Soil Survey. The growth of plants on the management unit begins March-April and plants become dormant by September. Most growth occurs between May and July with peak biomass occurring in June (Fig. 1).

Growth Curve Description
Cool-season/warm-season dominant

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0%	0%	2%	6%	21%	40%	20%	6%	4%	1%	0%	0%

Figure 1. Seasonal Growth Description of biomass on Native Grasslands (cool-season dominant) on the Missouri Slope rejoin of western North Dakota (Soil Survey Staff 2017).

Rangeland Plan Assignment 3 – Grazing Resources

This growth curve is confirmed by climate data used displayed in Report 2 (Fig 2.0) where average minimum temperature is near freezing April and returns to near freezing temperatures in October. Therefore, I assume the major growing season is between April and October.

To determine, average date of peak biomass, I also consulting the University of Idaho Climate Engine (http://app.climateengine.org/), I examined 5 years between 2002 and 2017 and recorded peak Enhanced Vegetation Index (EVI). The average date of peak EVI was June 14, confirming that June is the month of maximum biomass accumulation as indicated by the growth curve on Web Soil Survey.

*** During what months is your management unit generally able to be grazed? May to November or perhaps December in years without too much snow*

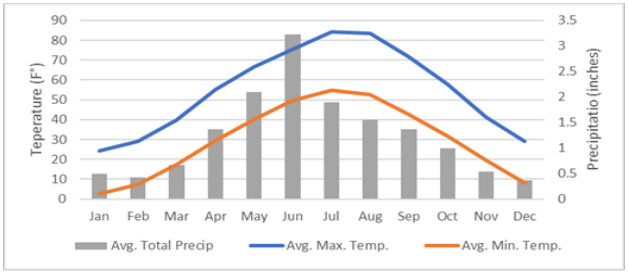


Figure 2. Temperature and precipitation patterns for Golden Valley County, North Dakota from the Western Regional Climate Center 2017

Based on your management objectives and proposed grazing method, when and for how long would you propose to graze this management unit?

***Describe season and number of days of grazing you propose:*

Suggested grazing period from May through November. The vegetation appears to be growing quickly and accumulating by at least mid-May. Grazing could continue through November till snow depth become prohibitive. At minimum a grazing period from mid-May until mid-November, 210 days, should be possible in most years.

5th → Stocking Rate. Number of animals or animal units your management unit can support in a year.

1) Consider pounds of available forage calculated in the 3rd step. = *339,926 pounds*

2) Then, consider the amount of forage each animal you selected will eat per day. (You made this calculation in the Range Plan 2 assignment.) = *A black baldy cows averaging 950 pounds would eat about 24 pounds per day.*

3) You also know how many days you expect to graze your heard/flock each year from the 4th step *= 210 days*

4) Finally, determine the number of animals you could stock in a normal year.

   Demand = 21 lbs/cow *× 210 days = 4,410 lbs/cow/season*

   Supply = 339,926 lbs or 453 AUMs (i.e., 339,926 lbs of supply ÷ 750 lbs/AUM =453 AUMs)

   Therefore 339,926 lbs supply /4,410 demand pe cow = 77 cows. At some point, make sure to consider bulls. About 3 bulls will be needed. (i.e., 25 cows/bull)

** How many animals can your land support in a year? 77 Cows

Rangeland Plan Assignment 3 – Grazing Resources

1,326 acres/453 AUMs = 3 acres/AUM (actually 2.93, but rounded up to 3 acres)

Or, 72 cows weighing 950 lbs = 68.4 AU * 7 months = 478.8 AUM

Plus 3 bulls weighing 1,250 lbs = 3.75 AU * 7 months = 26.26

578.8 AUM cows + 26.26 AUM Bulls = 505 AUM

** Stocking rate = 1,326/505 = 2.6 Acres/AUM

Complete the Answer Form for this assignment (i.e., RP3-Grazing Resources(2019)-AnswerForm).

Submit the Answer From through Bb-Learn.