Corn Suitability Rating 2 (CSR2) equation and component values

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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 ± EJ

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
Aeric Chromic Vertic Epiaqualfs	54
Aeric Endoaqualfs	88
Aeric Fluvaquents	79
Aeric Vertic Epiaqualfs	54
Aquents	50
Aquertic Argiudolls	83
Aquertic Chromic Hapludalfs	79
Aquertic Hapludalfs	79
Aquertic Hapludolls	92
Aquertic Udifluvents	84
Aquic Argiudolls	85
Aquic Cumulic Hapludolls	93
Aquic Hapludolls	100
Aquic Pachic Argiudolls	96
Aquic Pachic Hapludolls	98
Aquic Udifluvents	98
Aquic Udipsamments	60
Aquic Udorthents	84
Aquollic Hapludalfs	90
Aquolls	50
Argiaquic Argialbolls	80
Chromic Vertic Albaqualfs	74
Cumulic Endoaquolls	84
Cumulic Hapludolls	99
Cumulic Vertic Endoaquolls	79
Cumulic Vertic Epiaquolls	81
Dystric Eutrudepts	97
Entic Hapludolls	90
Fluvaquentic Endoaquolls	83
Fluvaquentic Hapludolls	85
Fluvaquentic Vertic Endoaquolls	93
Fluvaquents	50

Taxonomic Subgroup:	S factor
Fluventic Hapludolls	85
Glossic Hapludalfs	86
Lamellic Udipsamments	67
Limnic Haplosaprists	72
Lithic Endoaquolls	45
Lithic Hapludalfs	42
Lithic Hapludolls	42
Lithic Haplustolls	48
Mollic Endoaqualfs	85
Mollic Epiaqualfs	80
Mollic Fluvaquents	83
Mollic Hapludalfs	95
Mollic Oxyaquic Hapludalfs	90
Mollic Udifluvents	88
Oxyaquic Argiudolls	100
Oxyaquic Dystrudepts	42
Oxyaquic Eutrudepts	42
Oxyaquic Hapludalfs	85
Oxyaquic Hapludolls	100
Oxyaquic Haplustolls	81
Oxyaquic Udifluvents	88
Oxyaquic Vertic Argiudolls	97
Oxyaquic Vertic Hapludalfs	79
Pachic Argiudolls	100
Pachic Hapludolls	100
Pachic Haplustolls	78
Psammentic Hapludalfs	67
Terric Haplosaprists	87
Thapto-Histic Fluvaquents	85
Typic Albaqualfs	87
Typic Argialbolls	77
Typic Argiaquolls	82

Taxonomic Subgroup:	S factor
Typic Argiudolls	100
Typic Calciaquolls	78
Typic Calciudolls	84
Typic Endoaqualfs	66
Typic Endoaquerts	70
Typic Endoaquolls	94
Typic Eutrudepts	78
Typic Fluvaquents	80
Typic Haplohemists	64
Typic Haplosaprists	64
Typic Hapludalfs	89
Typic Hapludolls	100
Typic Natraquerts	52
Typic Paleudalfs	86
Typic Quartzipsamments	58
Typic Udifluvents	95
Typic Udipsamments	58
Typic Udorthents	72
Udertic Haplustolls	80
Udic Haplustolls	80
Udic Ustorthents	74
Udifluvents	50
Udollic Endoaqualfs	90
Vertic Albaqualfs	80
Vertic Argialbolls	80
Vertic Argiaquolls	90
Vertic Endoaquepts	78
Vertic Endoaquolls	75
Vertic Epiaqualfs	81
Vertic Epiaquolls	79
Vertic Fluvaquents	67

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

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

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

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