

ISU
 CSR2 Equation & Component Values
 3-8-2015

Corn Suitability Rating 2 (CSR2) equation and component values

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 March 08, 2015

CSR2 is a corn suitability rating calculated using six parameters. The "perfect corn producing" soil gets a rating of 100. A soil having nearly no potential to grow corn receives a rating of 5. Most soils have ratings somewhere in between. CSR2 is calculated on a map unit (MU) basis using the maps and data of the Iowa Cooperative Soil Survey (ICSS). Since the ICSS includes several agencies with sometimes slightly different data there are two ways it can be calculated. The first is CSR2-ISU, which assumes a MU is the soil series listed in the MU name. The second is CSR2-NRCS, which uses an area-weighted average of a MU that takes into account both the dominant soil and inclusions of other soils. The amount and types of inclusions as well as all other information used in CSR2-NRCS is available in USDA-NRCS Web Soil Survey. For most soils CSR2-ISU and CSR2-NRCS have comparable values. Cases where the two values differ by more than one or two points are when the MU has a high percentage of inclusions, has incomplete or conflicting data in Web Soil Survey, is on C-slope, or formed in very clayey or sandy parent materials. CSR2-ISU considers C-slopes reduce corn productivity by 15 points relative to nearly level land. CSR2-NRCS considers the reduction to be 10 points.

CSR2 formula: $CSR2 = S-M-W-F-D \pm EJ$

CSR2 Equation

Where:

- S - is the taxonomic subgroup class of the series of the soil map unit (MU),
- M - is the family particle size class,
- W - relates to available water holding capacity of the series
- F - is the field condition of a particular MU, for example, slope, flooding, ponding, erosion class and topsoil thickness,
- D - is the soil depth and tolerable rate of soil erosion,
- EJ - is an expert judgment correction factor. EJ is normally used with parent materials that have very high bulk density and/or are unusually clayey or sandy.

Note: Unless specified otherwise in Table 1 to 5, the minimum CSR2 rating is 5. This means that even if the CSR2 formula for a MU results in a rating of less than 5 that rating is automatically readjusted to 5.

Table 1. **Map units (MU) with conditions that negate the use of the regular CSR2 formula.**

FORMULA OVERRIDES	
Condition:	Assigned MU CSR value:
Any component in an Urban Land Complex map unit	5
Component Name is "Gullied Land"	5
Component Name is "Urban Land"	5
Frequent long flooding	5
Frequent very long flooding	5
Very frequent flooding, any duration	5
Land Capability Class 5W	25
Miscellaneous Area	0

Table 2. S factors used in the CSR2 formula.

Taxonomic Subgroup:	S factor	Taxonomic Subgroup:	S factor	Taxonomic Subgroup:	S factor
Aeric Chromic Vertic Epiaqualfs	54	Fluventic Hapludolls	85	Typic Argiudolls	100
Aeric Endoaqualfs	88	Glossic Hapludalfs	86	Typic Calciaquolls	78
Aeric Fluvaquents	79	Lamellic Udipsamments	67	Typic Calcudolls	84
Aeric Vertic Epiaqualfs	54	Limnic Haplosaprists	72	Typic Endoaqualfs	66
Aquents	50	Lithic Endoaquolls	45	Typic Endoaquents	70
Aquertic Argiudolls	83	Lithic Hapludalfs	42	Typic Endoaquolls	94
Aquertic Chromic Hapludalfs	79	Lithic Hapludolls	42	Typic Eutrudepts	78
Aquertic Hapludalfs	79	Lithic Haplustolls	48	Typic Fluvaquents	80
Aquertic Hapludolls	92	Mollic Endoaqualfs	85	Typic Haplohemists	64
Aquertic Udifluvents	84	Mollic Epiaqualfs	80	Typic Haplosaprists	64
Aquic Argiudolls	85	Mollic Fluvaquents	83	Typic Hapludalfs	89
Aquic Cumulic Hapludolls	93	Mollic Hapludalfs	95	Typic Hapludolls	100
Aquic Hapludolls	100	Mollic Oxyaquic Hapludalfs	90	Typic Natraquents	52
Aquic Pachic Argiudolls	96	Mollic Udifluvents	88	Typic Paleudalfs	86
Aquic Pachic Hapludolls	98	Oxyaquic Argiudolls	100	Typic Quartzipsamments	58
Aquic Udifluvents	98	Oxyaquic Dystrudepts	42	Typic Udifluvents	95
Aquic Udipsamments	60	Oxyaquic Eutrudepts	42	Typic Udipsamments	58
Aquic Udorthents	84	Oxyaquic Hapludalfs	85	Typic Udorthents	72
Aquollic Hapludalfs	90	Oxyaquic Hapludolls	100	Udertic Haplustolls	80
Aquolls	50	Oxyaquic Haplustolls	81	Udic Haplustolls	80
Argiaquic Argialbolls	80	Oxyaquic Udifluvents	88	Udic Ustorthents	74
Chromic Vertic Albaqualfs	74	Oxyaquic Vertic Argiudolls	97	Udifluvents	50
Cumulic Endoaquolls	84	Oxyaquic Vertic Hapludalfs	79	Udollic Endoaqualfs	90
Cumulic Hapludolls	99	Pachic Argiudolls	100	Vertic Albaqualfs	80
Cumulic Vertic Endoaquolls	79	Pachic Hapludolls	100	Vertic Argialbolls	80
Cumulic Vertic Epiaquolls	81	Pachic Haplustolls	78	Vertic Argiaquolls	90
Dystric Eutrudepts	97	Psammentic Hapludalfs	67	Vertic Endoaquepts	78
Entic Hapludolls	90	Terric Haplosaprists	87	Vertic Endoaquolls	75
Fluvaquentic Endoaquolls	83	Thapto-Histic Fluvaquents	85	Vertic Epiaqualfs	81
Fluvaquentic Hapludolls	85	Typic Albaqualfs	87	Vertic Epiaquolls	79
Fluvaquentic Vertic Endoaquolls	93	Typic Argialbolls	77	Vertic Fluvaquents	67
Fluvaquents	50	Typic Argiaquolls	82		

Table 3. M, W, and F factors used in the CSR2 formula.

Family Particle Size Class	M factor
coprogenous	0
fine-silty	0
fine-silty over clayey	0
organic	0
clayey	4
clayey over loamy	4
fine	4
fine-loamy	4
fine-loamy over clayey	4
very-fine	4
fine-loamy over sandy	4
coarse-loamy	12
coarse-loamy over clayey	12
coarse-silty	12
coarse-silty over clayey	12
loamy	12
mesic	35
mixed	35
sandy	35
sandy over clayey	35
sandy over loamy	35
sandy-skeletal	35
all other classes containing *skeletal*	12
calcareous	5**

** calcareous deductions are added on to any other M factor.

FLOODING FREQUENCY AND DURATION FOR THE MONTH OF MAY	
Flooding conditions:	F factor - flood
flooding frequency is none, rare or NULL, or flooding duration is NULL	0
frequent brief	20
frequent very brief	10
occasional brief	6
occasional very brief	4
occasional long	10
frequent extremely brief	5
occasional very long	34
occasional extremely brief	2

frequent long OR frequent very long
No deduction, Automatic component CSR2 of 5

Slope values:	F factor - slope
slope is NULL	0
slope RV < 2	0
slope RV < 5	5
slope RV < 9	15
slope RV ≥ 9	3 * slope RV

Other F factor Conditions:	F factor - local
Component Local phase is *channeled*	40
Component erosion class is "2" - moderately eroded	3

AWC CALCULATED TO 60 INCHES, ROUNDED TO TWO DECIMAL PLACES.	
Available Water Capacity (AWC, inches of water)	W factor
No AWC populated	99
AWC < 3.01	24
AWC < 6.00	12
AWC < 9.00	8
AWC ≥ 9.00	0

PONDING FREQUENCY AND DURATION FOR THE MONTH OF MAY	
Ponding conditions:	F factor - pond
Frequency is none or NULL	0
frequent brief	20
frequent very brief	20
occasional brief	20
occasional very brief	20
frequent long	44
frequent very long	44
occasional long	44
occasional very long	44

Table 4. D values used in CSR2.

RUSLE T values *	D factor
Any Histosols	0
T factor 5	0
T factor 4	10
T factor 3	20
T factor 2	30
T factor 1	40

* T values provided by NRCS, September 2014

Table 5a. EJ factors that reduce CSR2 values.

Paleosol Deductions	
Series	EJ Deduction
Adair	10
Armstrong	10
Ashgrove	10
Bucknell	10
Cerlin	15
Clarinda	15
Clearfield	20
Donnan	20
Galland	15
Keswick	10
Lagonda	5
Lamoni	10
Lineville	20
Malvern	20
Mystic	15
Northboro	15
Rinda	15

Dense Till Deductions	
Series	EJ Deduction
Cresco	5
Cresken	5
Protivin	5
Jameston	5
Lourdes	5
Riceville	5

Sandy Deductions	
Series	EJ Deduction
Farrar	15
Olin	10

"Old" clay loam till Deduction	
Series	EJ Deduction
Shelby	5
Gara	5
Lindley	5

Clayey Loess Deductions	
Series	EJ Deduction
Appanoose	15
Kniffin	15
Seymour	10
Rathbun	15

Table 5b. EJ factors that increase CSR2 value.

Series or Map unit symbol	EJ Addition
Macksburg	15
Mahaska	15
Kalona	10
Rowley	10
All components in map units 221B	10
Waukee	10