West Virginia

Grassland Suitability Groups

Statewide Counties

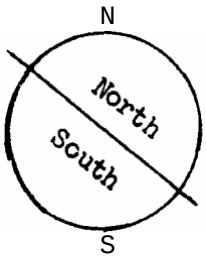
NRCS Natural Resources Conservation Service

GRASSLAND SUITABILITY GROUPS (GSG)

Definition - A GSG is a grouping of soils with similar capabilities for growing adapted herbaceous species and which will show a similar response to management, i.e., it is the "soil capability unit" for Grassland.

Soil mapping units were grouped according to their common soil property criteria (see GSG grouping key in the Appendix) into the following primary groups: Acid Hills, Acid Loams, Dry Hills, Droughty Shales, Dry Uplands, Fertile Hills, Fertile Loams, Limy Hills, Limy Uplands, Moist Hills, Moist Loams, Not Suited, Very Rocky Acid Soils, Very Rocky Limy Soils, Sands, Shale Hills, and Wetlands.

Where aspect can be identified on slopes over 8%, groupings can be further divided into "North" (N) or "South" (S) during the field resource inventory visit. Designation of (N) or (S) should be made on the basis of the following diagram:



Soil mapping units occurring in each GSG are listed in this section. Reclassification of the listings will occur as adequate data is obtained from soil-site correlation and field experience. New primary or secondary groupings may be added as practical or desirable in the future according to field experience and needs.

This section includes:

- Definition of Climate Precipitation Zones.
- Brief Grassland Suitability Group descriptions.
- Detailed GSG descriptions.
- Alphabetical listing of all soil mapping units and their respective GSG grouping.

GSG’s for individual counties may be found on the Soil Data Mart.

CLIMATE

30-40" Precipitation Zone*

Normal precipitation ranges from 35" to 38" in most of the zone, primarily in the form of rain. Isolated areas may receive as little as 28", such as near Rig in Hardy County and Upper Tract in Pendleton County. Growing season rainfall is approximately l8", with October being the driest month. Thunderstorm rainfall may be highly erratic in location and amount, especially during July and August. Stress periods of low rainfall during the growing season are common. Season long droughts can be expected about once every ten years. Mean annual snowfall varies from 20 to 40 inches. Snow cover, one inch or more, occurs 30-45 days per year. Approximate mean maximum and minimum July temperatures are 86 and 60 degrees. Temperature extremes of 112°F to -25°F have been recorded. Elevations range from 240 to 4,860 feet. Average frost free period is 150-175 days.

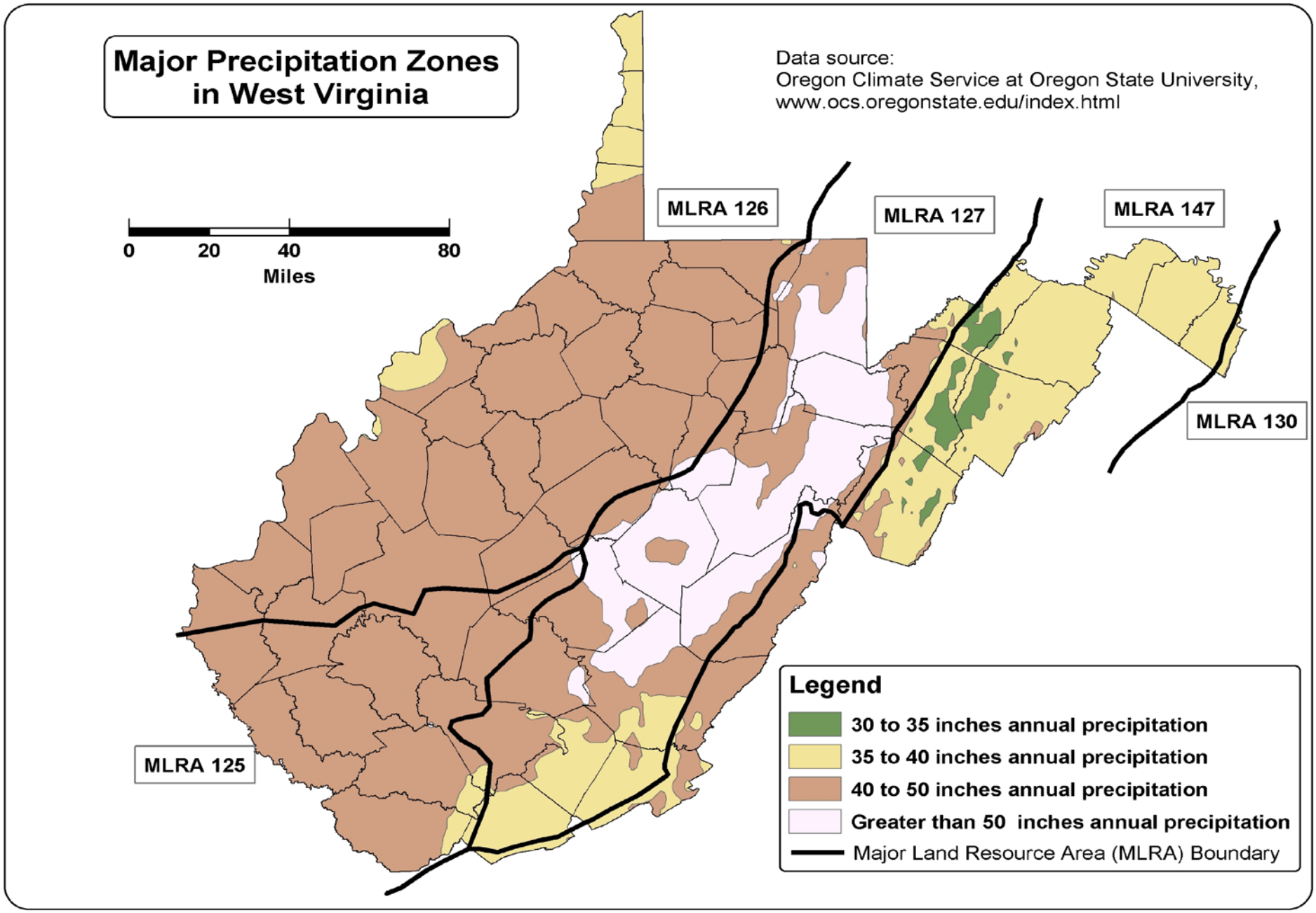
* - The 30-35″ and the 35-40″ zones differ only in production yields of forages.

40-50" Precipitation Zone

Precipitation averages about 42" to 45", primarily in the form of rain. May through September rainfall totals approximately 20". Distribution during the growing season is fairly even with the low occurring during October. Drought periods causing excessive growth stress are infrequent during the growing seasons. Seasonal droughts can be expected about once every ten years. Mean annual snowfall varies from 20-40" in the south, to 50-80" in the north. Snow cover, one inch or more, occurs on 25-45 days per year. Average frost free period is from 150 days in the north to 200 days south of Kanawha River. Mean maximum and minimum January temperatures are 47 and 25 degrees. Temperature extremes that have been recorded are 102°F to -25°F in the northern half of the zone, and 104°F to -10°F in the southern half. Mean maximum and minimum July temperatures are 88°F and 62°F. Elevation varies from 1,000 to 3,000 with the mean about 1500 feet.

50" Precipitation Zone

Normal precipitation ranges from 52-56" in most of the zone. This zone occurs in mountainous areas of the state at elevations above 2,500 to 3,000 feet. The major limiting factor is length of growing season which averages 90-130 days. The last killing frost in the spring is about May 20, the first in the fall is about September 30. Growing season rainfall is 24" or more, evenly distributed. Droughty periods during the growing season are infrequent and normally don't last long. Mean annual snowfall varies from 60 to 100" with some areas receiving from 120-160". Snow cover, one inch or more, occurs over 60 days a year. Mean maximum and minimum January temperatures are 43°F and 21°F. Mean July maximum and minimum temperatures are 8l°F and 55°F. Winter lows commonly go -10°F to -15°F below zero, with -25°F to -30°F to be expected on a 25-year frequency.


Major Precipitation Zones in West Virginia
Data source:
Oregon Climate Service at Oregon State University,
www.ocs.oregonstate.edu/index.html
0
20
40
80
Miles
MLRA 125
MLRA 126
MLRA 127
MLRA 147
MLRA 130
Legend
30 to 35 inches annual precipitation
35 to 40 inches annual precipitation
40 to 50 inches annual precipitation
Greater than 50 inches annual precipitation
Major Land Resource Area (MLRA) Boundary

BRIEF GRASSLAND SUITABILITY GROUP DESCRIPTION
LEGEND FOR PERMANENT GRASSLANDS

Grassland Suitability Groups (GSG) are groupings of soils which have similar capabilities for growing adapted herbaceous plants and which will show a similar response to management. These groupings, when combined with climate and aspect, reflect the productive potential and provide a guide to conservation and management needs when permanent grassland is the land use objective. Groupings are listed in the order which indicates their relative productive potential. Aspect affects plant adaptation and the time of the year when growth occurs. The cooler, moister north aspect is usually more productive than the warmer, drier south aspect. Descriptions of the GSG's and the precipitation zone are given below.

	1	2	3	4
PRECIPITATION ZONE:	30-35"	35-40"	40-50"	Over 50"

WV GRASSLAND SUITABILITY GROUPS FOR PERMANENT GRASSLANDS

AH1 - Acid Hills - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 30 to 35 inches.

AH2 - Acid Hills - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 36 to 40 inches.

AH3 - Acid Hills - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 40 to 50 inches.

AH4 - Acid Hills - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is greater than 50 inches.

AL1 - Acid Loams - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 30 to 35 inches.

AL2 - Acid Loams - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 36 to 40 inches.

AL3 - Acid Loams - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 40 to 50 inches.

AL4 - Acid Loams - moderately deep, deep, and very deep moderately well and well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is greater than 50 inches.

DH1 - Dry Hills - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is 30 to 35 inches.

DH2 - Dry Hills - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is 36 to 40 inches.

DH3 - Dry Hills - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is 40 to 50 inches.

DH4 - Dry Hills - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is over 50 inches.

DU1 - Dry Uplands - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is 30 to 35 inches.

DU2 - Dry Uplands - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is 36 to 40 inches.

DU3 - Dry Uplands - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is 40 to 50 inches.

DU4 - Dry Uplands - moderately deep, well drained soils with low natural fertility. Low moisture holding capacity with pH less than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is over 50 inches.

FH1 - Fertile Hills - moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 30 to 35 inches.

FH2 - Fertile Hills - moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 36 to 40 inches.

FH3 - Fertile Hills - moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 40 to 50 inches.

FH4 - Fertile Hills - moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is greater than 50 inches.

FL1 - Fertile Loams - Moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 30 to 35 inches.

FL2 - Fertile Loams - Moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 36 to 40 inches.

FL3 - Fertile Loams - Moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 40 to 50 inches.

FL4 - Fertile Loams - Moderately deep, deep, and very deep moderately well and well drained soils with moderate natural fertility. Moderate soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is greater than 50 inches.

LH1 - Limy Hills - moderately deep, well drained soils with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is 30 to 35 inches.

LH2 - Limy Hills - moderately deep, well drained soils with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is 36 to 40 inches.

LH3 - Limy Hills - moderately deep, well drained soils with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is 40 to 50 inches.

LH4 - Limy Hills - moderately deep, well drained soils with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 45 percent, or 15 to 35 percent if severely eroded. Annual precipitation is over 50 inches.

LU1 - Limy Uplands - moderately deep, well drained soils, with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is 30 to 35 inches.

LU2 - Limy Uplands - moderately deep, well drained soils, with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is 36 to 40 inches.

LU3 - Limy Uplands - moderately deep, well drained soils, with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is 40 to 50 inches.

LU4 - Limy Uplands - moderately deep, well drained soils with moderate to high natural fertility. Low to moderate moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent, or 0 to 15 percent if severely eroded. Annual precipitation is over 50 inches.

MH1 - Moist Hills - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 30 to 35 inches.

MH2 - Moist Hills - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 36 to 40 inches.

MH3 - Moist Hills - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is 40 to 50 inches.

MH4 - Moist Hills - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 25 to 60 percent or 25 to 45 percent if severely eroded. Annual precipitation is greater than 50 inches.

ML1 - Moist Loams - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 30 to 35 inches.

ML2 - Moist Loams - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 36 to 40 inches.

ML3 - Moist Loams - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is 40 to 50 inches.

ML4 - Moist Loams - Deep and very deep, well drained soils with high natural fertility. High soil moisture holding capacity with pH greater than 5.3. Slope ranges from 0 to 25 percent. Annual precipitation is greater than 50 inches.

NS - Not Suited - All other soils that have a combination of soil properties and climate limitations that make them not suited for forage production because adequate growth for forage use plus soil stabilization is normally not possible.

RA1 - Very Rocky Acid Soils - moderately deep, deep, and very deep well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH below 5.3. Slope ranges from 0 to 25 percent. Surface stones range from 0.1 to 50%. Annual precipitation is 30 to 35 inches.

RA2 - Very Rocky Acid Soils - moderately deep, deep, and very deep well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH below 5.3. Slope ranges from 0 to 25 percent. Surface stones range from 0.1 to 50%. Annual precipitation is 36 to 40 inches.

RA3 - Very Rocky Acid Soils - moderately deep, deep, and very deep well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH below 5.3. Slope ranges from 0 to 25 percent. Surface stones range from 0.1 to 50%. Annual precipitation is 40 to 50 inches.

RA4 - Very Rocky Acid Soils - moderately deep, deep, and very deep well drained soils with low natural fertility. Moderate to high soil moisture holding capacity with pH below 5.3. Slope ranges from 0 to 25 percent. Surface stones range from 0.1 to 50%. Annual precipitation is greater than 50 inches.

RL1 - Very Rocky Limy Soils - moderately deep, deep, and very deep well drained soils with high natural fertility. Moderate to high soil moisture holding capacity with pH above 5.3. Slope ranges from 25 to 45 percent. Surface stones range from 0.1 to 50%. Annual precipitation is 30 to 35 inches.

RL2 - Very Rocky Limy Soils - moderately deep, deep, and very deep well drained soils with high natural fertility. Moderate to high soil moisture holding capacity with pH above 5.3. Slope ranges from 25 to 45 percent. Surface stones range from 0.1 to 50%. Annual precipitation is 36 to 40 inches.

RL3 - Very Rocky Limy Soils - moderately deep, deep, and very deep well drained soils with high natural fertility. Moderate to high soil moisture holding capacity with pH above 5.3. Slope ranges from 25 to 45 percent. Surface stones range from 0.1 to 50%. Annual precipitation is 40 to 50 inches.

RL4 - Very Rocky Limy Soils - moderately deep, deep, and very deep well drained soils with high natural fertility. Moderate to high soil moisture holding capacity with pH above 5.3. Slope ranges from 25 to 45 percent. Surface stones range from 0.1 to 50%. Annual precipitation is greater than 50 inches.

SA1 - Sands - deep and very deep, excessively drained soils with low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 0 to 40 percent. Annual precipitation is 30 to 35 inches.

SA2 - Sands - deep and very deep, excessively drained soils with low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 0 to 40 percent. Annual precipitation is 36 to 40 inches.

SA3 - Sands - deep and very deep, excessively drained soils with low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 0 to 40 percent. Annual precipitation is 40 to 50 inches.

SA4 - Sands - deep and very deep, excessively drained soils with low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 0 to 40 percent. Annual precipitation is over 50 inches.

SD1 - Droughty Shales - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slope ranges from 0 to 15 percent, or 0 to 8 percent if severely eroded. Annual precipitation is 30 to 35 inches.

SD2 - Droughty Shales - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slope ranges from 0 to 15 percent, or 0 to 8 percent if severely eroded. Annual precipitation is 36 to 40 inches.

SD3 - Droughty Shales - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slope ranges from 0 to 15 percent, or 0 to 8 percent if severely eroded. Annual precipitation is 40 to 50 inches.

SD4 - Droughty Shales - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slope ranges from 0 to 15 percent, or 0 to 8 percent if severely eroded. Annual precipitation is over 50 inches.

SH1 - Shale Hills - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 15 to 35 percent slopes, or 8 to 25 percent if severely eroded. Annual precipitation is 30 to 35 inches.

SH2 - Shale Hills - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 15 to 35 percent slopes, or 8 to 25 percent if severely eroded. Annual precipitation is 36 to 40 inches.

SH3 - Shale Hills - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 15 to 35 percent slopes, or 8 to 25 percent if severely eroded. Annual precipitation is 40 to 50 inches.

SH4 - Shale Hills - shallow, well drained soils with very low natural fertility. Very low moisture holding capacity with pH below 5.3. Slopes range from 15 to 35 percent slopes, or 8 to 25 percent if severely eroded. Annual precipitation is over 50 inches.

W1 - Wetlands - very deep, poorly and very poorly drained soils with low to moderate natural fertility. High soil moisture holding capacity with pH ranging between 4.0 and 6.0. Annual precipitation is 30 to 35 inches.

W2 - Wetlands - very deep, poorly and very poorly drained soils low to moderate natural fertility. High soil moisture holding capacity with pH ranging between 4.0 and 6.0. Annual precipitation is 36 to 40 inches.

W3 - Wetlands - very deep, poorly and very poorly drained soils low to moderate natural fertility. High soil moisture holding capacity with pH ranging between 4.0 to 6.0. Annual precipitation is 40 to 50 inches.

W4 - Wetlands - very deep, poorly and very poorly drained soils low to moderate natural fertility. High soil moisture holding capacity with pH ranging between 4.0 to 6.0. Annual precipitation is greater than 50 inches.

ACID HILLS (AH)

RELATIVE GRASSLAND POTENTIAL: Fair

MAJOR PROBLEM: Soil stabilization, steep slopes, uniform use, soil treatment.

Soil Description

Well, moderately well, or artificially drained; 3.1 to 4.9 inch available moisture holding capacity within the effective rooting depth or up to 30" depth; average effective rooting depth exceeds 20"; average pH in the second horizon is lower than 5.3; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; low natural fertility; none to occasional flooding hazard. Steeper slope phases, 25-60%, or 25-45% if severely eroded are in this group.

Soil Series Characterizing This Group

Albrights	Allegheny	Berks	Blairton
Clymer	Dekalb	Ernest	Elliber
Gilpin	Laidig	Latham	Lily
Matewan	Muskingum	Pineville	Shelocta
Wharton	Zoar		

Climate - See precipitation zone descriptions

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	5480	6090	7035	6825
	TYPICAL	Medium	2455	2730	3465	3465
	POOR	Low	660	735	945	1050
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1890	2100	2520	2625
	TYPICAL	Natural	850	945	1260	1365
	POOR	Natural	380	420	735	945

Climatic fluctuations, primarily rainfall, have a significant effect on this group of soils causing annual yield variations up to 175% in the lower precipitation zones.

65-75% vegetative ground cover is typical when in Native Pasture.

Management

Minimum management required for soil stabilization and plant maintenance is higher than for Moist Hills or Fertile Hills because the situation is more critical. Adequate compensation in all practices should be planned.

(PTP) - Slope compounds the problem of PTP species. The soil pH needs to be raised before PTP species can be introduced and maintained. The steep slopes make liming questionable from both a physical and cost standpoint. In some situations the application of the recommended amount of phosphate plus a little extra to offset the phosphate tie up in the soil due to pH levels lower than 5.5 might be feasible, but in general if you can't get lime on, managing as PTP is questionable.

(ACID HILLS)

(NP) - Native species are as well adapted as on Fertile Hills. Palatability and quality will be slightly lower. This can be corrected by raising the phosphate level to medium. The economics of this may be questionable, though. Excellent condition native pasture should be the most economical use of this GSG where it is impractical to apply lime. Brush Control and Proper Pasture Management are required. Planned Grazing Systems are necessary to achieve proper grazing use.

ACID LOAMS (AL)

RELATIVE GRASSLAND POTENTIAL - Good

MAJOR PROBLEMS; Acid, less fertile soils

Soils Description

Well, moderately well, or artificially drained; 3.1 to 4.9 inch available moisture holding capacity within the effective rooting depth or up to 30" depth; average effective rooting depth exceeds 20"; average pH in the second horizon is lower than 5.3; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; low natural fertility; none to occasional flooding hazard. 0-25% slope.

Soil Series Characterizing This Group

Albrights	Allegheny	Basher	Berks
Blackthorn	Blairton	Buchanan	Captina
Calvin	Chavies	Clymer	Cookport
Cotaco	Craigsville	Dekalb	Downsville
Elliber	Ernest	Fenwick	Gilpin
Hustontown	Latham	Laidig	Lily
Lodi	Macove	Mandy	Meckesville
Mertz	Monongahela	Murrill	Muskingum
Pecktonville	Philo	Pineville	Pope
Potomac	Rayne	Shelocta	Shouns
Tilsit	Tygart	Wellston	Wharton
Zoar			

Climate - See precipitation zone descriptions

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	6050	6720	7875	7560
	TYPICAL	Medium	3115	3465	4305	4305
	POOR	Low	945	1050	1365	1680
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	2080	2310	2835	2940
	TYPICAL	Natural	1135	1260	1470	1680
	POOR	Natural	660	735	1050	1260

60-80% vegetative cover is typical when in Native Pasture.

Management

Soils in this group differ from those in Fertile Loams in that they are lower in natural pH and fertility. More consideration must be given maintenance of adequate cover for soil stabilization, especially under lower levels of management.

(PTP) - It takes more lime and fertilizer to get yields comparable to Fertile Loams even though maximum potential is only slightly less. Thus producing PTP here can be significantly more costly. Once soil treatment is initiated and the species requiring this higher level of fertility and pH become established, a perpetuating lime and fertilizer maintenance schedule must be adhered to.

(ACID LOAMS)

(NP) - Same as Fertile Hills. In addition, proper grazing use becomes more critical as the plants are already under more stress due to site conditions. A higher degree of management efficiency is required to maintain adequate cover for conservation. Brush Control and Proper Pasture Management are required.

DRY HILLS (DH)

RELATIVE GRASSLAND POTENTIAL: Poor

MAJOR PROBLEMS: Soil erosion, low production, cost of production, over stocking, accessibility, maintaining permanent stand, steep slopes, droughtiness, soil treatment, etc.

Soils Description

Well, moderately well, or artificially drained; 2-3 inch available moisture holding capacity within the effective rooting depth or up to 30" depth; average effective rooting depth varies from 15-30"; average pH in the second horizon is lower than 5.3; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; low natural fertility; no flooding hazard; slope 25-45%, or 15-35% if severely eroded.

Soil Series Characterizing This Group

Berks	Calvin	Dekalb	Elliber
Lehew	Litz	Rushtown	Weikert

Climate - See precipitation zone description.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	3780	4200	5250	5355
	TYPICAL	Medium	1510	1680	2415	3045
	POOR	Low	285	315	945	945
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1225	1365	1785	1890
	TYPICAL	Natural	565	630	840	1045
	POOR	Natural	135	150	315	630

55-70% vegetative ground cover is typical when in Native Pasture.

Management

All items mentioned in Dry Uplands become approximately twice as critical due to the increase in slope. Dry soil conditions are aggravated by loss of moisture due to increased runoff. Soils in this group must be managed very carefully from a conservation standpoint in either PTP or NP.

(PTP) - See Dry Uplands also. Higher cost is magnified due to lower production return per unit of input, making economics questionable. High levels of fertility are not considered desirable due to the extreme stress already placed on plants by the critical nature of the site. Erratic climate conditions are magnified by poor site conditions. Proper Pasture Management is extremely important and requires extra effort and ability to achieve.

(NP) - Native species are capable of maintaining adequate cover for soil stabilization and providing some grazing if they are allowed to naturally reseed (deferred grazing) once every four years. Production is very susceptible to climatic fluctuations, but to a lesser degree than PTP. All items mentioned in Dry Uplands apply, but become more binding. A grazing system which assures no more than 50% use of the total annual growth is required.

DRY UPLANDS (DU)

RELATIVE GRASSLAND POTENTIAL: Fair

MAJOR PROBLEMS: Dry, low productivity, maintaining cover

Soils Description

Well, moderately well, or artificially drained; 2-3 inch available moisture holding capacity within the effective rooting depth or up to 30" depth; average effective rooting depth varies from 15-30"; average pH in the second horizon is lower than 5.3; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; low natural fertility; no flooding hazard; slope 0-25%, or 0-15% if severely eroded.

Soil Series Characterizing This Group

Berks	Calvin	Clearbrook	Dekalb
Elliber	Lehew	Litz	Mandy
Rushtown	Weikert		

Climate - See precipitation zone description.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. Yields may vary up to 200% from year to year in this group. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	5010	5565	6510	6300
	TYPICAL	Medium	2365	2625	3465	3990
	POOR	Low	660	735	1050	1365
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1700	1890	2205	2205
	TYPICAL	Natural	850	945	1260	1470
	POOR	Natural	380	420	630	945

60-75% vegetative ground cover is typical when in Native Pasture.

Management

Productive capacity is seriously restricted due to the low moisture holding capacity of these soils. It is approximately 1/2 of that of Moist Loams. Therefore, amount, intensity and timing of rainfall during the growing season becomes very important. If rainfall is adequate and dependable, as in the "over 50" precipitation zone, relatively good production can be expected. In other precipitation zones, conservation and management requirements are higher. Average soil depth varies from 10-20 inches. Well adapted species are limited. Resulting yields are reduced proportionately. Costs per unit of production go up. Seasonal production reliability is only fair.

(DRY UPLANDS)

(PTP) - Where lime and fertilizer can be applied, PTP species can be maintained. Special emphasis should be given to identifying and correctly using north and south exposures in a system. Selection of the best adapted species for the site is important. Timing and amount of fertilization and grazing management alternatives are limited, but become more critical. It takes "more of everything", to maintain a healthy vigorous sod. High levels of fertility may not be desirable due to the plants limited response capacity, and may cause undue stress on the plants. For example, high fertility levels can cause overgrazed plants to die rather than go dormant during a drought.

(NP) - Native species are well adapted and can maintain adequate cover for soil stabilization but production is lower than for Acid Loams due to the more droughty soils. Palatability and quality will definitely be lower, but can be improved by the addition of phosphate and/or lime. Cost and return of application needs to be evaluated closely to determine if the economics is desirable. Careful control of grazing use is required to avoid abuse as pasture condition can deteriorate rapidly when overgrazed. This site is susceptible to climatic and managerial fluctuations. Therefore, management expertise needs to be better than average. Improved, more intensive management and conservation practices are required.

FERTILE HILLS (FH)

RELATIVE GRASSLAND POTENTIAL: Good

MAJOR PROBLEMS: Steep slopes, stabilization, uniform grazing use.

Soils Description

Well, moderately well, or artificially drained; 3.1" to 4.9" of available moisture holding capacity in the rooting zone or up to 30" of depth; average rooting depth over 30" except for a few fragipan soils with a restricting layer at 26-28 inches; average pH in the second horizon 5.3 or higher; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; medium natural fertility; none to occasional flooding hazard. Slope - 25-60%, or 25-45% if severely eroded.

Soil Series Characterizing This Group

Barbour	Beech	Clarksburg
Dormont	Guernsey	Murill
Sciotoville	Peabody	Pickaway
Upshur	Vandalia	Westmoreland
Wheeling		

Climate - See precipitation zone descriptions.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yields per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	5670	6300	7350	6930
	TYPICAL	Medium	2640	2940	3675	3675
	POOR	Low	850	945	1050	1260
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	2175	2415	2625	2730
	TYPICAL	Natural	945	1050	1365	1470
	POOR	Natural	660	735	945	1050

Climatic fluctuations, primarily rainfall, have a limited effect on this group of soils, but may still cause annual yield variations up to 140% in the lower precipitation zones.

70-85% vegetative ground cover is typical when in Native Pasture.

Management

Because of the moisture holding capacity of these soils being lower, slope becomes more critical.

(PTP) - Potential productivity is harder and more expensive to achieve and management demands for maintenance and production are higher than for Moist Hills.

Upshur soils, due to their clayey texture, can become a critical erosion problem due to animal trampling, overgrazing, or other factors which may cause a loss of adequate cover. Special attention should be given to time of use, and Proper Pasture Management. The Corydon and Chilhowie soils are slightly droughtier than the other soils in this group. Compensating emphasis should be given to management of these soils where they are the primary soil type in a field.

(FERTILE HILLS)

(NP) - Productive more palatable species very well adapted. Limitations on use of conventional equipment for PTP management make the use of native species more acceptable. Minimum management requirements are Brush Control and Proper Pasture Management. Planned grazing systems are normally necessary to achieve proper pasture management.

FERTILE LOAMS (FL)

RELATIVE GRASSLAND POTENTIAL: Very Good

MAJOR PROBLEMS: Topography

Soils Description

Well, moderately well, or artificially drained; 3.1" to 4.9" of available moisture holding capacity in the rooting zone or up to 30" of depth; average rooting depth over 30" except for a few fragipan soils with a restricting layer at 26-28 inches; average pH in the second horizon 5.3 or higher; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; medium natural fertility; none to occasional flooding hazard. Slope - 0-25%.

Soil Series Characterizing This Group

Barbour	Beech	Captina	Chavies
Clarksburg	Conotton	Coolville	Dormont
Gallia	Glenford	Grigsby	Guernsey
Lawrence	Licking	Markland	Middlebury
Murrill	Omulga	Otwell	Peabody
Pickaway	Ryder	Sciotoville	Shircliff
Shouns	Skidmore	Tarhollow	Tioga
Upshur	Vandalia	Vincent	Westmoreland
Wheeling	Woodsfield		

Climate - See precipitation zone descriptions.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yields per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	6235	6930	8085	7665
	TYPICAL	Medium	3305	3675	4515	4620
	POOR	Low	1135	1260	1575	1785
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	2265	2520	2940	3045
	TYPICAL	Natural	1320	1470	1680	1785
	POOR	Natural	945	1050	1365	1575

Climatic fluctuations, primarily rainfall, have a limited effect on this group of soils, but may still cause annual yield variations up to 125% in the lower precipitation zones.

75-90% vegetative ground cover is typical when in Native Pasture.

Management

The main factor reducing productive potential is a moisture holding capacity approximately 25% less than Moist Loams. Thus reliability and maximum yields are reduced accordingly. This limitation does not seem to be very significant in the “over 50” precipitation zone. A few of the soils have a fragipan at 22 -28”, thus slightly reducing the potential of some deeper rooted species such as alfalfa. These soils are designated with a (FP) immediately behind the series in the soils listing by GSG.

(FERTILE LOAMS)

(PTP) – Conservation and management requirements are the same as for Moist Loams. Because of the lower inherent productive capacity, cost of production will be slightly higher at the higher levels of production, I.e., returns may not be as good. Normally, these soils will support adequate herbaceous vegetation for acceptable soil stabilization without soil treatment.

Exceptions can occur on fields where poor or excessive cropping, and the resulting erosion, has seriously depleted the natural fertility.
(NP) – Productive more palatable species very well adapted and production from natural fertility only is relatively good. Minimum management requirements are Brush Control and Proper Pasture Management.

LIMY HILLS (LH)

RELATIVE GRASSLAND POTENTIAL: Fair

MAJOR PROBLEMS: Slope and limited moisture holding capacity.

Soils Description

Except for the slope limits, the soil characteristics of this site are the same as those described for Limy Uplands. Well or moderately well drained; 2-3" of available moisture holding capacity in the rooting zone or up to 30" of depth; average rooting depth range 16-35 inches; average pH in the second horizon higher than 5.3;' silt loams, silty clay, and clay surface texture; surface permeability; .2-2.0 inches per hour; 0-.1% surface stones; medium natural fertility; no flooding hazard; slope 25-45% or 15-35% if severely eroded.

Soil Series Characterizing This Group

Brooke	Calvin	Caneyville	Carbo
Cateache	Chilhowie	Culleoka	Edom
Fairpoint	Janelew	Opequon	Teas

Climate - See precipitation zone description.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	3970	4410	5460	5565
	TYPICAL	Medium	1605	1785	2730	3255
	POOR	Low	470	525	840	1155
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1415	1575	2100	2200
	TYPICAL	Natural	765	840	1050	1260
	POOR	Natural	380	420	525	840

65-80% vegetative ground cover is typical when in Native Pasture.

Management

All items mentioned in Limy Uplands become more critical or demanding due to the increased slope factor. Erosion hazard increases due to runoff and overgrazing. Use of conventional equipment is limited.

(PTP) - This soil is still very productive in the higher rainfall zones where extra moisture can overcome the limited moisture holding capacity. More dependable production can be expected from deeper rooted species. Adequate cover must be left on the ground to compensate for the increased runoff potential.

(NP) - Native species are all very well adapted to this site. Production is limited due to moisture. Brush Control and Proper Pasture Management are required. Planned grazing systems will usually be required to achieve proper grazing use.

LIMY UPLANDS (LU)

RELATIVE GRASSLAND POTENTIAL: Good

MAJOR PROBLEMS: Limited available moisture holding capacity.

Soils Description:

Well or moderately well drained; 2-3" of available moisture holding capacity in the rooting zone or up to 30" of depth; average rooting depth range 16-35 inches; average pH in the second horizon higher than 5.3;' silt loams, silty clay, and clay surface texture; surface permeability; .2-2.0 inches per hour; 0-.1% surface stones; medium natural fertility; no flooding hazard; slope 0-25% or 0-15% if severely eroded.

Soil Series Characterizing This Group

Brooke	Calvin	Caneyville	Carbo
Cateache	Chilhowie	Culleoka	Edom
Faywood	Opequon	Summers	Teas
Lowell			

Climate - See precipitation zone description.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	5195	5775	6720	6510
	TYPICAL	Medium	2455	2730	3780	4200
	POOR	Low	850	945	1260	1680
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1890	2100	2520	2415
	TYPICAL	Natural	1135	1260	1470	1680
	POOR	Natural	660	735	945	1260

70-85% vegetative ground cover is typical when in Native Pasture.

Management

The factor making these soils less productive and more apt to have conservation and management problems than Fertile Loams is the approximately 50% lower available moisture holding capacity. Maintaining adequate cover for soil stabilization becomes more critical and requires a higher degree of effort to achieve.

(PTP) - Conservation and management requirements are essentially the same as for Fertile Loams, but due to the lower productivity potential will not respond as efficiently. Harvesting frequency will need to be reduced, as the ability to recover, especially during the drier growing period, is limited. Requirements for plant maintenance increases. Due to droughtier conditions, the deeper root grass species are more desirable than the shallow rooted species such as Kentucky Bluegrass.

(NP) - The productive more palatable species are still very well adapted. Production at natural fertility levels is relatively good, approaching yields equal to Fertile Loams in the higher rainfall zones. Brush Control and Proper Pasture Management are required.

MOIST HILLS (MH)

RELATIVE GRASSLAND POTENTIAL: Very Good

MAJOR PROBLEMS: Stabilizing and using steep slopes

Description

Well, moderately well or artificially drained; available moisture holding capacity, in the upper 30 inches of soil, 5" or greater; average pH in the second horizon 5.3 or better; clay loam, silty clay loam, silt loam, loam, fine sandy loam or sandy loam surface texture; average rooting depth 30" or more; surface permeability .2-6.3 inches per hour; 0-.1% surface stones. Slope – 25-60%, 25-45% if severely eroded.

Soil Series Characterizing This Group

Belmont	Brookside
Hagerstown	Duffield
Frankstown	Frederick

Climate – See precipitation zone descriptions.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yields per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	6800	7560	7840	7980
	TYPICAL	Medium	2930	3255	3885	3990
	POOR	Low	945	1050	1260	1365
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	2270	2520	2940	3045
	TYPICAL	Natural	1135	1260	1470	1680
	POOR	Natural	850	945	1050	1260

Climatic fluctuations, primarily rainfall, have a limited effect on this group of soils, but may still cause annual yield variations up to 135% in the lower precipitation zones.

85-95% vegetative ground cover is typical when in Native Pasture.

Management

Slope is the primary limiting factor.

(PTP) - Response to PTP management is very good. More intensive conservation practices such as strip seeding, mulch seeding, and sod seeding must be used during reseeding operations where conventional seeding is possible. Proper grazing management becomes more important, i.e., slightly more growth needs to be left on the surface for proper water conservation and optimum plant growth. Uniform use requires more fencing and water development efforts. Exposure affects special adaptation and time (season) of growth, and thus use.

Use of conventional equipment becomes increasingly less practical. To achieve high levels of management, aerial spraying, aerial fertilization, hand labor, specialized ground equipment, and other non-conventional techniques must be used.

Inputs required to achieve high levels of management and production increases. When these inputs, such a labor, time materials, physical improvements and management go up, cost per unit of production goes up.

(MOIST HILLS)

(NP) – Productive, more palatable species very well adapted. Limitations on use of conventional equipment for PTP management make the use of native species more acceptable. Minimum management requirements are Brush Control and Proper Pasture Management.

MOIST LOAMS (ML)

RELATIVE GRASSLAND POTENTIAL: Excellent

MAJOR PROBLEMS: Possible Flooding Soils

Description

Well, moderately well or artificially drained; available moisture holding capacity, in the upper 30 inches of soil, 5" or greater; average pH in the second horizon 5.3 or better; clay loam, silty clay loam, silt loam, loam, fine sandy loam or sandy loam surface texture; average rooting depth 30" or more; surface permeability .2-6.3 inches per hour; 0-.1% surface stones. Slope - 0-25%.

Soil Series Characterizing This Group

Ashton	Belmont	Benevola	Brookside
Chagrin	Combs	Duffield	Duncannon
Dunmore	Elk	Frankstown	Frederick
Funkstown	Gallipolis	Hackers	Hagerstown
Huntington	Kanawha	Landes	Lappans
Lindside	Lobdell	Massanetta	Moshannon
Nelse	Nolin	Orrville	Senecaville
Sensabaugh	Swanpond		

Climate - See precipitation zone descriptions.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yields per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	7560	8400	9240	8925
	TYPICAL	Medium	3685	4095	4830	4835
	POOR	Low	1415	1575	1785	1995
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	2550	2835	3255	3360
	TYPICAL	Natural	1415	1575	1785	2100
	POOR	Natural	1135	1260	1575	1785

Climatic fluctuations, primarily rainfall, have the least effect on this group of soils but may still cause annual yield variations up to 125% in the lower precipitation zones.

85-100% vegetative ground cover is typical when in Native Pasture.

Management

Soils in this grouping have the greatest potential for maximum response to management and soil treatment. Use of this group is highly flexible, and is a very desirable asset to any operating unit. Use alternatives vary from native pasture with natural fertility to Bermuda grass pasture with 600 lbs. of nitrogen applied annually. All sites are tillable; thus intensive management practices such as reseeding to establish more productive species and liming and fertilizing to improve production can be carried out with conventional techniques and equipment. Secondary use of these areas for hay and grass silage is practical as a way to utilize excess forage and increases production efficiency. Recovery after proper grazing use is rapid and dependable. More "harvests" can be removed than on other GSG's, without jeopardizing the permanency or productivity of the stand. The number of harvests depends on the intensity of the grazing system.

(MOIST LOAMS)

Possible flooding hazard on soils located next to streams and rivers limits such practices as reseeding, haying, etc. If the vegetation on these areas is inundated for relatively long periods during the growing season, flood tolerant plants should be used.

(PTP) - This is the best group for the more productive and tall growing desirable grasses and legumes. To achieve the production capacity potential, management specifically for the species used and soil involved should be applied. General recommendations are too broad when striving for the ultimate.

(NP) - This GSG is seldom used for Native Pasture, although desirable native species will reach their most productive capacity on these soils. Brush Control and Proper Pasture Management are required. Warm season native species such as switchgrass may be managed as PTP specifically for summer grazing. Initial results indicate 6 tons of forage per acre with these species is possible.

NOT SUITED FOR PASTURE (NS)

These soils are not considered to be suitable for use as pasture or grazing land. The factors causing this classification may be any combination of the following: cost of production, cost of soil stabilization (conservation needs), cost of maintenance (brush control, lime, fertilizer), or accessibility. Any removal of foliage may create critical soil and/or water resource deterioration. The NS rating results when the circumstances require effort and cost which causes the growing of plants for forage to be unpractical or unfeasible under the current standards of living and economic situation. NS does not imply that these soils do not have the physical capacity of supporting herbaceous growth. In almost every case herbaceous growth can be adequately sustained with site and/or climatic modification, if funds and labor are not limiting.

VERY ROCKY, ACID SOILS (RA)

RELATIVE GRASSLAND POTENTIAL: Fair

MAJOR PROBLEMS: Too rocky or stony to till, acid, low fertility soils

Soils Description

This grouping of soils consists of the very stony, extremely stony, and rubbly phases of the same soils which occur in suitability group Acid Loams. Well, moderately well, or artificially drained; 3.1 to 4.9 inch available moisture holding capacity within the effective rooting depth or up to 30" depth; average effective rooting depth exceeds 20"; average pH in the second horizon is lower than 5.3; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; .1 to 50% surface stones; low natural fertility; none to occasional flooding hazard. Slopes may range from 0-60%, but most will occur in the 25-60% range.

Soil Characterizing This Group

Albrights	Beech	Bethesda	Berks
Blackthorn	Buchanan	Calvin	Cedarcreek
Cloverlick	Clymer	Cookport	Dekalb
Edgemont	Elliber	Ernest	Faywood
Fenwick	Gilpin	Hazleton	Highsplint
Jefferson	Kaymine	Laidig	Latham
Leatherbark	Leetonia	Lehew	Lily
Macove	Mandy	Matewan	Meckesville
Mertz	Muskingum	Oriskany	Pineville
Rayne	Sewell	Shelocta	Shouns
Schaffenaker	Sideling	Udorthents	Wharton

Climate - See precipitation zone description.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	4905	5455	7030	6715
	TYPICAL	Medium	2080	2310	3045	3360
	POOR	Low	660	735	1050	1050
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1600	1780	2095	2200
	TYPICAL	Natural	660	735	945	1260
	POOR	Natural	375	420	630	630

55-65% vegetative ground cover is typical when in Native Pasture.

Management

The management requirements of this group are the same as those discussed for Acid Loams and Acid Hills. Because of the accessibility problems due to slope and rocky conditions, use of conventional equipment is almost entirely eliminated. Selected areas may be accessible, but have to be evaluated by careful on-site inspection.

(VERY ROCKY, ACID SOILS)

(PTP) – Due to equipment limitations and more acid conditions, PTP is generally considered marginal. Cost of developing and maintaining this type of pasture is high, making economics a key concern. A management hazard is treating only small accessible spots, with stocking based on the total boundary size. This normally leads to heavy overgrazing and subsequent soil erosion on the treated areas. Cover suitable for soil stabilization is much harder to maintain than for Very Rocky Limy Soils. Using this GSG for PTP requires sound, careful management.

(NP) – Native species will maintain adequate cover for soil stabilization, but production is less that for Very Rocky Limy Soils. Brush Control and Proper Pasture Management are necessary, and hard to achieve. Planned grazing systems are usually necessary. Because costs of production are limited to fencing, water development and brush control, these soils can be more economical in native pasture than in permanent tame pasture.

VERY ROCKY, LIMY SOILS (RL)

RELATIVE GRASSLAND POTENTIAL: Good

MAJOR PROBLEMS: Too rocky or stony to till

Soils Description

This grouping of soils consists of the very stony, extremely stony, or rubbly phases of the same soils which occur in suitability group Fertile Loams. Slopes may range from 0 to 60%, but most will occur in the 25 to 60% range. The soils are well, moderately well, or artificially drained; 3.1" to 4.9" of available moisture holding capacity in the rooting zone or up to 30" of depth; average rooting depth over 30" except for a few fragipan soils with a restricting layer at 26-28 inches; average pH in the second horizon 5.3 or higher; Fine earth surface texture of clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam; surface permeability .2-6.3 inches per hour; .1 to 50% surface stones; medium natural fertility; none to occasional flooding hazard.

Soils Characterizing This Group

Belmont	Benevola	Calvin	Caneyville
Cateache	Chilhowie	Clarksburg	Clifton
Corydon	Duffield	Dunmore	Elliber
Fairpoint	Faywood	Fiveblock	Frankstown
Frederick	Hagerstown	Kaymine	Murrill
Meckesville	Myra	Opequon	Ryder
Udorthents	Upshur	Vandalia	

Climate - See precipitation zone description.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	5195	5775	7350	7035
	TYPICAL	Medium	2265	2520	3360	3675
	POOR	Low	850	945	1260	1260
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1885	2095	2310	2415
	TYPICAL	Natural	945	1050	1365	1575
	POOR	Natural	565	630	945	945

50-60% vegetative cover is typical. Bare rock may occupy 20-35% when in Native Pasture.

Management

The management of this GSG is the same as discussed for Fertile Loams and Fertile Hills except that use of conventional equipment is normally completely eliminated. Selected areas may not have this limitation but has to be determined by careful on-site evaluation of each site.

(PTP) - These soils will respond to aerial fertilization and will support a satisfactory stand of Kentucky bluegrass and white clover if adequate P205 is applied. Application should allow 40-50 lbs. of P_2O_5 to be available annually. Once fertilization is started, it must be perpetuated. Brush control and uniform grazing distribution are the two primary management problems. Lack of suitable water development sites compounds distribution problems. Field size and planned grazing system designs are often dictated by water availability. A rotation type grazing system is usually the only practical way of achieving proper grazing use.

(VERY ROCKY, LIMY SOILS)

(NP) - Because of limited accessibility, this soil should have special consideration for use as Native Pasture. The "desirable" native species should be introduced as rapidly as possible to realize the full productive potential of these soils - without soil treatment. Brush Control and Proper Pasture Management are required. Planned grazing systems are normally necessary to achieve proper pasture management.

SANDS (Sa)

RELATIVE GRASSLAND POTENTIAL: Poor (Good if irrigated)

MAJOR PROBLEMS: Excessive drainage, coarse textured soil

Soils Description

Excessively drained; 1.5-2.0 inches of available moisture holding capacity in the upper 30" of soil; average pH of the second horizon, 5.0-5.5; loamy fine sand, loamy sand, or sand surface texture; average rooting depth over 30"; surface permeability in excess of 6.3-inches per hour; 0-.1% surface stones; low natural fertility; none to occasional flooding frequency; Slope - 0-25%.

Soil Series Characterizing This Group

Craigsville	Lakin	Pope	Potomac
Psamments	Leetonia	Yeager	Barbour

Climate - See precipitation zone descriptions.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	4065	4515	5250	5250
	TYPICAL	Medium	1510	1680	2100	2415
	POOR	Low	565	630	945	1365
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	1605	1785	2310	2520
	TYPICAL	Natural	660	735	945	1365
	POOR	Natural	375	420	630	735

50-65% vegetative ground cover is typical when in Native Pasture.

Management

The soils in this GSG are very droughty due to coarse soil texture, lack of organic matter content, and excessive drainage. Production is very unstable and unreliable. Only deep rooting, drought tolerant species should be used. Grassland potential can be raised to good with an adequate irrigation system.

(PTP) and (NP) - All management practices should recognize the limitations caused by excessive droughtiness and adjust accordingly, i.e., leave more residue, best for spring and fall use, good winter feeding area due to drainage and manure builds organic matter.

DROUGHTY SHALES (SD)

RELATIVE GRASSLAND POTENTIAL: Poor

MAJOR PROBLEMS: Droughty conditions, soil erosion, low erratic production, high cost of production, excessive overgrazing, maintenance of stands

Soils Description

Well or moderately well drained; less than 2 inch available moisture holding capacity within the effective rooting zone; average effective rooting depth is normally less than 15 inches; average pH in-the second horizon is less than 5.3; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; class 0-.1% surface stones; low natural fertility; no flooding hazard; Slope 0-15% or 0-8% if severely eroded.

Soil Series Characterizing This Group

Berks	Klinesville	Litz
Rushtown	Weikert	

Climate - See precipitation zone descriptions.

Productivity Index – A Productivity Index for Droughty Shales is not given

Management

These soils have next to the poorest potential of any soils considered suitable for pasture. They are normally shallow, very droughty and/or severely eroded. The moisture holding capacity is very low, approximately-1/4 that of Moist Loams. Many acres are in pasture though, because of the large acres of land accessible to conventional equipment.

Maintenance of adequate cover for soil stabilization is very critical and difficult. "Desert" type management might best explain the "frame of mind" needed to properly manage these soils. The degree of grazing use must be restricted in order to maintain the larger accumulation of mulch (litter, etc.) needed to insulate the soil. Without this mulch, high temperature, excessive runoff, high evaporation rates all compound the inherent droughtiness of these sites. Shallow soils limit plant adaptation. Climatic extremes in temperature and rainfall have a far greater impact on this group than any other. Winter kill, frost heaving, drought death loss, etc., are common.

(PTP) - It is very doubtful that this group should be used for PTP except in a few special situations. Selecting species which can persist under these extreme stress conditions is more important than selecting species for yield. Production must be considered a by-product or secondary objective. High levels of fertility are not desirable unless supplemental water is available. Due to the erratic yields year to year, annual economics may or may not be desirable. Over the long run, economics may be at the breakeven point. Generally, the low intensity approach is most desirable.

(NP) - Native plants are capable of maintaining adequate cover for stabilization. Limited utilization is possible under a good grazing system. Quality and palatability can be improved with the addition of phosphate. Other points mentioned in NP section of Dry Uplands apply here also, but are considerably more critical and demanding.

SHALE HILLS (SH)

RELATIVE GRASSLAND POTENTIAL: Marginal

MAJOR PROBLEMS: Droughty conditions, soil erosion, low erratic production, high cost of production, excessive overgrazing, maintenance of stands

Soils Description

Except for slope limits, the characteristics of this site are the same as for Droughty Shales. Well or moderately well drained; less than 2 inch available moisture holding capacity within the effective rooting zone; average effective rooting depth is normally less than 15 inches; average pH in-the second horizon is less than 5.3; clay loam, silty clay loam, silt loam, loam, fine sandy loam, or sandy loam surface texture; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; low natural fertility; no flooding hazard; Slope 15-35% or 8-25% if severely eroded.

Soil Series Characterizing This Group

Berks	Klinesville	Litz
Rushtown	Weikert	

Climate - See precipitation zone descriptions.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	2835	3150	4200	4200
	TYPICAL	Medium	755	840	1575	2415
	POOR	Low	110	125	315	630
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	945	1050	1365	1470
	TYPICAL	Natural	475	525	630	735
	POOR	Natural	65	75	105	420

40-60% vegetative ground cover is typical when in Native Pasture.

Management

All items covered in Dry Hills and Droughty Shales apply here also, but are more critical. This group is the most undesirable for grassland as far as soil and moisture are concerned. Only top management can maintain these areas in pasture without conservation problems. This group is almost unsuitable for grassland in the lower precipitation zones, while in the high rainfall areas, the problem of low available water capacity is reduced.

Although more productive in higher rainfall areas, the relative potential of this GSG to others in the same rainfall zone still applies. Most of the statements below are directed towards the less than 50" precipitation zone.

(SHALE HILLS)

Although adequate cover for soil conservation is possible, adequate yields for conservation and livestock use are not always possible. This will vary year by year, and season by season. Those using this group for either PTP or NP pasture should not count on an economical return. As in any GSG, this varies farm by farm depending on how these areas are integrated into the total management system. Also, in special cases, it may be desirable to use areas where there is no economic return because less money is lost by grazing these areas than any other available alternative such as feeding or selling part of the breeding herd. The primary management objective must be conservation.

(PTP) - Not considered desirable due to high cost of production and inconsistency of production. A grazing system which maintains a residue on the soil surface adequate for soil stabilization is a must. Low vigor, weak, unproductive short-lived stands and frequent reseeding is common. Loss of cover and resulting soil erosion are continuous conservation problems. Maintenance of desirable PTP species requires extremely careful fertility, pH, and grazing management. Amount of herbaceous growth that can be harvested for forage is limited due to plant requirements for growth and maintenance. A rotational grazing system should be used and grazing must not exceed 50% of the total annual growth.

(NP) - Even with adapted native species, production is limited. A rotational grazing system should be used and grazing must not exceed 50% of the total annual growth. NP is also very susceptible to drought fluctuations although less affected than PTP. Natural reseeding (deferred grazing) must occur every 3 to 4 years in order to maintain a satisfactory stand.

WETLANDS (W)

RELATIVE GRASSLAND POTENTIAL: Good

MAJOR PROBLEMS: Poor drainage

Soils Descriptions

Very poorly, poorly and the poorer end of somewhat poorly drained; 3.4-6.0 inches of available water holding capacity in the upper 30" of soil, average pH of the second horizon ranges from 4.0 to 6.0, a few may be above; clay loam, silty clay loam, silt loam, loam, fine/sandy loam, or sandy loam surface texture; average rooting depth 20"-or more; surface permeability .2-6.3 inches per hour; 0-.1% surface stones; moderate natural fertility; occasional to frequent flooding. Slope may range from 0-25% but are normally 0-3%.

Soil Series Characterizing This Group

Andover	Armagh	Atkins	Blago
Brinkerton	Captina	Cavode	Dunning
Elkins	Fairplay	Fluvaquents	Ginat
Guyan	Holly	Lickdale	McGary
Melvin	Nolo	Orrville	Purdy
Robertsville	Sees	Taggart	Toms
Trussel	Tygart	Tyler	Wyatt

Climate - See precipitation zone descriptions.

Productivity Index - Total Pounds Air Dry Weight Per Acre

Production varies due to pasture condition, fertility level and precipitation zone. The following total forage yield per acre can be expected in normal years:

Kind	Level of Operation	Level of Fertility	Precipitation Zone 30-35	35-40	40-50	50+
Permanent Tame Pasture-(PTP)	EXCELLENT	High	5860	6510	6300	6090
	TYPICAL	Medium	2740	3045	2940	2730
	POOR	Low	1225	1365	1680	1575
Native (Wildgrass) Pasture-(NP)	EXCELLENT	Improved	2550	2835	3150	3045
	TYPICAL	Natural	1225	1365	1575	1575
	POOR	Natural	945	1050	1365	1365

90-100% vegetative cover is typical when in Native Pasture.

Management

Excessive wetness is the primary limiting factor that causes these soils to be grouped together. Consider this site a special use area. Adapted species, time of use, and cultural treatment is definitely restricted. Pastures on these soils are slow to greenup in the spring. Excessive water can be an asset if sites are used for summer pasture, especially in the 30-40" precipitation zone.

(PTP) - Reed canarygrass is the species best suited. Tall fescue does well, but the disorder "fescue foot" is strongly associated with fescue on wetlands. Responds to all levels of management but maximum potential is reduced because of wetness.

(NP) - Very few of these areas are managed as native pasture because they are the more inaccessible areas. Natural fertility is adequate to support a good stand. Raising the phosphate level to medium will improve quality, palatability and production. Brush Control and Proper Pasture Management are required.