

Exhibit 537-15 -- Conservation Tree/Shrub Suitability Groups (CTSG)

A Conservation Tree/Shrub Group (CTSG) is a physiographic unit or area having similar climatic and edaphic characteristics that control the selection and height growth of trees and shrubs. It consists mainly of two elements: 1) Major Land Resource Area, and 2) Soil Group.

- 1) The first part of a CTSG is the designated Major Land Resource Area or MLRA. This refines the list of woody plant species selection and adaptation to a specified geographic area with similarities in climate. MLRAs are defined in USDA Agricultural Handbook 296 (2006) re. <http://soils.usda.gov/survey/geography/mlra/index.html>. As needed, States will subdivide an MLRA where there are varying elevations (e.g., hardiness zones) and diverse ranges of average annual precipitation that influence species selection and performance.
- 2) The second part is the Soil Group. This part of the CTSG further refines the list of woody plants based on groupings of edaphic conditions. Rather than try to correlate plant data for each and every soil component, a component is evaluated against criteria and placed in a soil group. Woody plants are then correlated to a specific soil group within the identified MLRA (or subdivision thereof). The calculation of soil group uses criteria displayed in Exhibit 537-15. Local, custom criteria can be used to override the calculated soil group as well as recognize additional local soil groups if needed.

The correlation and display of adapted woody species, height performance, other attributes, and associated practices and measures using the CTSG system need to be clearly understood by clients. The performance of species is expressed as the expected height at a base age (usually 20 years in continental U.S. and Alaska and 10 years for tropical and subtropical areas). Other attributes may be correlated to each species such as longevity, wildlife value, and crown shape and spread. In addition to height performance and other attributes, the CTSG MLRA (or subdivision thereof) and soil group may be used to determine facilitating practices and measures that can enhance survival and growth of woody species for correlated soil components. For example, a soil component in *Soil Group 7 (sandy)* in an agricultural area in *MLRA B7* will likely have blowing sand that will damage new seedlings in a zone of low precipitation. Permanent irrigation (e.g., Irrigation System - Microirrigation, 441) and moisture-conserving “weed barrier” (e.g., Mulching, 484) in combination with small physical barriers on the windward side of planted seedlings (e.g., straw bales or snow-fence) could offer mitigating actions to insure better survival and establishment.

States are responsible for developing CTSG interpretations for MLRAs that occur wholly within their state. For MLRAs that cross state boundaries, the individual state with the greatest extent of the MLRA is responsible for developing CTSG interpretations but must coordinate with adjacent states having the MLRA. States will use the national CTSG soil group criteria (NASIS calculation) or, if needed, a modified version done by individual MLRA (requires coordination of all states with the MLRA). All states must develop subdivisions of an MLRA, as needed, to accommodate cold hardiness zones, precipitation zones, or other plant-influencing landscape-level conditions. In so far as possible, these subdivisions should align with established Land Resource Units. States make periodic reviews and updates to such displays so that information and data are current in section II of the eFOTG, Web Soil Survey, Soil Data Mart, and other documents as applicable. Although the CTSG designation is very helpful in conservation planning, it does not override the need for on-site evaluation for properly selecting trees and shrubs and estimating design heights and other planning requirements.

Part 537.4 - Exhibits

Exhibit 537-15 Conservation Tree/Shrub Group (CTSG) Criteria for Soil Groups (see notes/definitions at the end of the Exhibit)

NOTE: An "F" is added to CTSG soil groups 1-9 having a flooding status during the growing season of *very frequent* or *frequent* and *very brief* or *brief*, e.g. a 3a with flooding becomes a 3af. Soil components with a growing season flooding duration of *long* or *very long* are classified into a group 10 and require an on-site evaluation; exceptions are groups 2, 2a, 2k, and 2h which can have a *long* flooding duration during the growing season.

G R O U P	Soil Depth (cm)	Avail- able Water Capa- city (cm)	CaCO ₃ Equiv. (% 0-30cm) and [Sodium Adsorption Ratio, SAR]	pH (0-30cm)	Electric al Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Texture and Other Notes (AWC is a primary criterion with texture being an important supplemental criterion for some groups. Histosols are applicable only to groups 1h and 2h)	Typical Associated Family Taxomic Particle Size Class	Associated General Group Concept
1	≥100	≥22.5	≤5 [<13]	5.1-7.8	≤2	≥45, <120	--	Loamy	<i>Wet Favorable</i>
1a	≥100	≥22.5	≤5 [<13]	4.0-5.0	≤2		--	Loamy	<i>Wet Favorable - Acid</i>
1h	≥50	≥22.5	--	≤7.8	≤4		Histosol or texture-in-lieu-of is "peat", "muck", or "mucky peat"	(Histosols)	<i>Wet Favorable - Organic</i>
1k	≥100	≥22.5	>5, ≤15 [<13]	typically 7.9-8.4	≤4		--	Loamy	<i>Wet Favorable - Carbonates</i>
1s	≥100	15.2- 22.4	≤5 [<13]	5.1-7.8	≤2		--	Various	<i>Wet Favorable - Droughty</i>
1sa	≥100	15.2- 22.4	≤5 [<13]	4.0-5.0	≤2		--	Various	<i>Wet Favorable - Acid - Droughty</i>
1sk	≥100	15.2- 22.4	>5, ≤15 [<13]	typically 7.9-8.4	≤4		--	Various	<i>Wet Favorable - Carbonates - Droughty</i>
1ss	≥100	7.6-15.2	≤5 [<13]	5.1-7.8	≤2		--	Various	<i>Wet Favorable - Very Droughty</i>
1ssa	≥100	7.6-15.2	≤5 [<13]	4.0-5.0	≤2		--	Various	<i>Wet Favorable - Acid - Very Droughty</i>

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G R O U P	Soil Depth (cm)	Avail- able Water Capa- city (cm)	CaCO₃ Equiv. (% 0- 30cm) and [Sodium Adsorption Ratio, SAR]	pH (0-30cm)	Electric al Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Texture and Other Notes (AWC is a primary criterion with texture being an important supplemental criterion for some groups. Histosols are applicable only to groups 1h and 2h)	Typical Associated Family Taxomic Particle Size Class	Associated General Group Concept
2	≥100	≥7.6	≤5 [<13]	5.1-7.8	≤2	≥15, <45	--	All (except Histosols)	<i>Wet</i>
2a	≥100	≥7.6	≤5 [<13]	4.0-5.0	≤2		--	All (except Histosols)	<i>Wet - Acid</i>
2k	≥100	≥7.6	>5, ≤15 [<13]	typically 7.9-8.4	≤4		--	All (except Histosols)	<i>Wet - Carbonates</i>
2h	≥100	≥22.5	--	≤7.8	≤4		Histosol or texture-in-lieu-of is "peat", "muck", or "mucky peat"	(Histosols)	<i>Wet - Organic</i>
3	≥100	≥22.5	≤5 [<13]	5.1-7.8	≤2	≥120	Non-clayey 20-120 cm	Loamy	<i>Loamy</i>
3a	≥100	≥22.5	≤5 [<13]	4.0-5.0	≤2		Non-clayey 20-120 cm	Loamy	<i>Loamy - Acid</i>
4	≥50	≥17.0	≤5 [<13]	5.1-7.8	≤2	≥120	20-50 cm of Non-clayey over >35% Clay	20-50 cm of Non-clayey over >35% Clay	<i>Clayey Favorable</i>
4a	≥50	≥17.0	≤5 [<13]	4.0-5.0	≤2		20-50 cm of Non-clayey over >35% Clay	20-50 cm of Non-clayey over >35% Clay	<i>Clayey Favorable - Acid</i>
4sa	≥50	≥10.0	≤5 [<13]	4.0-5.0	≤2		20-50 cm of Non-clayey over >35% Clay	20-50 cm of Non-clayey over >35% Clay	<i>Clayey Favorable - Acid</i>
4k	≥50	≥17.0	>5, ≤15 [<13]	typically 7.9-8.4	≤4		20-50 cm of Non-clayey over >35% Clay	20-50 cm of Non-clayey over >35% Clay	<i>Clayey Favorable - Carbonates</i>
4c	≥50	≥15.2	≤5 [<13]	5.1-7.8	≤2	≥120	>35% clay; 0-20cm can be non-clayey	>35% clay; 0-20cm can be non-clayey	<i>Clayey</i>
4ca	≥50	≥15.2	≤5 [<13]	4.0-5.0	≤2		>35% clay; 0-20cm can be non-clayey	>35% clay; 0-20cm can be non-clayey	<i>Clayey - Acid</i>
4ck	≥50	≥15.2	>5, ≤15 [<13]	typically 7.9-8.4	≤4		>35% clay; 0-20cm can be non-clayey	>35% clay; 0-20cm can be non-clayey	<i>Clayey - Carbonates</i>

Part 537.4 - Exhibits

G R O U P	Soil Depth (cm)	Avail- able Water Capa- city (cm)	CaCO₃ Equiv. (% 0- 30cm) and [Sodium Adsorption Ratio, SAR]	pH (0-30cm)	Electric al Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Texture and Other Notes (AWC is a primary criterion with texture being an important supplemental criterion for some groups. Histosols are applicable only to groups 1h and 2h)	Typical Associated Family Taxomic Particle Size Class	Associated General Group Concept
5	≥100	15.2- 22.4	≤5 [<13]	5.1-7.8	≤2	≥120	Non-sandy	Loamy; loamy- skeletal	<i>Droughty</i>
5a	≥100	15.2- 22.4	≤5 [<13]	4.0-5.0	≤2		Non-sandy		<i>Droughty - Acid</i>
5k	≥100	15.2- 22.4	>5, ≤15 [<13]	typically 7.9-8.4	≤4		Non-sandy		<i>Droughty - Carbonates</i>
6	≥50	7.6-15.1	≤5 [<13]	5.1-7.8	≤2	≥120	Non-sandy surface	Loamy and loamy- skeletal over sands/gravels	<i>Very droughty</i>
6a	≥50	7.6-15.1	≤5 [<13]	4.0-5.0	≤2		Non-sandy surface		<i>Very Droughty - Acid</i>
6k	≥50	7.6-15.1	>5, ≤15 [<13]	typically 7.9-8.4	≤4		Non-sandy surface		<i>Very Droughty - Carbonates</i>
6d	50-100	≥15.2	≤5 [<13]	5.1-7.8	≤2		Non-sandy surface	Loamy/loamy- skeletal over impervious layer	<i>Droughty - Moderately deep</i>
6da	50-100	≥15.2	≤5 [<13]	4.0-5.0	≤2		Non-sandy surface		<i>Droughty - Moderately deep - Acid</i>
6dk	50-100	≥15.2	>5, ≤15 [<13]	typically 7.9-8.4	≤4		Non-sandy surface		<i>Droughty - Moderately deep - Carbonates</i>

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G R O U P	Soil Depth (cm)	Avail- able Water Capa- city (cm)	CaCO₃ Equiv. (% 0- 30cm) and [Sodium Adsorption Ratio, SAR]	pH (0-30cm)	Electric al Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Texture and Other Notes (AWC is a primary criterion with texture being an important supplemental criterion for some groups. Histosols are applicable only to groups 1h and 2h)	Typical Associated Family Taxomic Particle Size Class	Associated General Group Concept
7	≥50	≥7.6	≤5 [<13]	5.1-7.8	≤2	≥120	Sand surface	Sandy surface	<i>Sandy</i>
7k	≥50	≥7.6	>5, ≤15 [<13]	typically 7.9-8.4	≤4		Sand surface		<i>Sandy - Carbonates</i>
7a	≥50	≥7.6	≤5 [<13]	4.0-5.0	≤2		Sand surface		<i>Sandy - Acid</i>
7s	≥50	≥7.6	≤5 [<13]	5.1-7.8	≤2	≥120	Sand surface and sand below	Sandy throughout	<i>Sandy Throughout</i>
7sk	≥50	≥7.6	>5, ≤15 [<13]	typically 7.9-8.4	≤4		Sand surface and sand below		<i>Sandy Throughout - Carbonates</i>
7sa	≥50	≥7.6	≤5 [<13]	4.0-5.0	≤2		Sand surface and sand below		<i>Sandy Throughout - Acid</i>
8	≥100	≥22.5	>5, ≤15 [<13]	typically 7.9-8.4	≤4	≥120	Non-clayey 20-120 cm	Loamy	<i>Loamy - Carbonates</i>
9	≥50	≥7.6	[<25]	--	>4, ≤16	≥45	Saline and/or sodic	Various	<i>Dry - Saline/Alkaline</i>
			[≥13 - <25]	--	≤16				
9w	≥50	≥7.6	[<25]	--	>4, ≤16	<45	Saline and/or sodic	Various	<i>Wet - Saline/Alkaline</i>
			[≥13 - <25]	--	≤16				
10	<50	<7.6	>15 [≥25]	typically <4.0, >8.4	>16	<15	Any single criterion can classify a soil component into a group 10	Various	<i>On-site evaluation</i>

Exhibit 537-15 Notes/Definitions

Available Water Capacity—The total potential available water capacity of the soil to the first restriction. Total potential available water capacity is derived by multiplying the available water capacity of each horizon in the soil profile by the horizon thickness and summing the products.

CaCO₃ Equivalent—Percent of free lime is by weight per soil unit in the upper 30 centimeters. For automated interpretations using NASIS, the average representative CaCO₃ Equivalent value within 30cm of the soil surface is used.

Depth to Growing Season Water Table—Depth to a layer with a moisture status of "wet" during all or part of the growing season. See *Growing Season*.

Electrical Conductivity—The standard measure, in millimhos per centimeter, of salinity or amount of salts in a soil as determined by the electrolytic conductivity of an extract from saturated soil paste; <2 mmhos/cm indicates little or no salinity; <4 mmhos/cm indicates a very slightly saline soil; 4 to 8 mmhos/cm indicates slightly saline; and greater than 8 mmhos/cm indicates moderately to strongly saline soil. For automated interpretations using NASIS, the maximum representative EC value within 30cm of the soil surface are used.

Flooding— Flooding is expressed by (1) flooding frequency class, (2) flooding duration class, and (3) time of year that flooding occurs. *Frequent flooding* is likely to occur often under usual weather conditions; more than a 50 percent chance of flooding in any year or more than 50 times in 100 years, but less than a 50 percent chance of flooding in all months in any year. *Very Frequent Flooding* is likely to occur very often under usual weather conditions; more than a 50 percent chance of flooding in all months of any year. *Duration classes* are very brief (4 to 48 hours), brief (2 to 7 days), long (7 to 30 days), and very long (≥ 30 days). Inundation from flood water is assessed during growing season months.

Histosols—A soil component is determined to be a Histosol if its taxonomic order is Histosols or if it has a substitute term used in lieu of texture of muck, peat, or mucky peat.

pH—A numerical expression of the relative acidity or alkalinity of a soil sample. The most common laboratory method for measurement of pH is the 1:1 soil-to-water ratio method, however, the 0.01M calcium chloride method is commonly used to measure pH in Histosols. Values less than 4.5 indicate an ultra or extremely acid soil; 4.5 to 5.5 indicates very strongly to strongly acid; 5.6 to 7.8 indicates moderately acid to slightly alkaline; 7.9 to 8.4 indicates moderately alkaline; and greater than 8.4 indicates strongly or very strongly alkaline soil. For automated interpretations using NASIS, the minimum representative pH value within 30cm of the soil surface is used.

Root Restrictive Layer—A nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly reduce the movement of water and air through the soil or that otherwise provides an unfavorable root environment. For automated interpretations using NASIS, the possible restrictive properties are: abrupt textural change; bedrock (lithic and paralithic); densic material; duripan; fragipan; natric; ortstein; permafrost; petrocalcic; petroferric; petrogypsic; placic; plinthite; salic; strongly contrasting textural stratification; and sulfuric.

Sandy Horizon Texture—The horizon of a soil component is determined to be sandy if the texture class of the horizon is coarse sand (cos), sand (s), fine sand (fs), very fine sand (vfs), loamy coarse sand (lcos), loamy sand (ls), loamy fine sand (lfs), or loamy very fine sand (lvfs).

Sandy/Gravelly Horizon—The horizon of a soil component is determined to be sandy/gravelly if the percent passing the #10 sieve times the percent passing the #200 sieve divided by 100 is less than or equal to 15 percent.

Sodium Adsorption Ratio (SAR)—A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste, expressed as a percentage. For automated interpretations using NASIS, the maximum representative SAR value within 30cm of the soil surface is used.

Soil Depth—Depth to first restrictive layer measured from the top of the uppermost mineral horizon (or surface for Histosols) to the top of the restrictive layer.