NCSS Soils Data

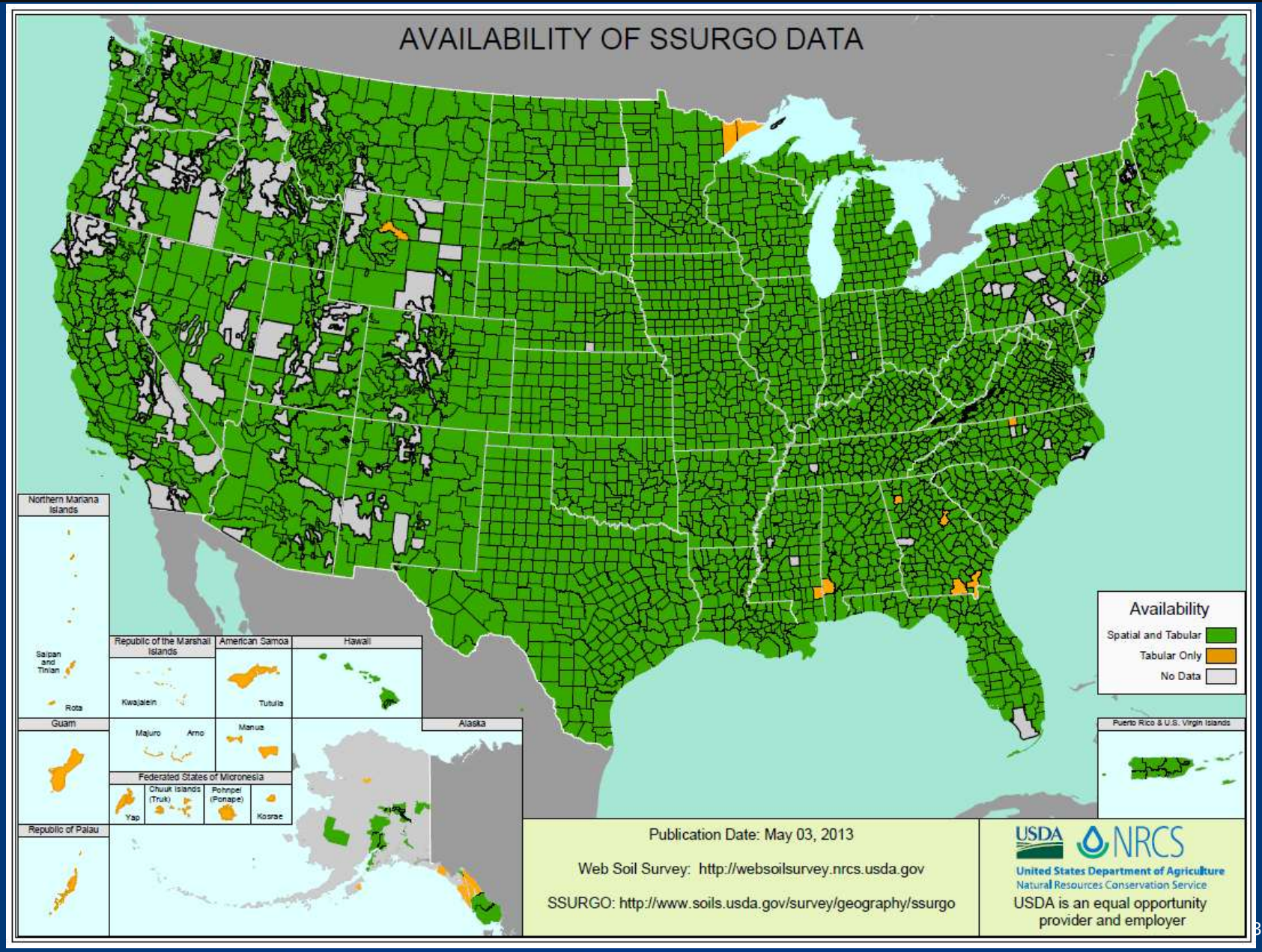
Availability and Use

USDA-NRCS
National Soil Survey Center
September 2013

David Hoover, National Leader, Soil Business Systems

Overview

- Available SSURGO data
- SSURGO database content
- gSSURGO soil parameter groupings as a means for soil moisture point data extrapolation
- Spline functions

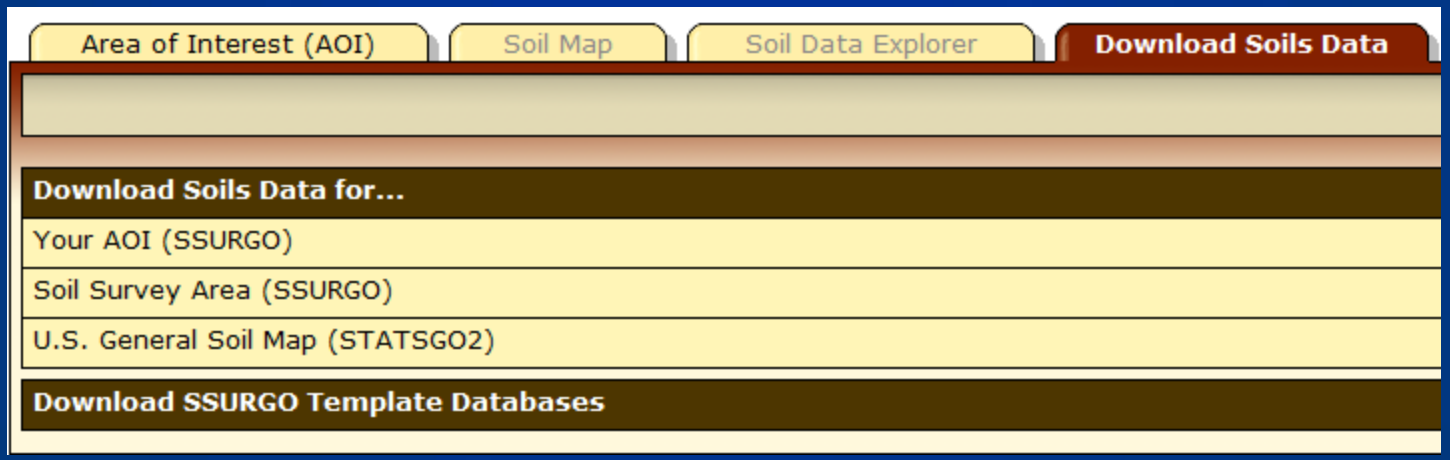

AVAILABILITY OF SSURGO DATA
Availability
Spatial and Tabular
Tabular Only
No Data
Northern Mariana Islands
Saipan and Tinian
Rota
Guam
Republic of Palau
Republic of the Marshall Islands
Kwajalein
Majuro
Arno
American Samoa
Tutuila
Manua
Hawaii
Alaska
Federated States of Micronesia
Yap
Chuuk Islands (Truk)
Pohnpei (Ponape)
Kosrae
Puerto Rico & U.S. Virgin Islands
Publication Date: May 03, 2013
Web Soil Survey: http://websoilsurvey.nrcs.usda.gov
SSURGO: http://www.soils.usda.gov/survey/geography/ssurgo
USDA
NRCS
United States Department of Agriculture
Natural Resources Conservation Service
USDA is an equal opportunity provider and employer

Availability of Data

- Spatial and tabular data are available for download through the Web Soil Survey

Web Soil Survey Data Download

- Data can be downloaded by survey area or by specified AOI (if one has been created)



Web Soil Survey Data Download

- Versioning and template information are displayed for the cached zip file

Soil Survey Area (SSURGO)

General Information

Link: Description of Soil Survey Geographic (SSURGO) Database

Download Contents: Tabular data, spatial data (if available), template database (if selected), and FGDC metadata

Spatial Data Format: ESRI Shapefile, Geographic WGS84

Options

State: Texas

County (optional):

Only show Soil Survey Areas updated since... Update Clear

Sort by... Area Symbol

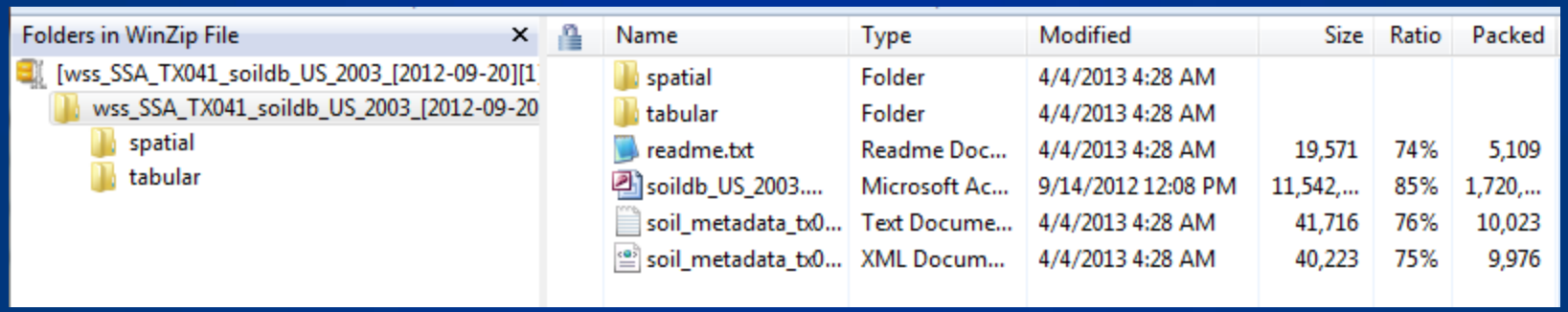
Include Template Database ☑

Soil Survey Area (SSURGO) Download Links

Name	Area Symbol	Data Availability	Version	Template Database	Download Size	Download Link
			Tabular: Version 8, Sep 20, 2012 Spatial: Version 1, Oct 20, 2004	Version 36		
Brazos County, Texas	TX041	Tabular and Spatial, complete	Survey Area: Version 10, Sep 20, 2012 Tabular: Version 9, Sep 20, 2012 Spatial: Version 2, Jun 12, 2008	soildb_US_2003 Access 2003 Version 36	9.4 MB	wss_SSA_TX041_soildb_US_2003_[2012-09-20].zip

Web Soil Survey Data Download

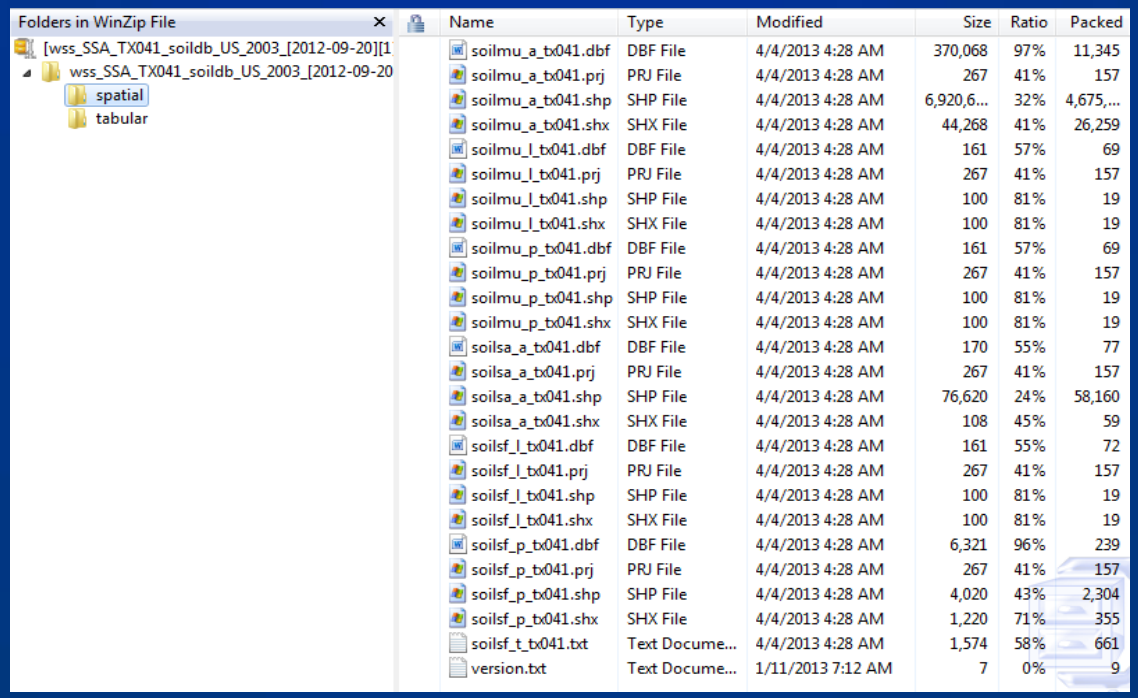
- Zip file contains the national template, metadata files, and directories for spatial and tabular data



Name	Type	Modified	Size	Ratio	Packed
spatial	Folder	4/4/2013 4:28 AM			
tabular	Folder	4/4/2013 4:28 AM			
readme.txt	Readme Doc...	4/4/2013 4:28 AM	19,571	74%	5,109
soildb_US_2003....	Microsoft Ac...	9/14/2012 12:08 PM	11,542,...	85%	1,720,...
soil_metadata_tx0...	Text Docume...	4/4/2013 4:28 AM	41,716	76%	10,023
soil_metadata_tx0...	XML Docum...	4/4/2013 4:28 AM	40,223	75%	9,976

Web Soil Survey Data Download

- The spatial directory contains shape files for the soil map unit polygons, lines, and points, the boundary, and line and point special features



Folders in WinZip File

- [wss_SSA_TX041_soildb_US_2003_[2012-09-20][1
  - wss_SSA_TX041_soildb_US_2003_[2012-09-20
    - spatial
    - tabular

Name	Type	Modified	Size	Ratio	Packed
soilmu_a_tx041.dbf	DBF File	4/4/2013 4:28 AM	370,068	97%	11,345
soilmu_a_tx041.prj	PRJ File	4/4/2013 4:28 AM	267	41%	157
soilmu_a_tx041.shp	SHP File	4/4/2013 4:28 AM	6,920,6...	32%	4,675,...
soilmu_a_tx041.shx	SHX File	4/4/2013 4:28 AM	44,268	41%	26,259
soilmu_l_tx041.dbf	DBF File	4/4/2013 4:28 AM	161	57%	69
soilmu_l_tx041.prj	PRJ File	4/4/2013 4:28 AM	267	41%	157
soilmu_l_tx041.shp	SHP File	4/4/2013 4:28 AM	100	81%	19
soilmu_l_tx041.shx	SHX File	4/4/2013 4:28 AM	100	81%	19
soilmu_p_tx041.dbf	DBF File	4/4/2013 4:28 AM	161	57%	69
soilmu_p_tx041.prj	PRJ File	4/4/2013 4:28 AM	267	41%	157
soilmu_p_tx041.shp	SHP File	4/4/2013 4:28 AM	100	81%	19
soilmu_p_tx041.shx	SHX File	4/4/2013 4:28 AM	100	81%	19
soilsa_a_tx041.dbf	DBF File	4/4/2013 4:28 AM	170	55%	77
soilsa_a_tx041.prj	PRJ File	4/4/2013 4:28 AM	267	41%	157
soilsa_a_tx041.shp	SHP File	4/4/2013 4:28 AM	76,620	24%	58,160
soilsa_a_tx041.shx	SHX File	4/4/2013 4:28 AM	108	45%	59
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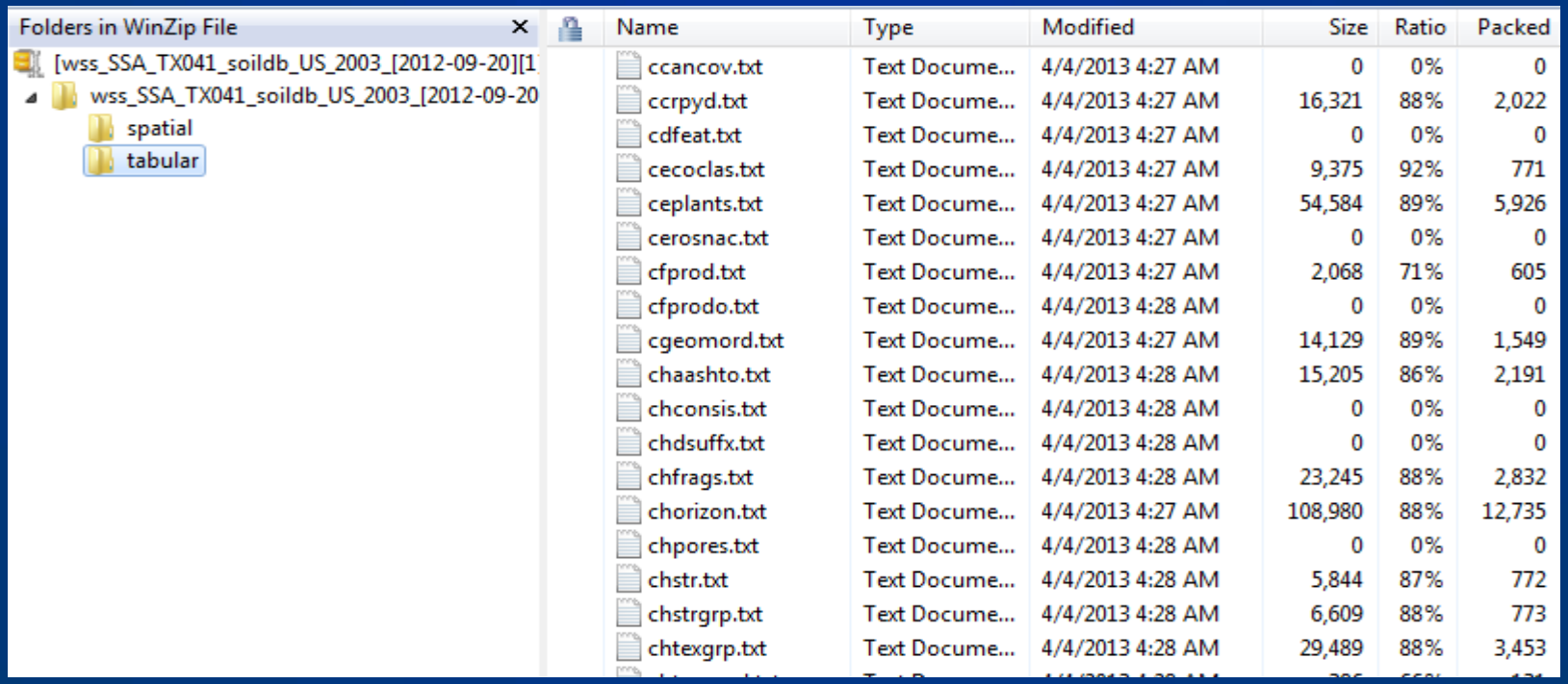
soilsf_l_tx041.prj	PRJ File	4/4/2013 4:28 AM	267	41%	157
soilsf_l_tx041.shp	SHP File	4/4/2013 4:28 AM	100	81%	19
soilsf_l_tx041.shx	SHX File	4/4/2013 4:28 AM	100	81%	19
soilsf_p_tx041.dbf	DBF File	4/4/2013 4:28 AM	6,321	96%	239
soilsf_p_tx041.prj	PRJ File	4/4/2013 4:28 AM	267	41%	157
soilsf_p_tx041.shp	SHP File	4/4/2013 4:28 AM	4,020	43%	2,304
soilsf_p_tx041.shx	SHX File	4/4/2013 4:28 AM	1,220	71%	355
soilsf_t_tx041.txt	Text Docume...	4/4/2013 4:28 AM	1,574	58%	661
version.txt	Text Docume...	1/11/2013 7:12 AM	7	0%	9

Web Soil Survey Data Download

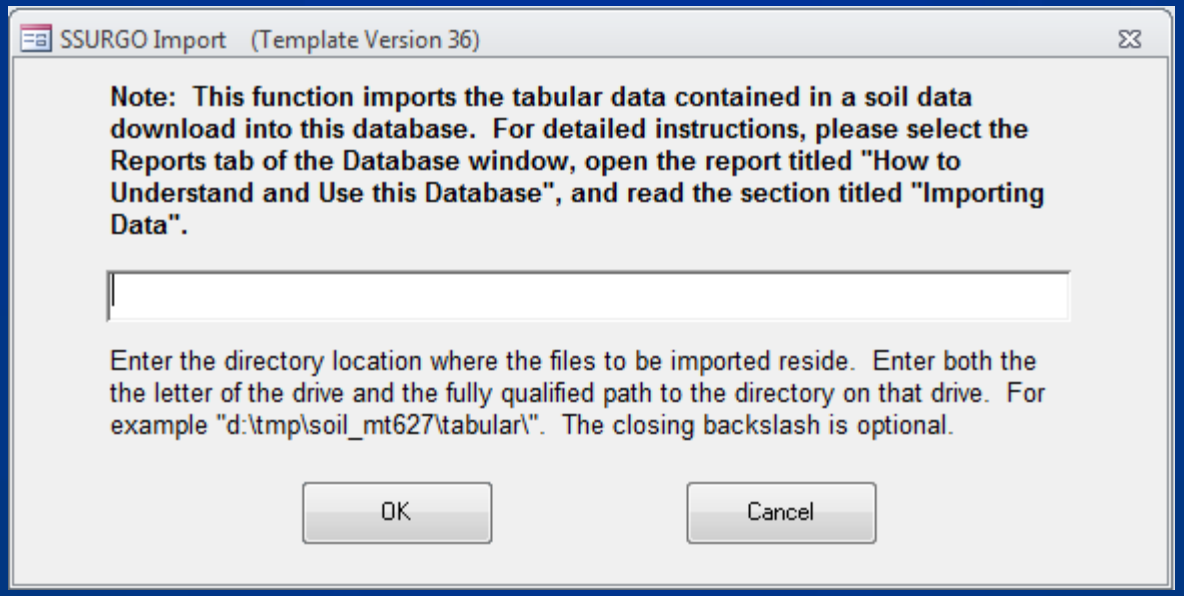
- The tabular directory contains text files that are used to populate the database template



Name	Type	Modified	Size	Ratio	Packed
ccancov.txt	Text Docume...	4/4/2013 4:27 AM	0	0%	0
ccrpyd.txt	Text Docume...	4/4/2013 4:27 AM	16,321	88%	2,022
cdfeat.txt	Text Docume...	4/4/2013 4:27 AM	0	0%	0
cecoclas.txt	Text Docume...	4/4/2013 4:27 AM	9,375	92%	771
ceplants.txt	Text Docume...	4/4/2013 4:27 AM	54,584	89%	5,926
cerosnac.txt	Text Docume...	4/4/2013 4:27 AM	0	0%	0
cfprod.txt	Text Docume...	4/4/2013 4:27 AM	2,068	71%	605
cfprodo.txt	Text Docume...	4/4/2013 4:28 AM	0	0%	0
cgeomord.txt	Text Docume...	4/4/2013 4:27 AM	14,129	89%	1,549
chaashto.txt	Text Docume...	4/4/2013 4:28 AM	15,205	86%	2,191
chconsis.txt	Text Docume...	4/4/2013 4:28 AM	0	0%	0
chdsuffx.txt	Text Docume...	4/4/2013 4:28 AM	0	0%	0
chfrags.txt	Text Docume...	4/4/2013 4:28 AM	23,245	88%	2,832
chorizon.txt	Text Docume...	4/4/2013 4:27 AM	108,980	88%	12,735
chpores.txt	Text Docume...	4/4/2013 4:28 AM	0	0%	0
chstr.txt	Text Docume...	4/4/2013 4:28 AM	5,844	87%	772
chstrgrp.txt	Text Docume...	4/4/2013 4:28 AM	6,609	88%	773
chtexgrp.txt	Text Docume...	4/4/2013 4:28 AM	29,489	88%	3,453

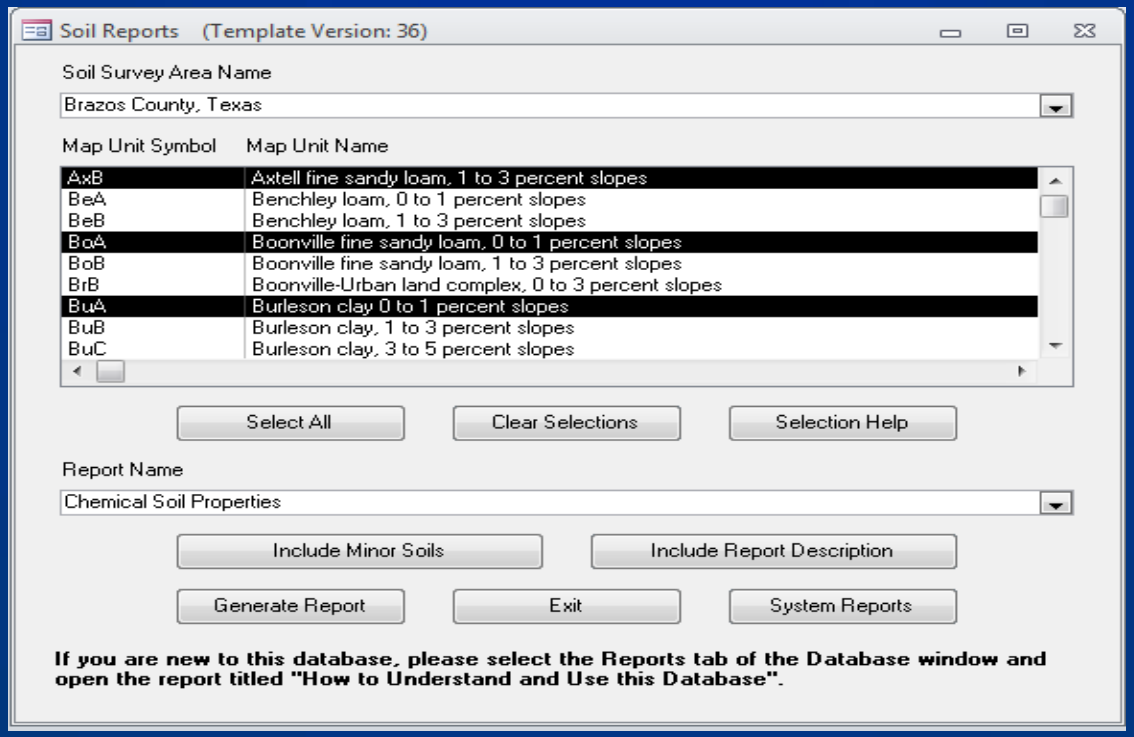
Access Data Import

- After everything is unzipped, the tabular text files can be imported to the blank database template



Access Data Application

- The first thing to pop up is a nice report generation tool for that soil survey area



Access Data Tables

- Tables
  - **Mapunit**
  - Component
  - Horizon

mapunit

Field Name	Data Type
musym	Text
muname	Text
mukind	Text
mustatus	Text
muacres	Number
mapunitlfw_l	Number
mapunitlfw_r	Number
mapunitlfw_h	Number
mapunitpfa_l	Number
mapunitpfa_r	Number
mapunitpfa_h	Number
farmlndcl	Text
muhelcl	Text
muwathelcl	Text
muwndhelcl	Text
interpfocus	Text
invesintens	Text
iacornsr	Number
nhiforsoigrp	Text
nhspiagr	Number
vtsepticsyscl	Text
mucertstat	Text
lkey	Text
mukey	Text

Access Data Tables

- Tables
  - Mapunit
  - **Component**
  - Horizon

component

Field Name
comppct_l
comppct_r
comppct_h
compname
compkind
majcompflag
otherph
localphase
slope_l
slope_r
slope_h
slopelenusle_l
slopelenusle_r
slopelenusle_h
runoff
tfact
wei
weg
erocl
earthcovkind1
earthcovkind2
hydricon
hydricrating
drainagecl
elev_l
elev_r
elev_h

component

Field Na
aspectccwise
aspectrep
aspectcwise
geomdesc
albedodry_l
albedodry_r
albedodry_h
airtempa_l
airtempa_r
airtempa_h
map_l
map_r
map_h
reannualprecip_l
reannualprecip_r
reannualprecip_h
ffd_l
ffd_r
ffd_h
nirrcapcl
nirrcapscl
nirrcapunit
irrcapcl
irrcapscl
irrcapunit
cropprodindex
constreeshrubgrp

component

Field Name
wndbrksuitgrp
rsprod_l
rsprod_r
rsprod_h
foragesuitgrpid
wlgrain
wlgrass
wlherbaceous
wlshrub
wlconiferous
wlhardwood
wlwetplant
wlshallowwat
wlrangeland
wlopenland
wlwoodland
wlwetland
soilslippot
frostact
initsub_l
initsub_r
initsub_h
totalsub_l
totalsub_r
totalsub_h
hydgrp
corcon

component

Field Name
taxclname
taxorder
taxsuborder
taxgrtgroup
taxsubgrp
taxpartsize
taxpartsizemod
taxceactcl
taxreaction
taxtempcl
taxmoistscl
taxtempregime
soiltaxedition
castorieindex
flecolcomnum
flhe
flphe
flsoilleachpot
flsoirunoffpot
fltemik2use
fltriumph2use
indraingrp
innitrateleachi
misoimgmtgrp
vasoimgtgrp
mukey
cokey

Access Data Tables

- Tables
  - Mapunit
  - **Component**
  - Horizon

coecoclass

Field Name	Data Type
ecoclasstypename	Text
ecoclassref	Text
ecoclassid	Text
ecoclassname	Memo
cokey	Text
coecoclasskey	Text

coecoclass

Ecological Classificat	Ecological Classification ID	Ecological Classification Name
NRCS Rangeland Site	R086BY219TX	Loamy Bottomland 32-40" PZ
NRCS Rangeland Site	R086BY219TX	Loamy Bottomland 32-40" PZ
NRCS Rangeland Site	R087AY229TX	Gravelly 28-40" PZ
NRCS Rangeland Site	R087AY237TX	Sandy Loam 28-40" PZ
NRCS Rangeland Site	R087AY234TX	Sandy 28-40" PZ
NRCS Rangeland Site	R087AY237TX	Sandy Loam 28-40" PZ
NRCS Rangeland Site	R087AY237TX	Sandy Loam 28-40" PZ
S Rangeland Site	R087AY237TX	Sandy Loam 28-40" PZ
S Rangeland Site	R087AY221TX	Claypan Savannah 28-40" PZ
S Rangeland Site	R087AY221TX	Claypan Savannah 28-40" PZ
S Rangeland Site	R086BY211TX	Clayey Bottomland 32-40" PZ
S Rangeland Site	R086BY211TX	Clayey Bottomland 32-40" PZ
S Rangeland Site	R087AY221TX	Claypan Savannah 28-40" PZ
S Rangeland Site	R087AY225TX	Deep Sand 28-40" PZ
S Rangeland Site	R087AY237TX	Sandy Loam 28-40" PZ
NRCS Rangeland Site	R086BY214TX	Claypan Prairie 32-40" PZ
NRCS Rangeland Site	R086BY214TX	Claypan Prairie 32-40" PZ
NRCS Rangeland Site	R086BY208TX	Blackland 32-40" PZ
NRCS Rangeland Site	R086BY208TX	Blackland 32-40" PZ
NRCS Rangeland Site	R087AY221TX	Claypan Savannah 28-40" PZ
NRCS Rangeland Site	R087AY225TX	Deep Sand 28-40" PZ
NRCS Rangeland Site	R087AY234TX	Sandy 28-40" PZ

Access Data Tables

- Tables
  - Mapunit
  - **Component**
  - Horizon

comonth

Field Name
monthseq
month
flodfreqcl
floddurcl
pondfreqcl
ponddurcl
ponddep_l
ponddep_r
ponddep_h
dlyavgprecip_l
dlyavgprecip_r
dlyavgprecip_h
dlyavgpotet_l
dlyavgpotet_r
dlyavgpotet_h
cokey
comonthkey

comonth

Month Sequ	Month	Flooding Fre	Flooding Du	Pond			Ponding Dep	Ponding Dep
7	July	None		None				
6	June	None		None				
3	March	None		None				
5	May	None		None				
11	November	None		None				
10	October	None		None				
9	September	None		None				
4	April	Frequent	Very long	Frequ			7	15
8	August							
12	December	Frequent	Very long	Frequent	Long	0	7	15
2	February	Frequent	Very long	Frequent	Long	0	7	15
1	January	Frequent	Very long	Frequent	Long	0	7	15
7	July							
6	June							
3	March	Frequent	Very long	Frequent	Long	0	7	15
5	May	Frequent	Very long	Frequent	Long	0	7	15
11	November	Frequent	Very long	Frequent	Long	0	7	15
10	October	Frequent	Very long	Frequent	Long	0	7	15

Access Data Tables

- Tables
  - Mapunit
  - Component
  - **Horizon**

chorizon

Fie
hzname
desgndisc
desgnmaster
desgnmaster
desgnvert
hzdept_l
hzdept_r
hzdept_h
hzdepb_l
hzdepb_r
hzdepb_h
hzthk_l
hzthk_r
hzthk_h
fraggt10_l
fraggt10_r
fraggt10_h
frag3to10_l
frag3to10_r
frag3to10_h
sieveno4_l
sieveno4_r
sieveno4_h
sieveno10_l
sieveno10_r
sieveno10_h
sieveno40_l

chorizon

Fie
sandtotal_l
sandtotal_r
sandtotal_h
sandvc_l
sandvc_r
sandvc_h
sandco_l
sandco_r
sandco_h
sandmed_l
sandmed_r
sandmed_h
sandfine_l
sandfine_r
sandfine_h
sandvf_l
sandvf_r
sandvf_h
silttotal_l
silttotal_r
silttotal_h
siltco_l
siltco_r
siltco_h
siltfine_l
siltfine_r
siltfine_h

chorizon

Fiel
claytotal_l
claytotal_r
claytotal_h
claysizedcarb
claysizedcarb
claysizedcarb
om_l
om_r
om_h
dbtenthbar_l
dbtenthbar_r
dbtenthbar_h
dbthirdbar_l
dbthirdbar_r
dbthirdbar_h
dbfifteenbar
dbfifteenbar
dbfifteenbar
dbovendry_l
dbovendry_r
dbovendry_h
partdensity
ksat_l
ksat_r
ksat_h
awc_l
awc_r
awc_h

chorizon

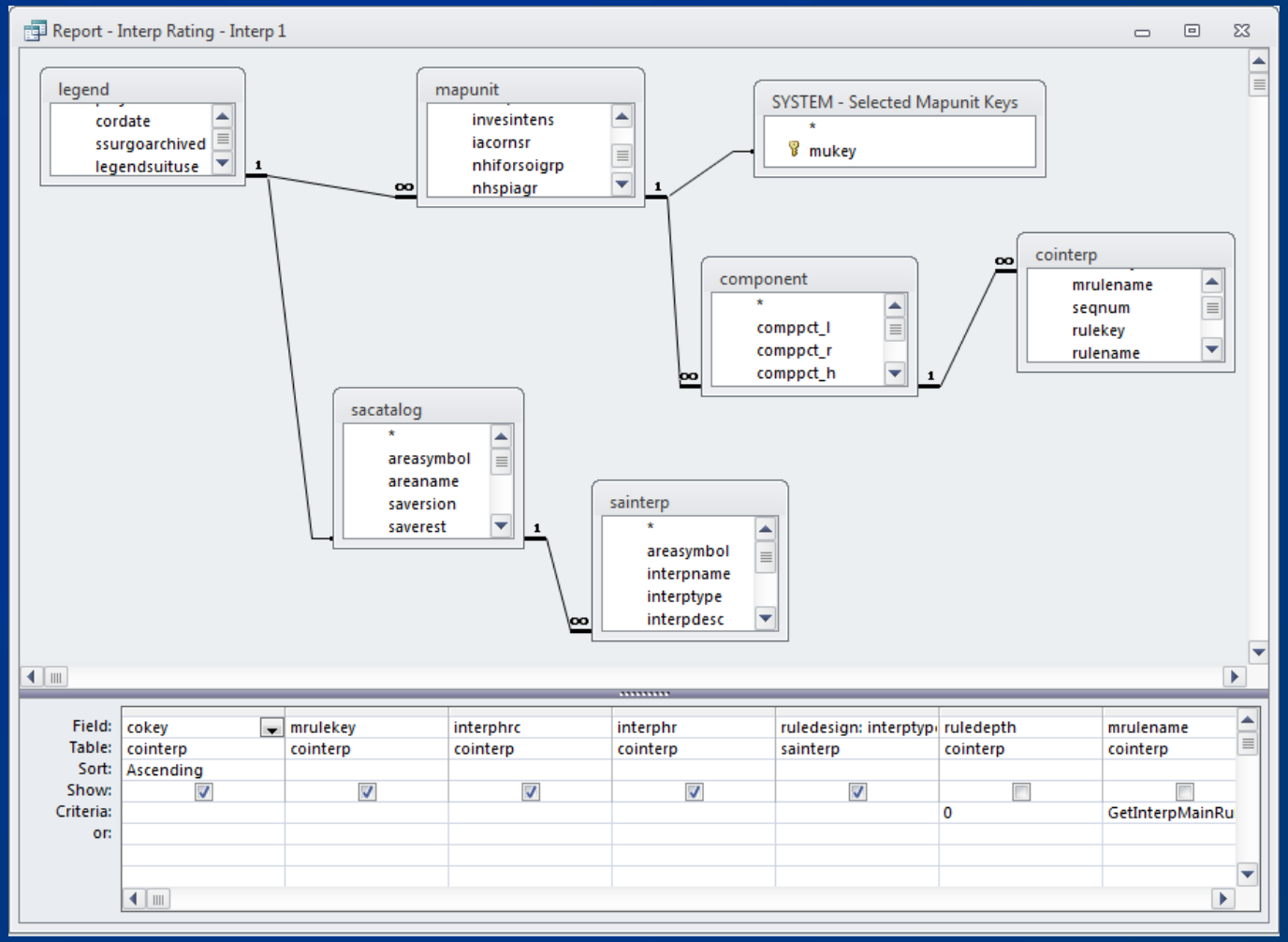
Fie
lep_l
lep_r
lep_h
ll_l
ll_r
ll_h
pi_l
pi_r
pi_h
aashind_l
aashind_r
aashind_h
kwfact
kffact
caco3_l
caco3_r
caco3_h
gypsum_l
gypsum_r
gypsum_h
sar_l
sar_r
sar_h
ec_l
ec_r
ec_h
cec7_l

chorizon

Field Name
cec7_r
cec7_h
ecec_l
ecec_r
ecec_h
sumbases_l
sumbases_r
sumbases_h
ph1to1h2o_l
ph1to1h2o_r
ph1to1h2o_h
ph01mcacl2_l
ph01mcacl2_r
ph01mcacl2_h
freeiron_l
freeiron_r
freeiron_h
feoxalate_l
feoxalate_r
feoxalate_h
extracid_l
extracid_r
extracid_h
extral_l
extral_r
extral_h
aloxalate_l

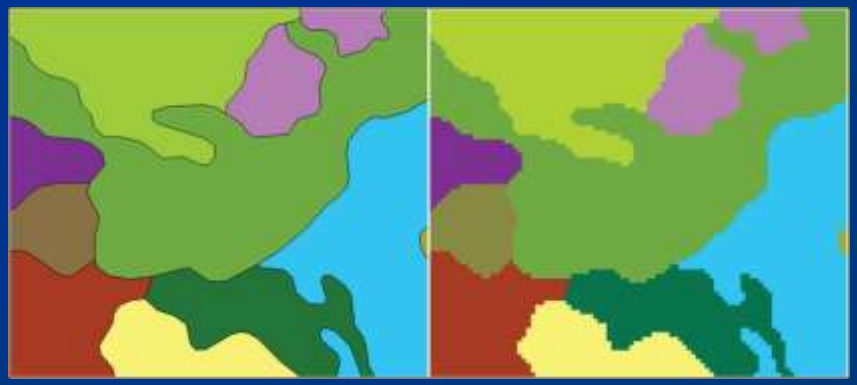
Access Data Tables

- Queries

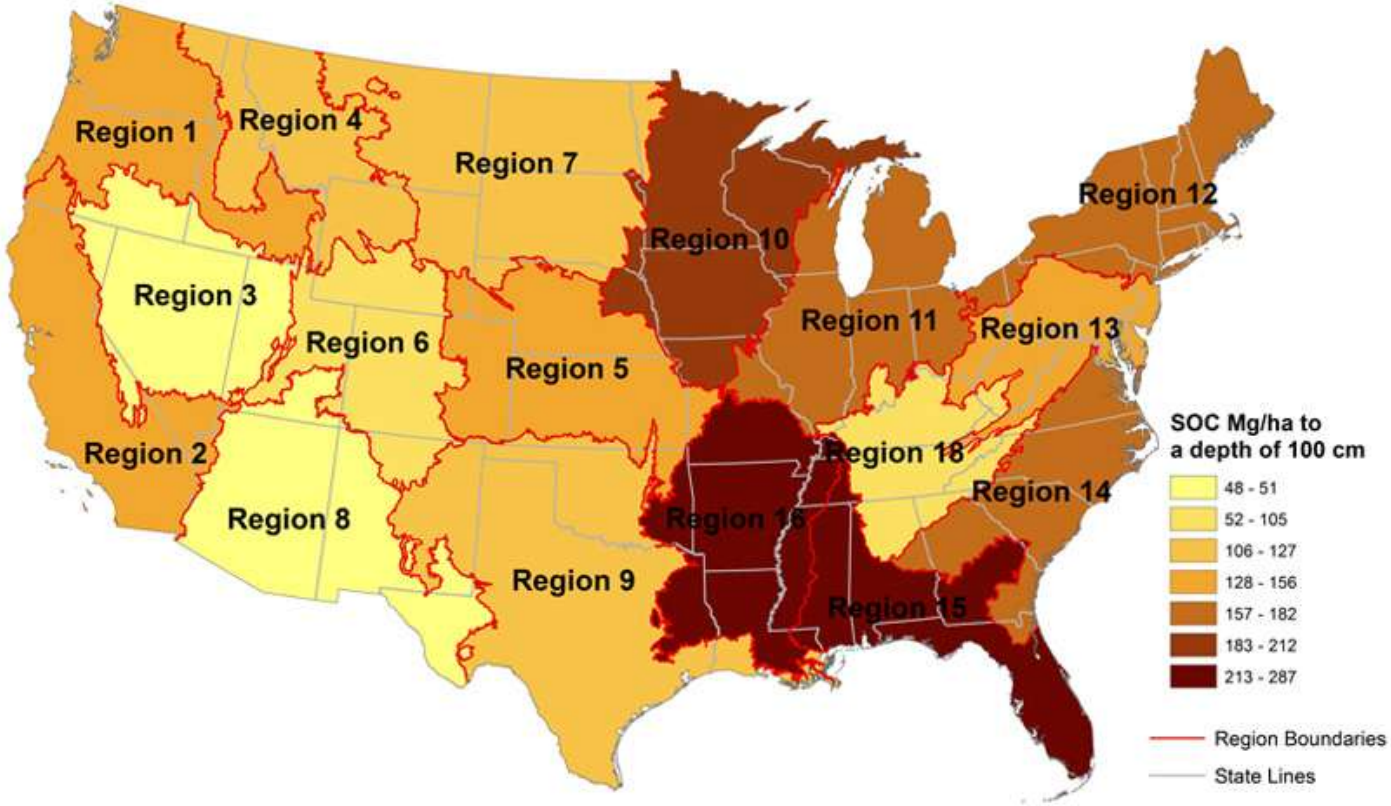


gSSURGO

- Raster SSURGO data tiled by state
- 10m^2 cells
- http://soils.usda.gov/survey/geography/ssurgo/description_gssurgo.html
- Advantages (speed, compatibility)



Soil Parameter Groupings



{click on each region for a high-resolution PDF file}

Soil Parameter Groupings

Soil Order

SOILORDER	Score
HISTOSOLS	8
ANDISOLS	4
SPODOSOLS	4
GELISOLS	4
INCEPTISOLS	3
MOLLISOLS	3
VERTISOLS	3
OXISOLS	3
ALFISOLS	2
ULTISOLS	2
ENTISOLS	2
ARIDISOLS	1

General Moisture Regime	Code Used	Score
Aquic	A	4
Xeric	X	2
Udic	D	3
		2
		0
		1

Classes	Depths	Score
Very Deep	> 150cm	2
Deep	100 I 150 cm	2
Moderately deep	50 I 100 cm	2
Shallow	25 I 50 cm	1
Very Shallow		
Null or unknown		

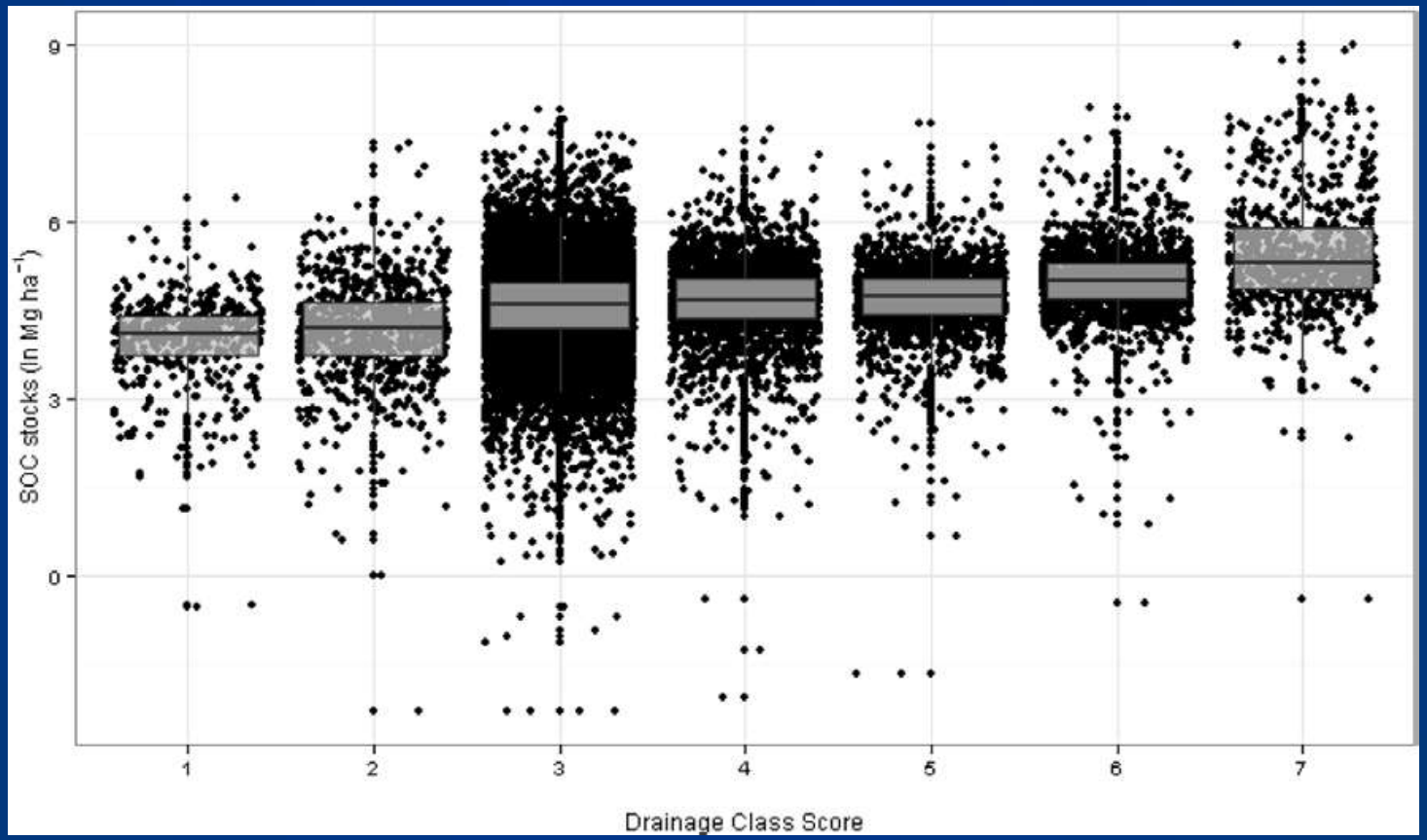
Maximum Flooding Reported	Score
Frequent	3
Common	2
Occasional	1
Rare	0
Very Rare	0

Table 1. Numerical values for the divisions of the soil properties

Texture	
Sandy	1
Coarse-loamy	2
Fine-loamy	3
Clayey	4
Fine-silty	5
	6

Drainage class	Score
Excessively	1
Somewhat Excessively	2
Well or Somewhat Excessively	2
Well	3
Null*	3
Unkonwn	3
Well or Moderately Well	4
derately Well	4
derate	4
mewhat Poorly	5
orly	6
y Poorly	7

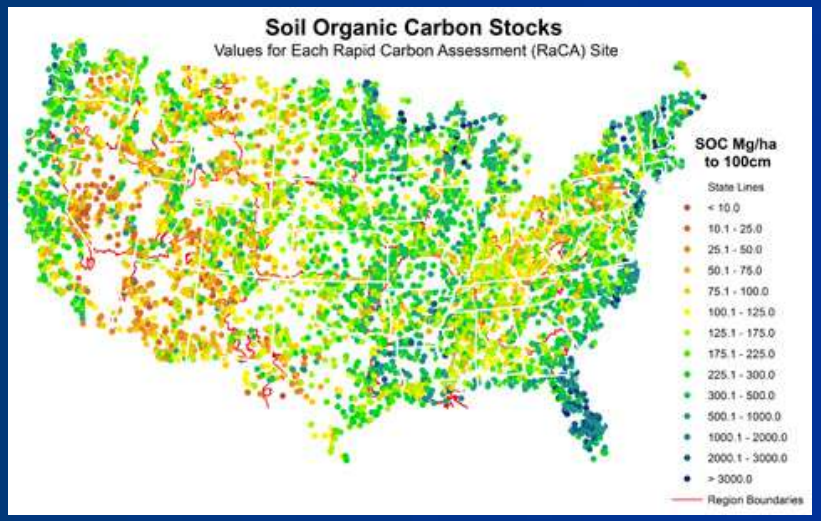
Soil Parameter Groupings



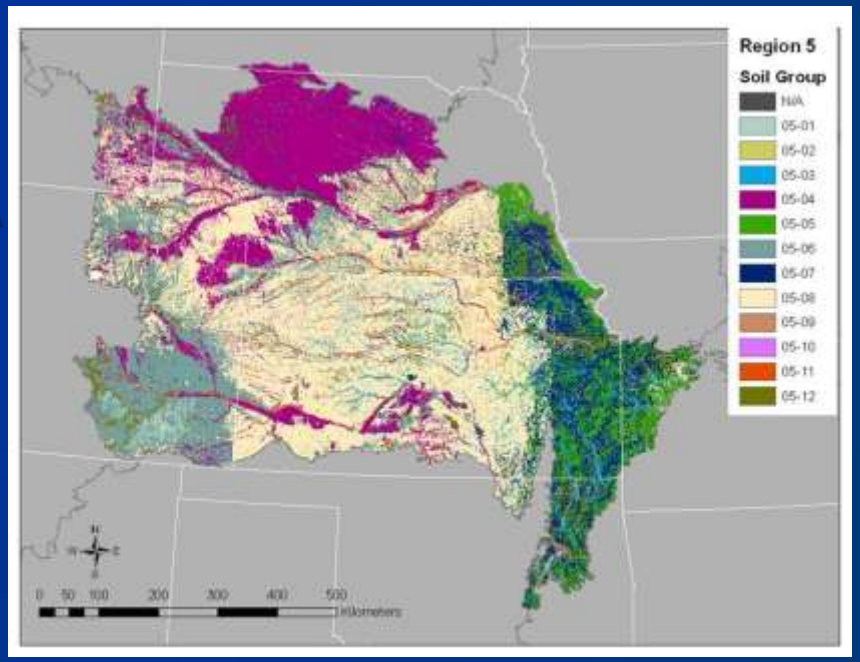
Soil Parameter Groupings

Component or Soil Series	SOILORDER	SUBORDER	GRTGROUP	SUBGROUP MOD	Partsize class	SOILTEMP	SOIL DEPTH	DRAINAGE CLASS	Tax total score	Moist total score	Flood max score	Temp score	Partsize scores	Drain score	Depth score	Hierarchical cluster
Osage	VERTISOLS	AQUERTS	EPIAQUERTS	TYPIC	FINE	THERMIC	very deep	U	3	4	3	0	8	3	2	3
Carl	VERTISOLS	AQUERTS	EPIAQUERTS	TYPIC	FINE	THERMIC	deep	U	3	4	0	0	8	3	2	5
Ness	VERTISOLS	AQUERTS	EPIAQUERTS	USTIC	FINE	MESIC	deep	U	3	3.5	0	0	8	3	2	5
Apperson	VERTISOLS	UDERTS	HAPLUDERTS	AQUIC	FINE	THERMIC	deep	SWP	3	3.5	0	0	8	5	2	7
Feterita	VERTISOLS	AQUERTS	EPIAQUERTS	ARIDIC	FINE	MESIC	very deep	SWP	3	3.25	0	0	8	5	2	7
Bogue	VERTISOLS	USTERTS	HAPLUSTERTS	LEPTIC	VERY-FINE	MESIC	moderately deep	MW	3	2	0	0	9	4	2	8
Goessel	VERTISOLS	USTERTS	HAPLUSTERTS	TYPIC	FINE	MESIC	deep	U	3	2	0	0	8	3	2	8
Lela	VERTISOLS	USTERTS	HAPLUSTERTS	UDIC	FINE	THERMIC	very deep	SWP	3	2.5	1	0	8	5	2	8
Ritoazul	VERTISOLS	USTERTS	HAPLUSTERTS	ARIDIC	FINE	MESIC	moderately deep	W	3	1.5	0	0	8	3	2	8
Latanier	VERTISOLS	UDERTS	HAPLUDERTS	OXYAQUIC	CLAYEY OVER LOAMY	THERMIC	very deep	SWP	3	3	3	0	7	5	2	10
Moreland	VERTISOLS	UDERTS	HAPLUDERTS	OXYAQUIC	VERY-FINE	THERMIC	very deep	SWP	3	3	3	0	9	5	2	10
Roebuck	VERTISOLS	AQUERTS	EPIAQUERTS	AERIC	FINE	THERMIC	very deep	SWP	3	4	3	0	8	5	2	10
Ustibuck	VERTISOLS	AQUERTS	EPIAQUERTS	USTIC	FINE	THERMIC	very deep	P	3	3.5	3	0	8	6	2	10

Soil Parameter Groupings



Point Data



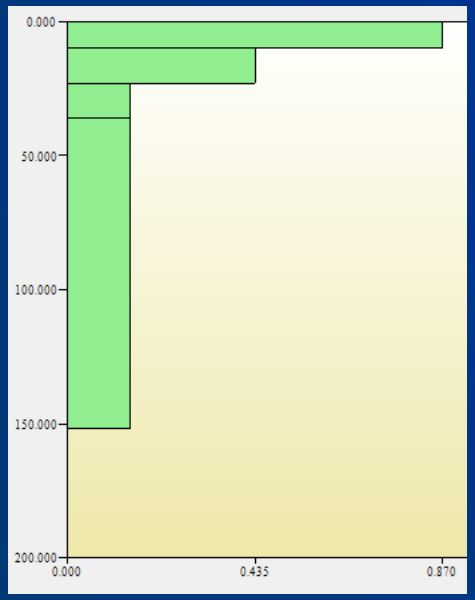
Continuous Surface Raster

Fitting splines

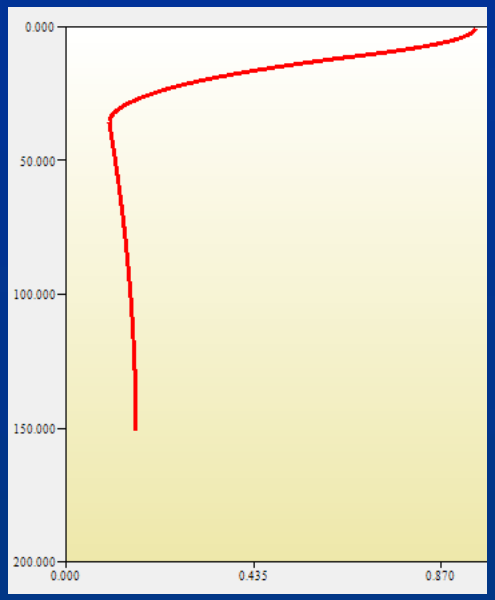
- Splines
  - Equal-area splines (Malone *et al*. 2009, Bishop *et al*. 1999)

    For more details see Spatial Predictions In Soils, Crops and Agro/Forest/Urban/Wetland Ecosystems: II, Title: Application of the Equal-Area Spline Function to Legacy Soil Data.

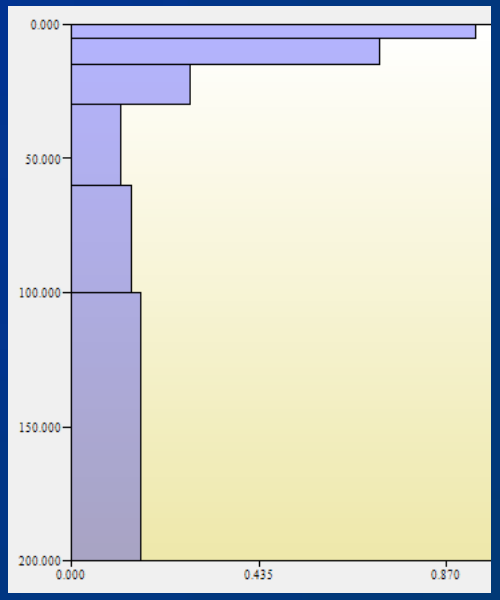
Soil profile with property data



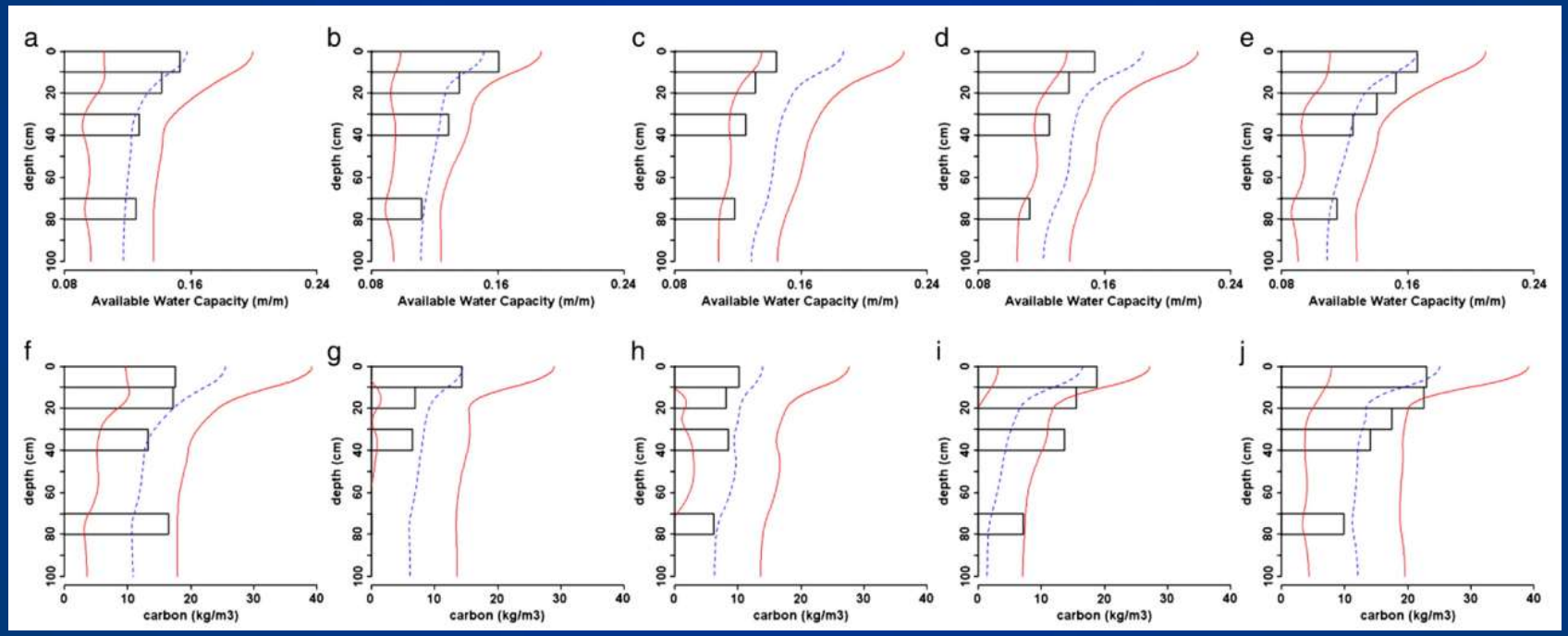
Continuous spline (1 cm resolution)



Property estimates at specific increments



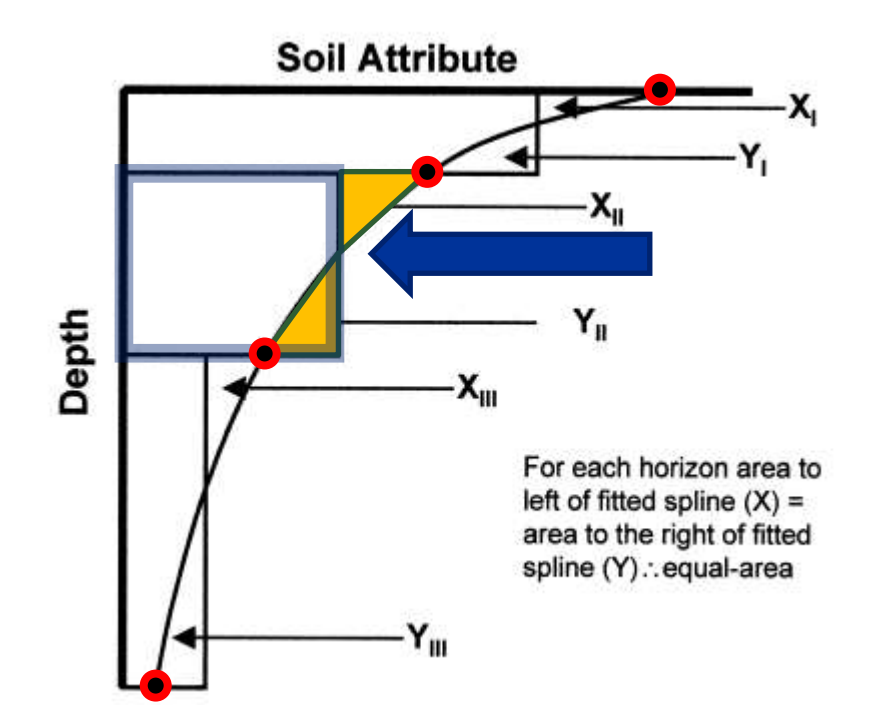
Profile plots of AWC (a–e) and OC (f–j) Bars represent actual observed values. Dotted lines represent final spline predictions. Solid lines represent upper and lower prediction limits.



Source: Malone et al. 2011. Geoderma
http://dx.doi.org/10.1016/j.geoderma.2010.11.013

Spline Background

- The solution: equal-area depth splines
- Consist of a series of local quadratic polynomials with “knots” or joins at horizon boundaries



Bishop, T.F.A., McBratney, A.B. and Laslett, G.M., 1999. Modelling soil attribute depth functions with equal-area quadratic smoothing splines. Geoderma, 91: 27-45

Ponce-Hernandez, R., Marriott, F.H.C. and Beckett, P.H.T., 1986. An improved method for reconstructing a soil profile from analyses of a small number of samples. Journal of Soil Science, 37: 455-467

NCSS Soils Data for Soil Moisture Modeling

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