Guide for Placing Soils in Capability Classes in Montana
2/2006

United States Department of Agriculture
Natural Resources Conservation Service
Bozeman, Montana

When used as a key and switching of next lower class, soil must satisfy all criteria for that class.

Capability Class	Depth Inches	Surface Soil Texture (0 to 7")	Subsoil Permeability (below 7")	Max. Slope	Max. Erosion Hazard (Wind & Water)	Min. AWC[7] Inches (Surf. Ft / Per. Ft. To 60")		Drainage Class	Maximum Overflow (flooding)		Frost Free Days 32° F	Minimum PE Index (Dry)	Salinity (E.C.)			Sodicity -- SAR				
																0-7"[4]				7-30"[5]
																<35% Clay		>35% Clay		
								Water Table (inches)	Fall, Winter & Spring (thru June)	Summer						EC < 4	EC > 4	EC < 4	EC > 4	
	IRR & NIRR	IRR & NIRR	IRR & NONIRR	IRR & NIRR		IRR	NIRR						IRR	NONIRR 0-16"	16-30"					
I	≥40	COSL, SL, FSL, VFSL, L, SIL, SI, SCL, CL, and SICL	Mod. slow to mod. rapid	2	None or Slight	1.5	1.5	W & MW	Rare	None	≥140	44	<4	<4		<4	na	<4	na	<13
						7.5	7.5							<4						
II	≥40	COSL, SL, FSL, VFSL, L, SIL, SI, SCL, CL, SICL; May be GR surface texture, organic	Mod. slow to mod. rapid	4	Moderate	1.0	1.0	W to SP	Occas.	Rare	≥105	28[6]	<4	<4		<4	na	<4	na	<13
						5.0	5.0							<4						
III	≥20	COSL, SL, FSL, VFSL, L, SIL, SI, SCL, CL, SICL, SC, SIC, C; May be CB or GR surface texture[8]	Slow to rapid[3] (may be very slow below 20")	8	Moderate	0.75	1.0	SE to PD[3]	Freq.	Occas.	≥90*		<8[3]	<4		<4	<13	<4	<13	<20
						3.75	4.5							<8						
IV	≥20	COSL, SL, FSL, VFSL, L, SIL, SI, SCL, CL, SICL, SC, SIC, C; Also LFS and LVFS if IRR. May be CB or GRV surface texture May have 0.01to 3% of >10" fragments on or in surface layer	Very slow to very rapid[2]	15	High	0.6	0.75	SE[2] to PD[3]	Freq.	Occas.	≥70*		<16[2]	<4[1]	<8	<13	<20	<4	<13	<60
						2.5	3.75							<16	<8					
V	≥10	All textures	Very slow to very rapid	4	None or Slight			PD or VP[3]	Freq.	Freq.	Any		<8	<8		<4	<13	<4	<13	<20
														<8						
VI	≥10	All textures except Sand GRX, CBV surface texture 3% to 15% of 10" to 24" fragments on or in surface layer 0.01% to 15% of >24" fragments on or in surface layer	Very slow to very rapid	35[9]	NOTE: Severely eroded lands gullied or channeled are Class VI or VII	0.3	0.3	Any	Freq.	Freq.	Any		<20	<16		<20	<40	<20	<20	<100
						2.0	2.0							<16						
VII	Any	NONIRR. Any—dunes CBX, FLX surface texture > 15% of >10" fragments on or in surface layer	Very slow to very rapid	70			Any	Any	Freq.	Freq.	Any			Any		Any	Any	Any	Any	Any
VIII	Miscellaneous land types such as rock outcrop, rubble land, riverwash, badlands, slickspots, etc.																			

Note: Factors not considered for a capability class are blocked out.

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Footnotes:

* Some soils placed in Capability Class VI are known to have produced various cultivated crops successfully. They are not, however, known to produce crops successfully on a dependable or consistently long term basis (at least seven out of ten years). The base reference crop is spring wheat.

1 If permeability is slow or very slow and EC values are between 16 and 30 inches are 8 to 16 mmhos, place in class VI.

2 Irrigated soils that are very slowly permeable with:

a. EC values of 8 to 16 mmhos, place in Class VI
b. EC values of >16 mmhos, place in Class VII

3 Irrigated soils that are slowly permeable and poorly drained with:

a. EC values of 4 to 8 mmhos within a depth of 30 inches, place in Class IV
b. EC values of >16 mmhos within a depth of 30 inches, place in Class VII

4 Reflects soil dispersion as it affects seedling emergence. Class limits for SARs were interpreted from the publication 'Water Quality for Agriculture" sponsored by the Food and Agriculture Organization of the United Nations – Rome, Italy, 1976. The class limits and reasoning for them are as follows:

a. Less than 4—effects of sodicity is none or minimal
b. From 4 to 13—effects of sodicity are visibly recognized by clay dispersion, surface crusting, and effects on plant growth and plant species
c. From 13 to 20—based on laboratory data on soils in Montana, the majority of them are placed in capability Class VI because response can be expected from mechanical treatment for range improvement
d. Greater than 13—can be determined in field by: Ethanol-Cresol red test; by use of Hach testing kit; or from laboratory data

5 Reflects sodium effects on plant production

6 For non-irrigated crops, need 80 percent probability of receiving 7 inches of moisture from April 1 to July 31. Refer to Bulletin 712, Precipitation Probabilities in Montana, Montana Agricultural Experiment Station

7 When AWC ranges significantly into two capability classes, the most limiting class is selected. Soils that have insufficient available water for growing dryland crops due to lack of timely precipitation may be placed in a land capability Class IV or VI.

8 If the texture of the surface 7 inches is more than 55 percent clay, go to Class IV

9 For shallow soils above 15 percent, go to Class VII

AWC = Available Water Capacity
EC = Electrical Conductivity
PE = Precipitation Effectivity
SAR = Sodium Adsorption Ratio

Flooding Frequency:
Rare = Floods less than once in 20 years
Occasional = Floods once in 2 to 20 years
Frequent = Floods at least once every 2 years

Additional References:
Ag Handbook No. 60, USDA
National Soils Handbook, SCS, USDA
Soil Survey Manual, Ch 4-5, SCS, USDA
Ag Handbook No. 210, SCS, USDA