Agronomy of small grain production in California's North Coast region

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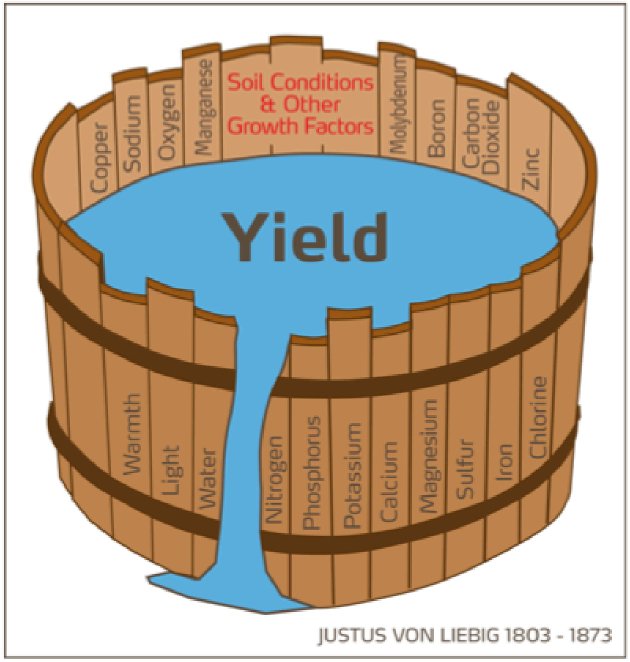
- General agronomic concepts
- Pre-season considerations
- In-season considerations
- Resources

Liebig's law of the minimum

Justus von Liebig's "Law of the Minimum" published in 1873

"If one growth factor/nutrient is deficient, plant growth is limited, even if all other vital factors/nutrients are adequate…plant growth is improved by increasing the supply of the deficient factor/nutrient"



http://kemnovation.com/crop-nutrition/

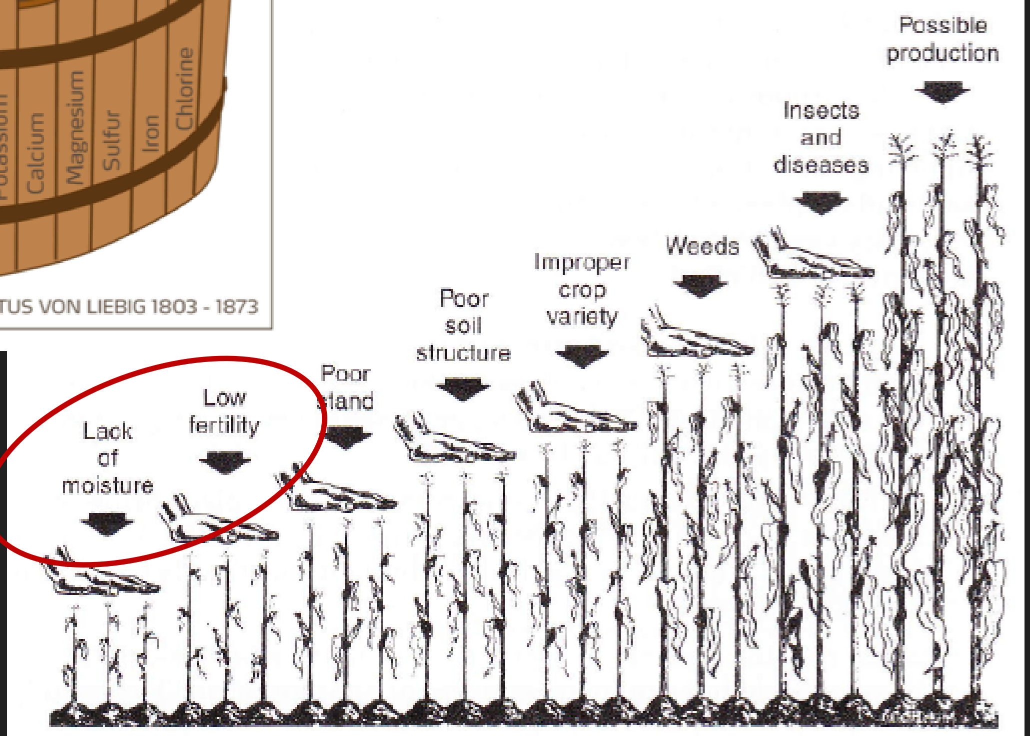


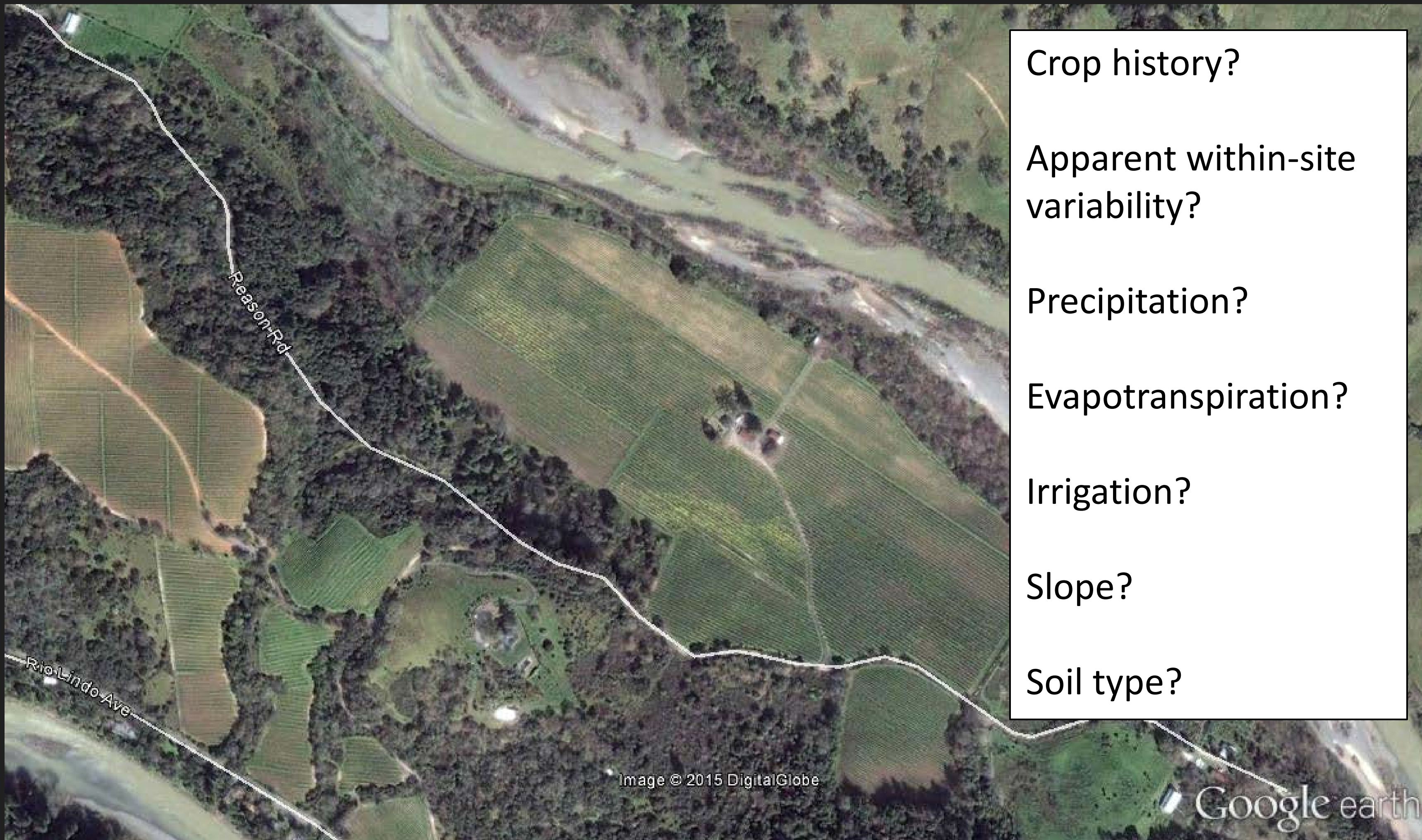
Figure 1-10 Leibig's Law of the Minimum states that the most limiting factor determines yield potential. Producers should minimize or eliminate the most limiting factor first, then the second most limiting factor, and so forth. Only in this manner can maximum yield potential be achieved *(Source: Potash and Phosphate Institute)*.

Havlin, J. L. et al. 2005. Soil Fertility and Fertilizers, 7th ed.

Site selection

4/20/2013

Site selection



Crop history?

Apparent within-site variability?

Precipitation?

Evapotranspiration?

Irrigation?

Slope?

Soil type?

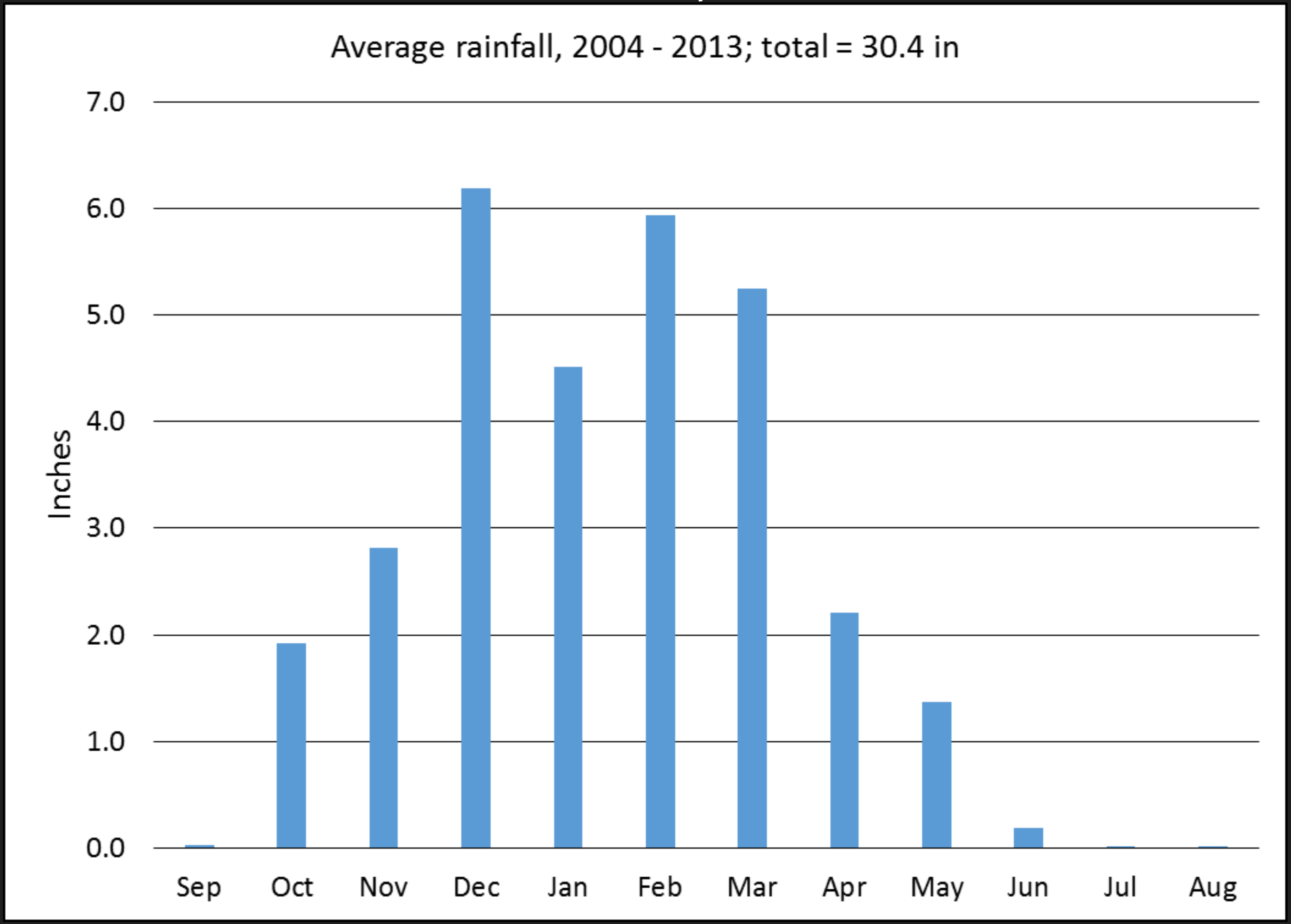
3/13/2010

Rainfall and plant water demand

http://www.cimis.water.ca.gov/

Rainfall

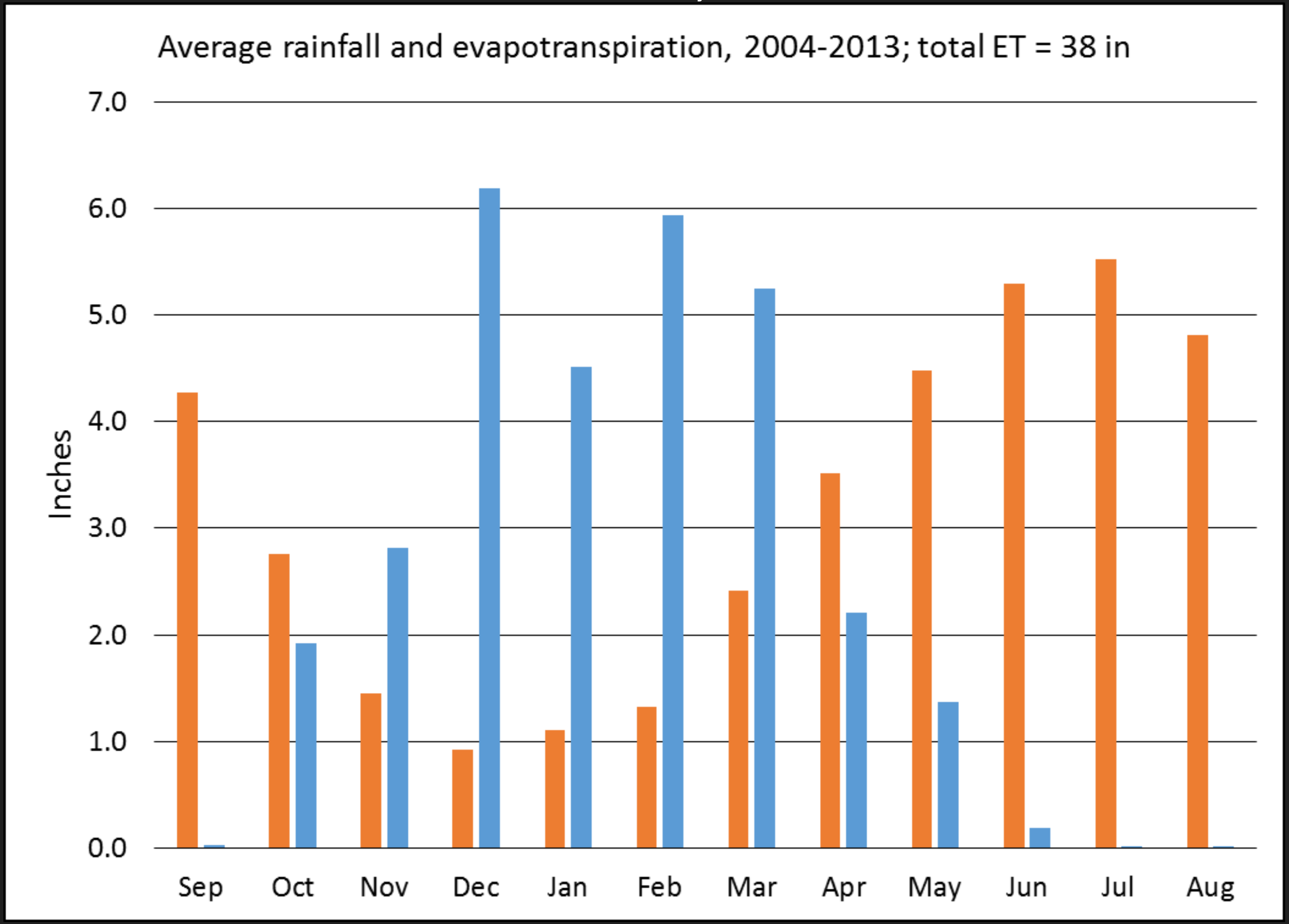
Windsor, CA



Average rainfall total: 30.4 inches

Rainfall and evapotranspiration

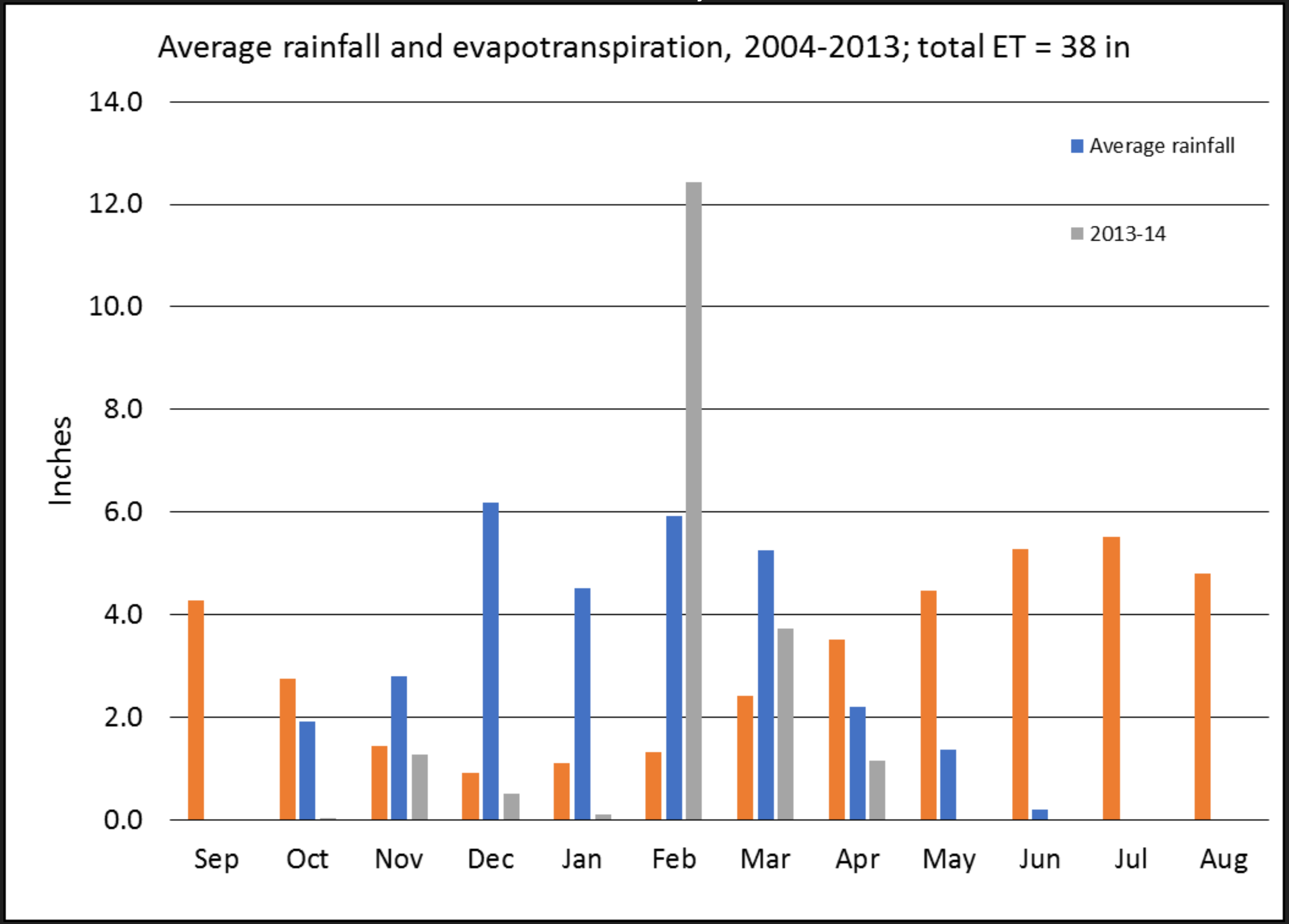
Windsor, CA



Aridity Index [Precipitation (30.4) / Evapotranspiration (37.9)] = 0.80

Rainfall distribution & totals vary from year to year

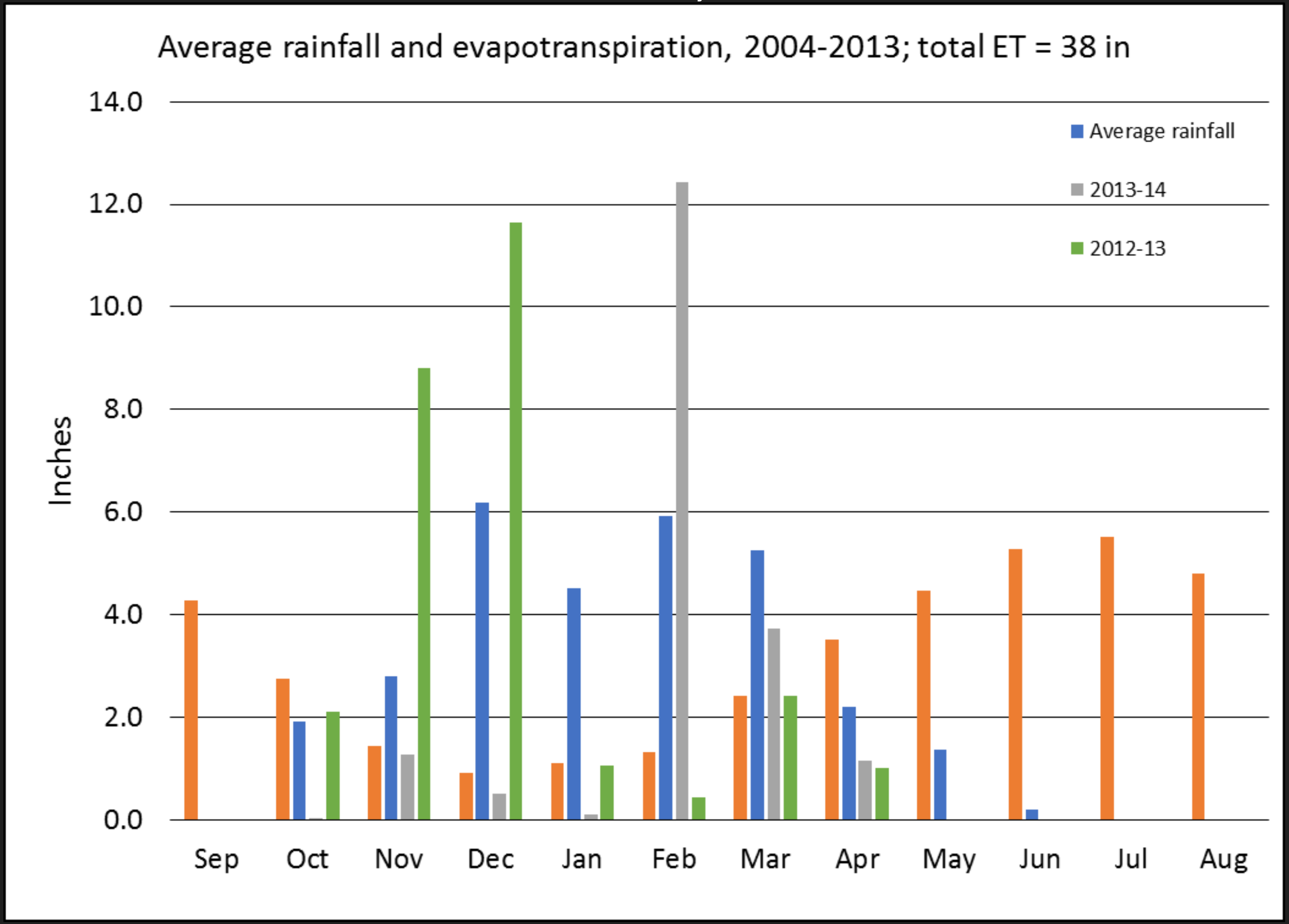
Windsor, CA



2013-2014 rainfall total: 19.3 inches

Rainfall distribution & totals vary from year to year

Windsor, CA



2013-2014 rainfall total: 19.3 inches

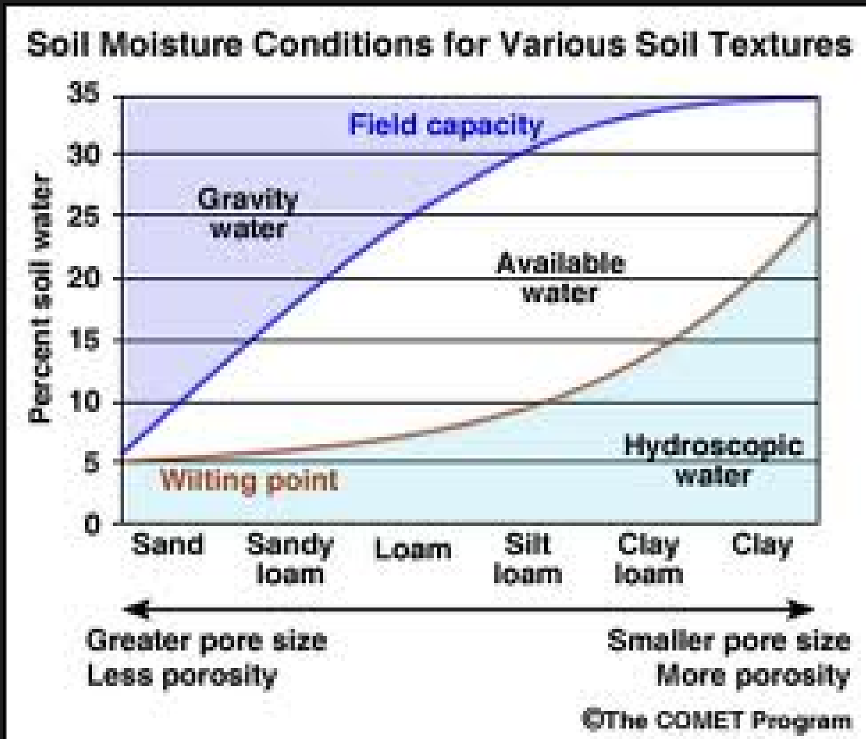
2012-2013 rainfall total: 27.5 inches

- Small grains use 17 – 26 inches of soil water
  - amount that leaves the system via evapotranspiration
  - barley < oats < wheat

- Amount of water available to the crop will depend on:
  - what you grow
  - when you plant
  - irrigation?
  - SOIL

- How much will soil water contribute to total evapotranspiration?

How much of evapotranspiration comes from soil water?



Meted.ucar.edu

Depends on soil type

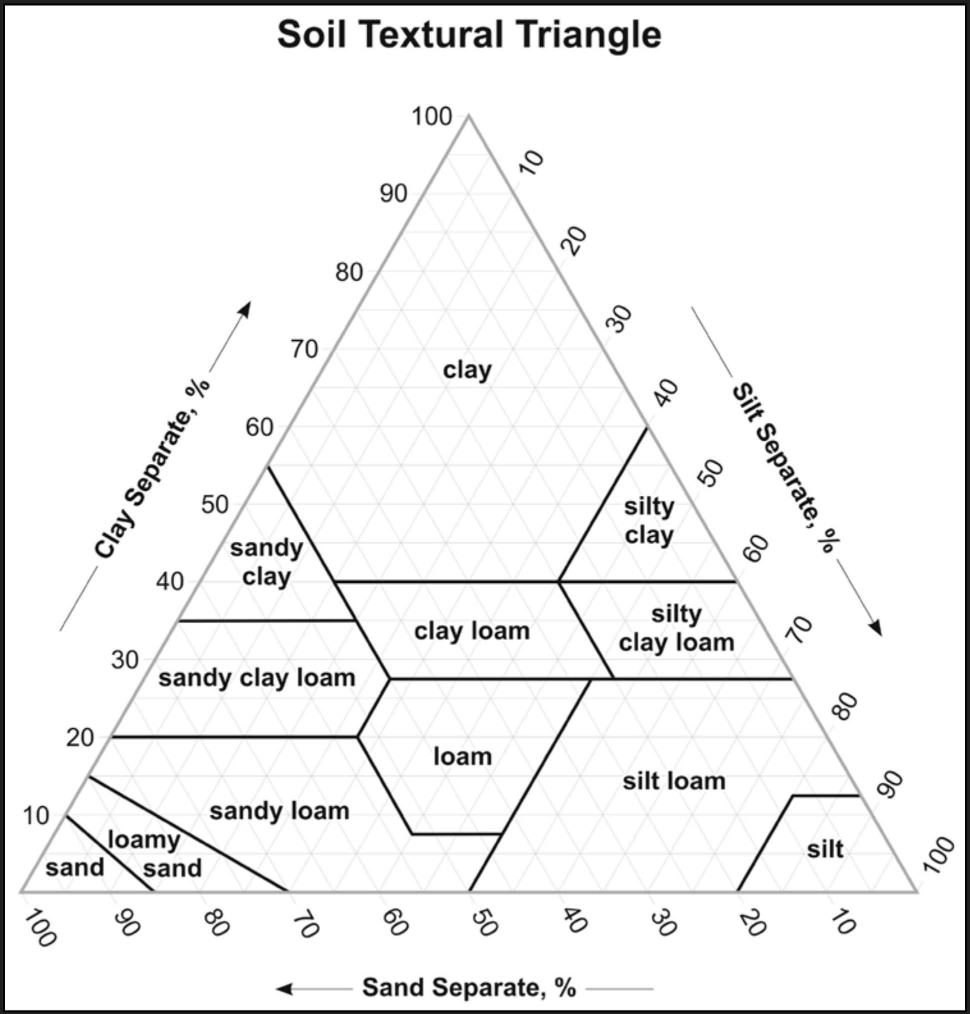
What is my soil type?

Available Water Capacity by Soil Texture

Textural Class	Available Water Capacity (Inches/Foot of Depth)	Available Water Capacity (mm/m)
Coarse sand	0.25–0.75	21-63
Fine sand	0.75–1.00	63-84
Loamy sand	1.10–1.20	92-100
Sandy loam	1.25–1.40	104-117
Fine sandy loam	1.50–2.00	125-167
Silt loam	2.00–2.50	167-208
Silty clay loam	1.80–2.00	150-167
Silty clay	1.50–1.70	125-141
Clay	1.20–1.50	100-125

http://www.noble.org/ag/Soils/SoilWaterRelationships/Index.htm

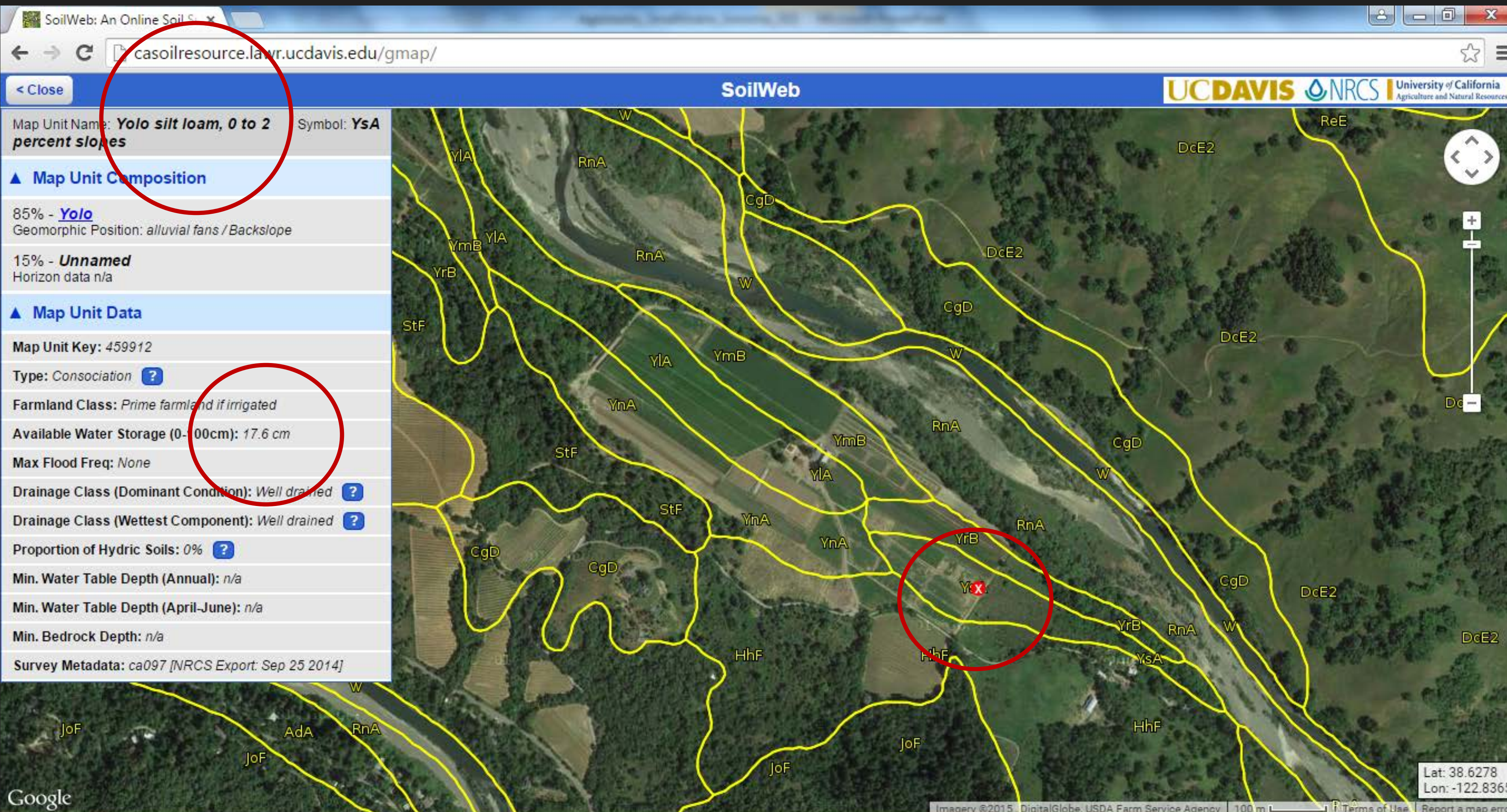
What is my soil type?



NRCS

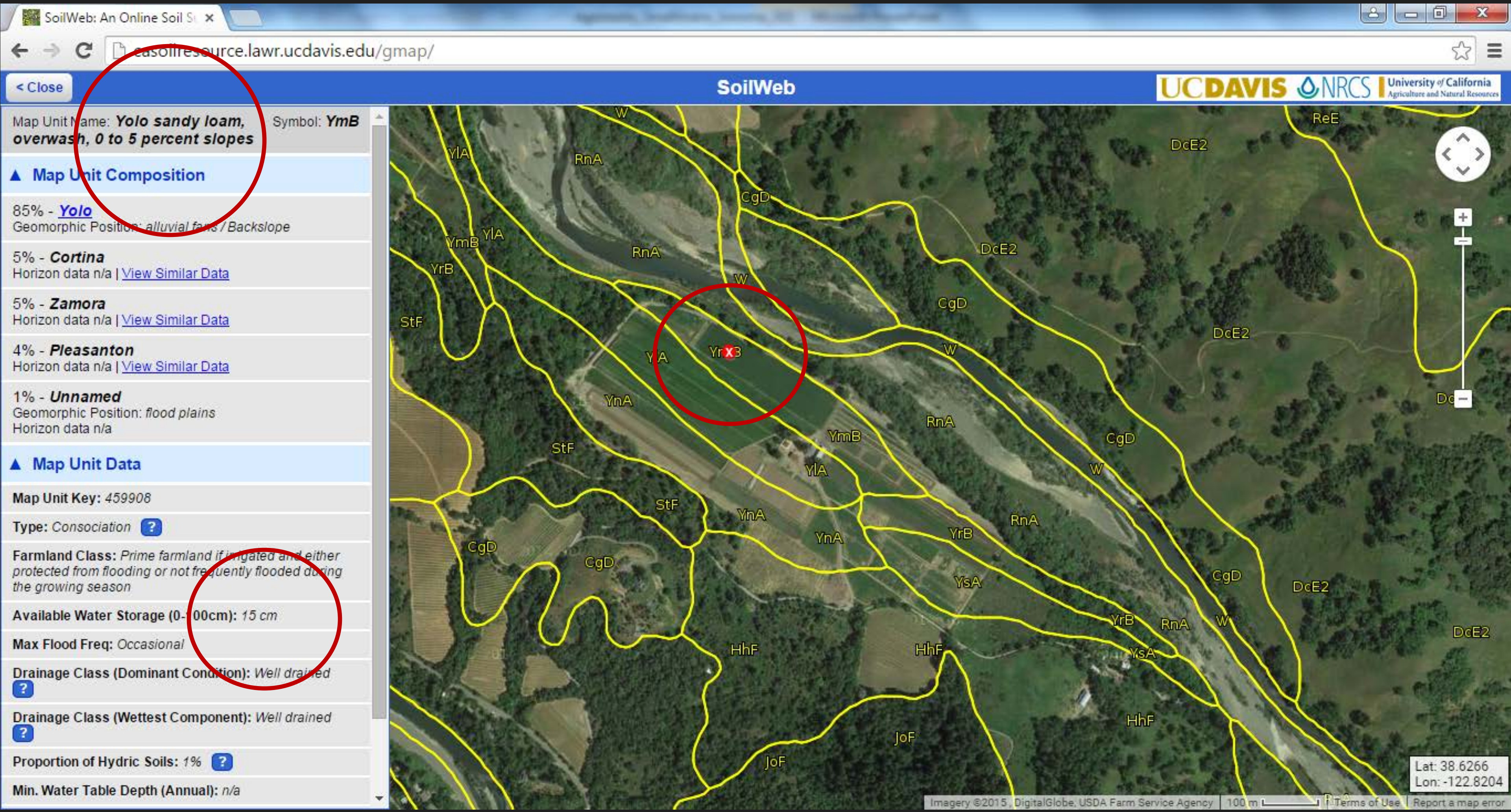
- Soil **texture** does not change
- Soil structure, porosity, water holding capacity, organic matter are affected by management:
  Eg. 1% increase in SOM
  - ≈ 5% increase water retention
  - improved infiltration, structure

What is my soil type?



google: “soil web ucdavis”

What can I learn from knowing my soil type?



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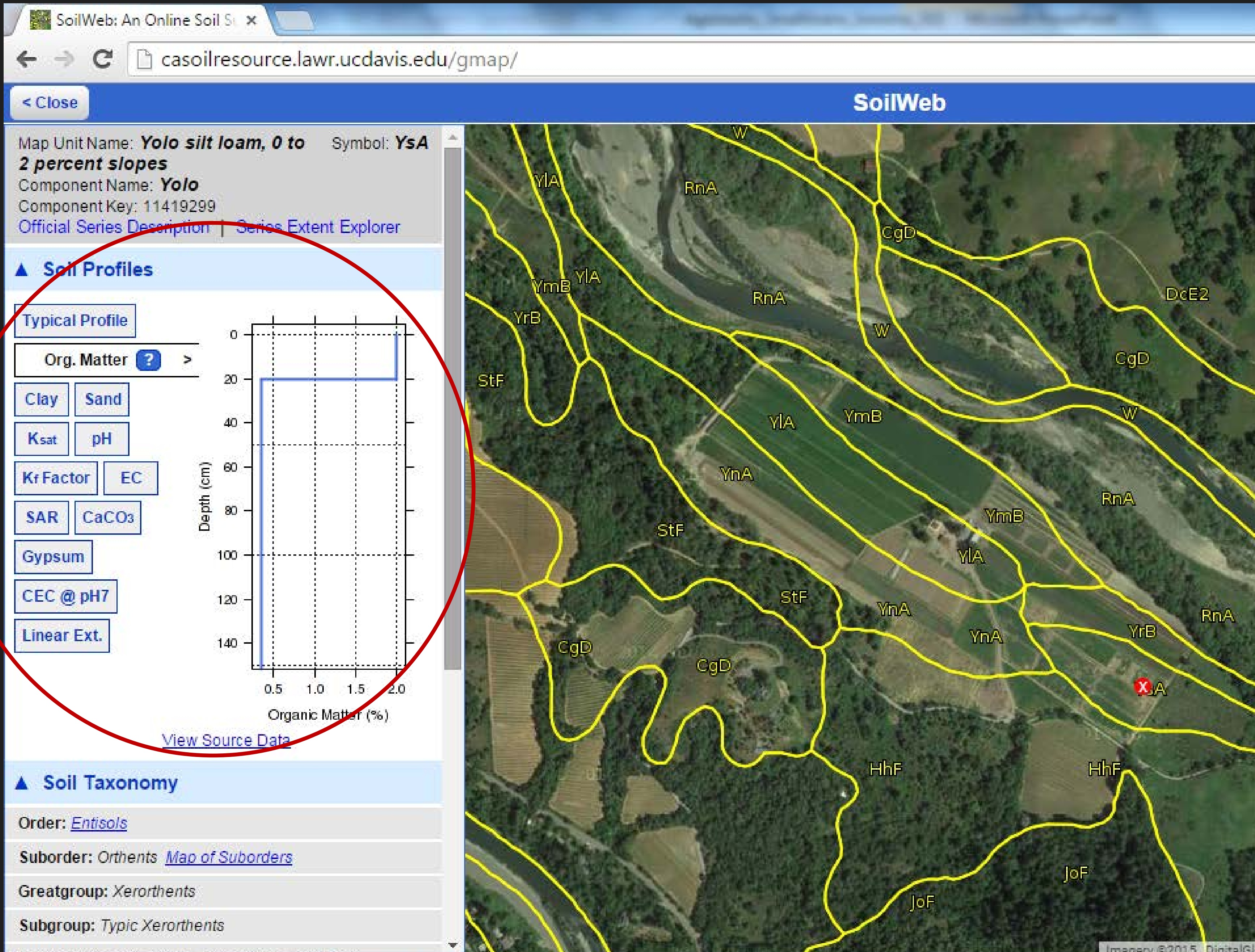

SoilWeb: An Online Soil S
casoilresource.lawr.ucdavis.edu/gmap/
< Close
SoilWeb
Map Unit Name: Yolo silt loam, 0 to 2 percent slopes
Symbol: YsA
Component Name: Yolo
Component Key: 11419299
Official Series Description | Series Extent Explorer
Soil Profiles
Typical Profile
Org. Matter ? >
Clay
Sand
Ksat
pH
Kf Factor
EC
SAR
CaCO3
Gypsum
CEC @ pH7
Linear Ext.
Depth (cm)
Organic Matter (%)
View Source Data
Soil Taxonomy
Order: Entisols
Suborder: Orthents Map of Suborders
Greatgroup: Xerorthents
Subgroup: Typic Xerorthents
Imagery ©2015 , DigitalGlob

Field-based soil texture estimation methods

Classification in the field
A simple manual texture test is shown below.

Explanation:
- A ball about 2.5 cm diameter is formed from approximately 1 tablespoon of fine earth.
- Water is slowly dripped onto the soil until it approaches the sticky point, i.e., the point at which the soil just starts to stick to the hand.
- The extent to which the moist soil can be shaped by hand is indicative of its texture.

Textural class:
(A) Sand - Soil remains loose and single-grained; can only be heaped into a pyramid.
(B) Loamy sand - The soil contains sufficient silt and clay to become somewhat cohesive; can be shaped into a ball that easily falls apart.
(C) Silt loam - Same as for loamy sand but can be shaped by rolling into a short, thick cylinder.
(D) Loam - About equal sand, silt, and clay means the soil can be rolled into a cylinder about 15 cm long that breaks when bent.
(E) Clay loam - As for loam, although soil can be bent into a U, but no further, without being broken.
(F) Light clay - Soil can be bent into a circle that shows cracks.
(G) Heavy clay - Soil can be bent into a circle without showing cracks.

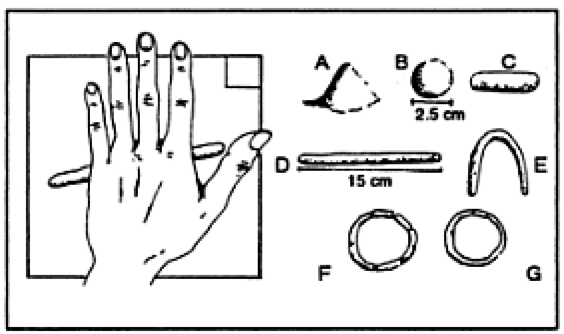
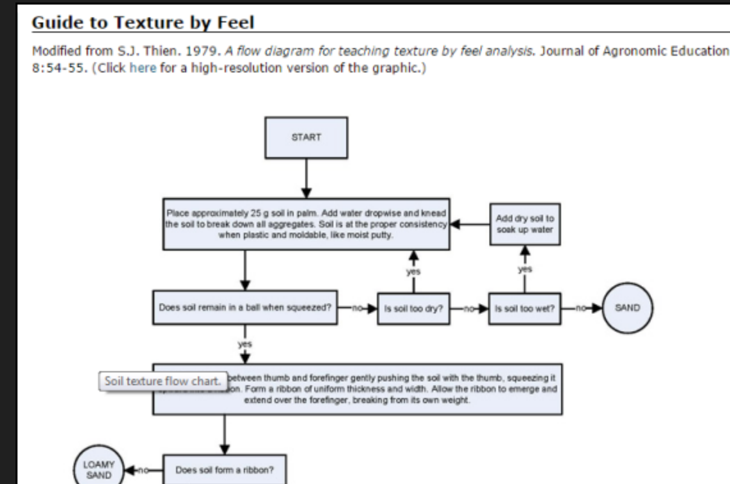


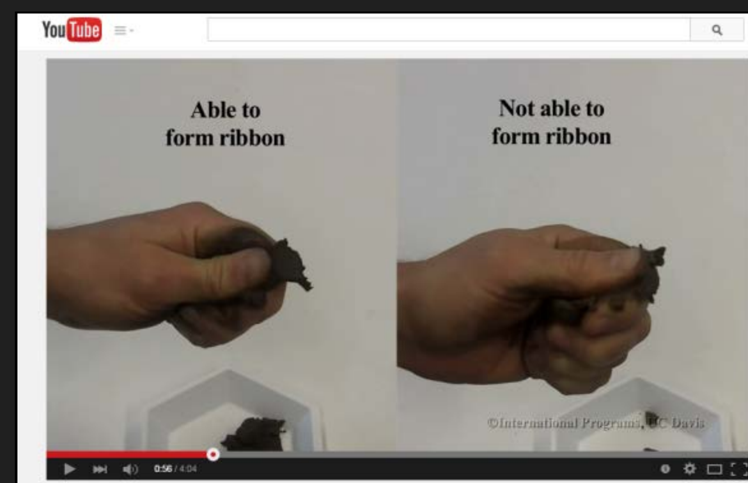
Figure 4. Field method for evaluation of soil texture by feel. From Ilaco (1985).

NRCS:



http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054311

UCDavis:

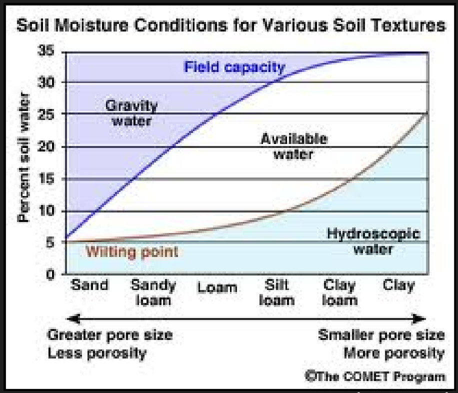


https://www.youtube.com/watch?v=GWZwbVJCNec

Estimating depth of moisture, time to stress from soil type

Table 1. Percent moisture by volume

Texture	Perm. Wilting Point	Field Capacity	Available Water
		%	
Medium Sand	2.5	10.0	7.5
Fine Sand	3.3	12.5	9.2
Sandy Loam	5.0	16.7	11.7
Fine Sandy Loam	6.7	21.7	15.0
Loam	10.0	26.7	16.7
Silt Loam	11.7	29.2	17.5
Clay Loam	15.0	31.7	16.7
Clay	21.7	33.3	11.7



Meted.ucar.edu

For a loam soil ≈ 27% moisture by volume at field capacity (FC).

- If the rooting depth is 20 inches, 20 in x 0.27 = 5.4 inches of water by volume
- **Rule of thumb**: FC/2 = available water. So, 5.4 / 2 = **2.7 inches** of available water.

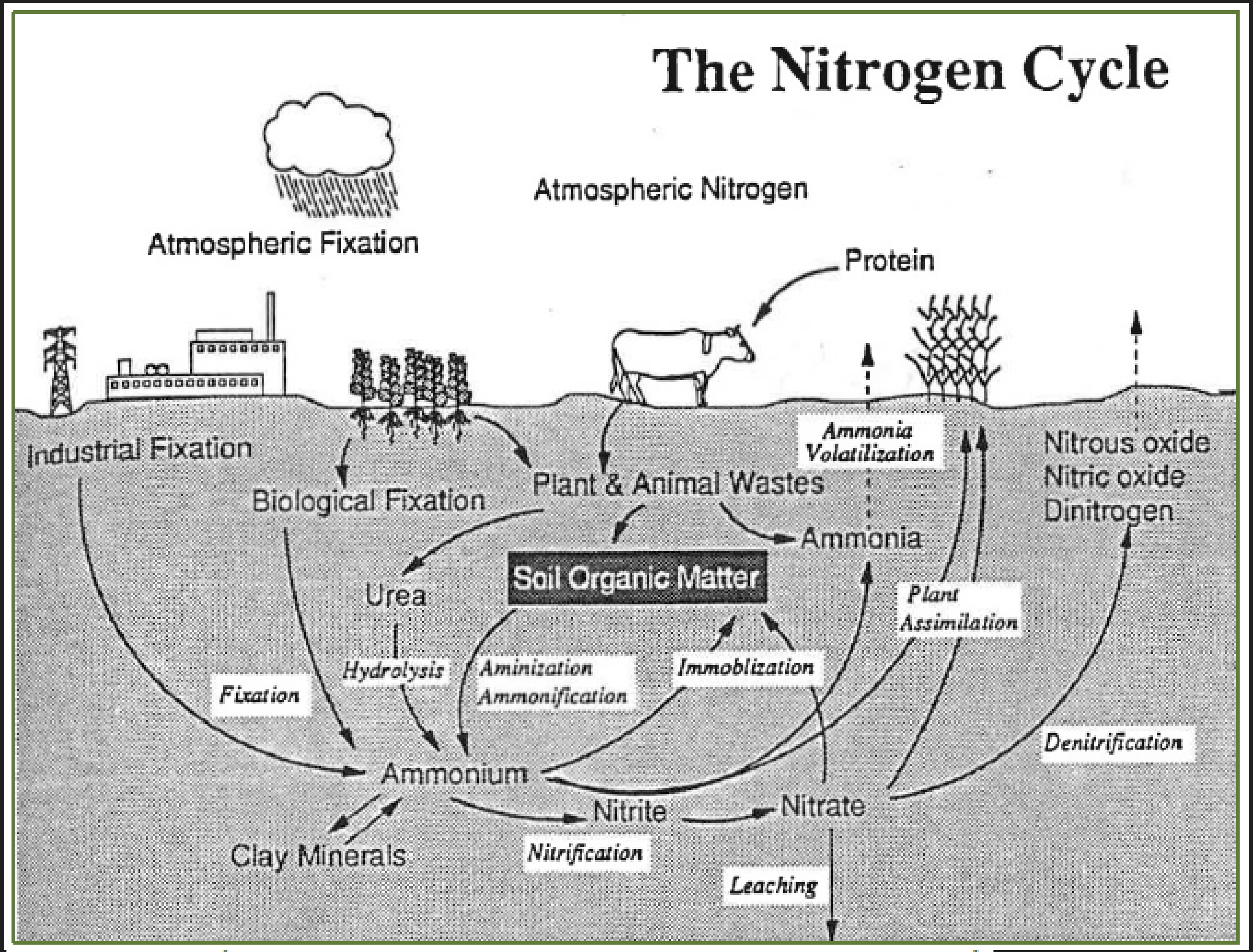
When will stress begin?

- **Rule of thumb**: stress begins at available water / 2. So 2.7 / 2 = **1.35 inches** before stress.

Average daily ET in April in Windsor = 0.20 inches

- 1.35 inches / 0.20 inches per day
  - ≈ 7 days before stress.
  - ≈ 9 days if you use the table.

Soil type is a major factor in soil fertility



Nitrogen cycle ("Soil as a Plant Sees It", University of Nebraska, 1991).

Estimating soil fertility: Don't let the perfect be the enemy of the good

Figure 3. Nitrate-N quick hand test.

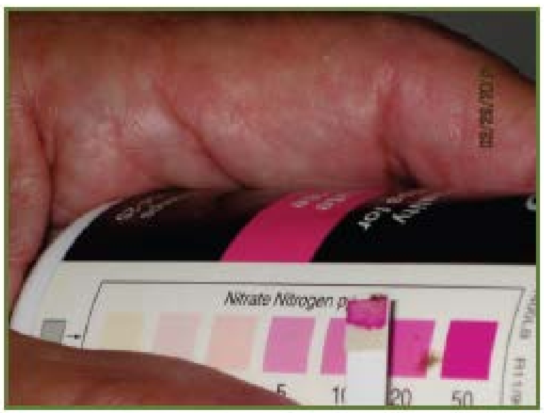


Figure 4. Nitrate color scale.

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053274.pdf

The Basic SOLVITA® Soil Response Color System

The patented gel-technology system indicates CO_2-respiration over a color range of 0 to 5 (see chart). In CO_2-Burst mode this corresponds to a range of 5 to 160 ppm CO_2-C. In BASAL mode it corresponds to a range of 0 – 55 ppm or 1 – 25 kg m²/year as CO_2.

All Solvita kits work with a basic visual color system, as shown below. By using the Solvita Digital Color Reader (DCR) the soil test values can be more accurately and precisely determined.

Sequence of Typical Soil Solvita Test Results:

Estimating soil fertility: Some <u>rough</u> rules of thumb

- Total N: Clay > Silt > Sand
  - effective/available N ≠ total N

- ppm soil NO3-N x 3.8 ≈ lb N ac^{-1} ft^{-1} of soil
  - eg. 12 ppm NO3-N (1st ft) x 3.8 ≈ 46 lbs available N

- Manure: assume about 10% mineralized / season
  - 5 tons dry manure / acre; with 1.8% N ≈ 18 lb ac^{-1} yr^{-1}

Estimating soil fertility: Some rough rules of thumb

- Prior crop N contribution (depends on productivity of prior crop):
  - Tomato residue ≈ 25 lb ac^{-1} returned
  - Alfalfa contribution ≈ 75 lb ac^{-1} +

- Soil organic matter (SOM) N mineralization:
  - 1.2% OM % x 30 lb N / % OM ≈ 36 lb ac^{-1}

- BUT! Mineralization rates vary (2-5%) $year^{-1}$
  - depend on C:N ratio, temperature, moisture, residue quality, etc.

Estimating soil fertility: Some <u>rough</u> rules of thumb

- Critical C:N ratio for residues ≈ 20
  - Residues with C:N > 20 will "fix" N

	C:N	Fix or release N?
Manure (Fresh)	15:1	RELEASE
Legumes (peas etc.)	15:1	RELEASE
Grass Clippings	20:1	EQUILIBRIUM
Weeds (Fresh)	25:1	FIX
Hay (Dry)	40:1	FIX
Weeds (Dry)	90:1	FIX
Straw, cornstalks	100:1	FIX
Sawdust	500:1	FIX

- <u>Bottom line</u>: fertility will be site-specific and a function of recent & long-term rotation/soil management

Estimating plant N removal from the system

If yield = **2500 lb acre^{-1}** and protein = **12.5%**

How much N am I removing from the system?

2500lb acre^{-1} x 0.125 / 5.7 (protein to N factor)

- **≈ 55 lb N in grain**

55 x 1.33 (additional straw requirement)

- = 73 lb – 55lb
- **≈ 18 lb N in straw**

If we estimated that 100 lb of N are available from soil NO3-N, SOM, and manure addition, will this crop experience N deficiency?

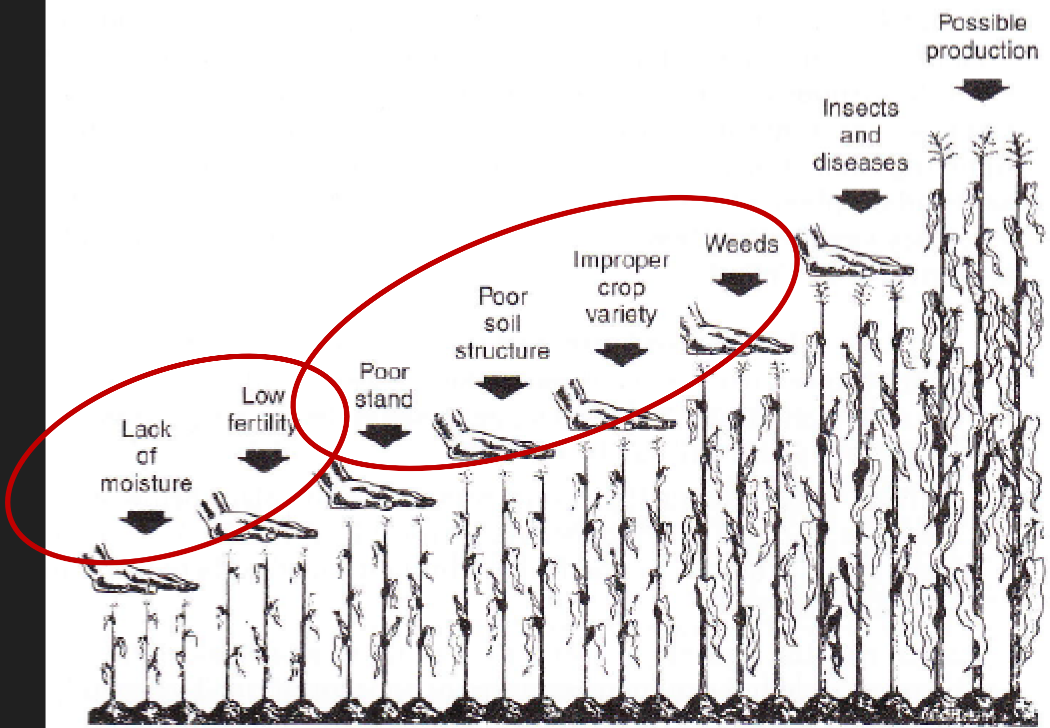
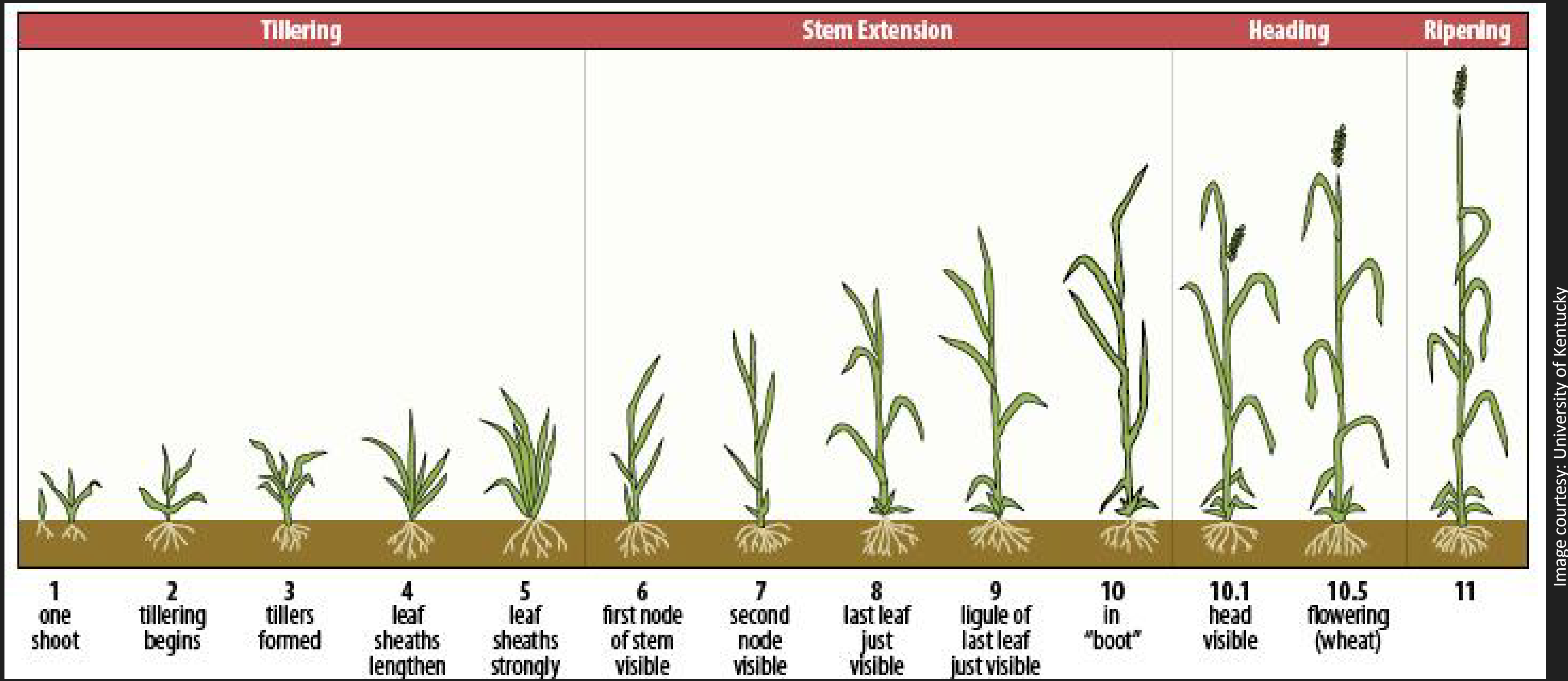


Figure 1-10 Leibig's Law of the Minimum states that the most limiting factor determines yield potential. Producers should minimize or eliminate the most limiting factor first, then the second most limiting factor, and so forth. Only in this manner can maximum yield potential be achieved *(Source: Potash and Phosphate Institute)*.

Havlin, J. L. et al. 2005. Soil Fertility and Fertilizers, 7th ed.

Small grain growth stages and yield components



plants acre^{-1}

tillers plant^{-1}

spikelets spike^{-1}

spike plant^{-1}

grains spikelet^{-1}

grains acre^{-1}

weight kernel^{-1}

GRAIN YIELD

Stand establishment

Seed selection

- Certified seed?
- plump uniform seeds, not cracked or broken, no weed seeds
  - < 1 year old
  - stored in dark, cool, dry conditions (free from pests and disease)

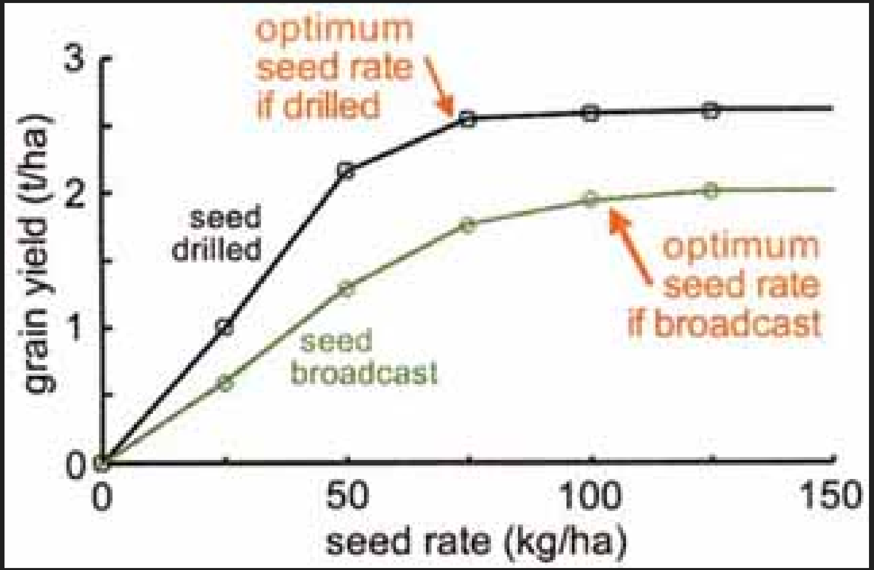
FAO. “Optimizing plant population, crop emergence and establishment”

Stand establishment

Germinability

- Rule of thumb: subtract 15% from germination test to get field germinability
- Seed-soil contact, soil moisture, temperature determine germination in the field
  - Rule of thumb: soil aggregates are no more than 3-4X seed size

Image courtesy: http://www.bcg.org.au/



FAO. “Optimizing plant population, crop emergence and establishment”

Stand establishment

Seeding Depth

- Rule of thumb: depth less than the coleoptile length.
    - coleoptile length varies
- Plant to moisture? or Moisture to follow?
    - Ensure sufficient moisture for complete germination

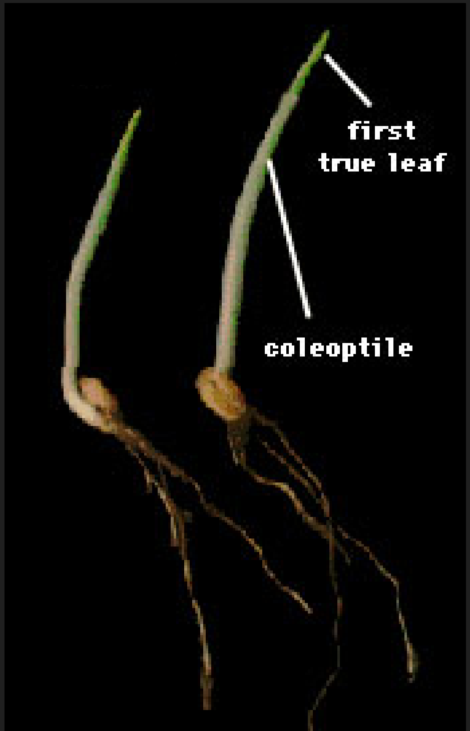


Image courtesy: U Minnesota

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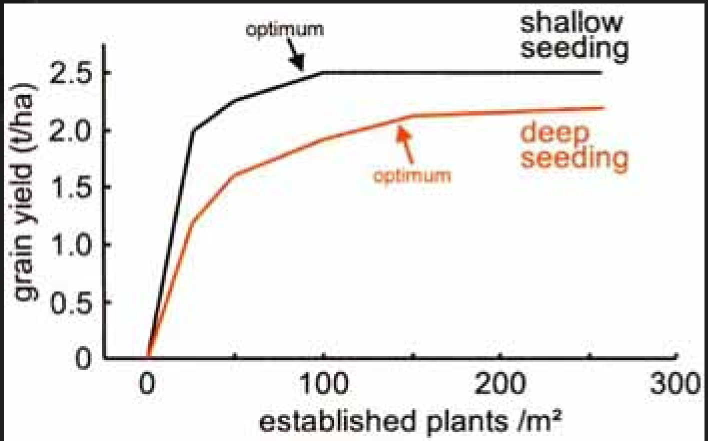
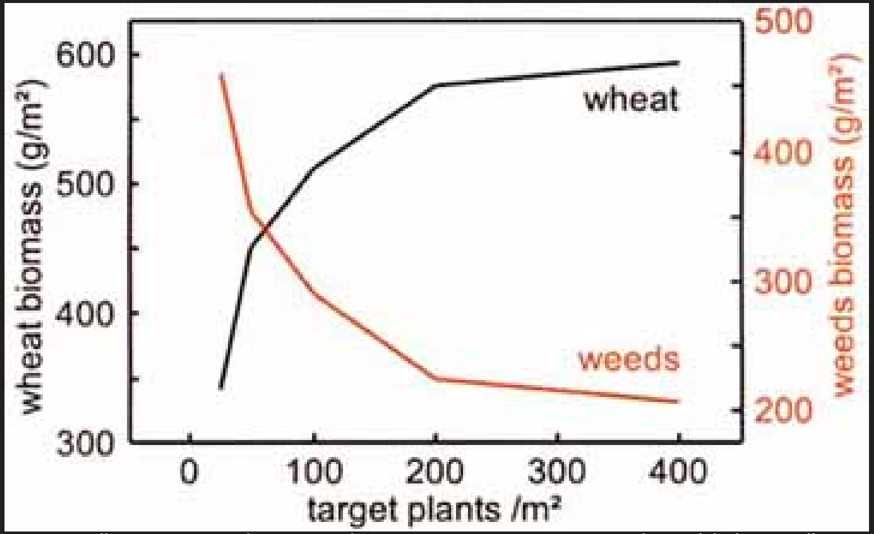


FAO. “Optimizing plant population, crop emergence and establishment”

Stand establishment

Seeding rate

- Optimum plant populations and seeding rates require some empirical work. Range for most small grains: 75 – 125 lb $acre^{-1}$
  - spelt is higher (160 lb $acre^{-1}$ +)*
- Seeding rate interacts with weeds.
- BUT! For heirloom varieties, higher seeding rates will also tend to produce more lodging. WHY?
  - Site fertility also interacts with lodging outcomes.



FAO. "Optimizing plant population, crop emergence and establishment"

*http://www.uvm.edu/extension/cropsoil/wp-content/uploads/TopTenGrowGrain.pdf

Stand establishment

Seeding rate exercise:

- 2, 6 inch rows with 12 seeds per linear ft = 24 seeds / ft^2
  - 43560 ft^2 $acre^{-1}$ x 24 seeds / ft^2 = 1045440 seeds $acre^{-1}$

- For 10000 seeds lb^{-1}:
  - 1045440 seeds $acre^{-1}$ / 10000 seeds lb^{-1}
    = 104 lb of seed $acre^{-1}$

- For 85% field germination rate:
  - 104 lb seed $acre^{-1}$ / 0.85 = 122 lb seed $acre^{-1}$

Stand establishment

Plant population exercise:

- 2, 6 inch rows with 12 seeds per linear ft = 24 seeds / ft^2
  - 43560 ft^2 $acre^{-1}$ x 24 seeds / ft^2 = 1045440 seeds $acre^{-1}$
- For 85% field germination rate:
  - 1045440 seed $acre^{-1}$ x 0.85 = 888624 plants $acre^{-1}$
  - How many tillers per plant?
  - How many spikes per tiller?
  - How many spikelets per spike?
  - How many grains per spikelet?
  - Kernel weight?
- For 2500 lb $acre^{-1}$ yield, how many plants support 1 lb?
  - 888624 plants $acre^{-1}$/ 2500 lb $acre^{-1}$ = 355 plants lb^{-1} grain
- When growing an heirloom variety, determining the optimum plant stand & seeding rate for your operation is worth the effort!

A brief note on TILLAGE

Why till?

- residue incorporation
- weed competition
- soil aeration
- aggregation (short term)
  - seed-soil contact

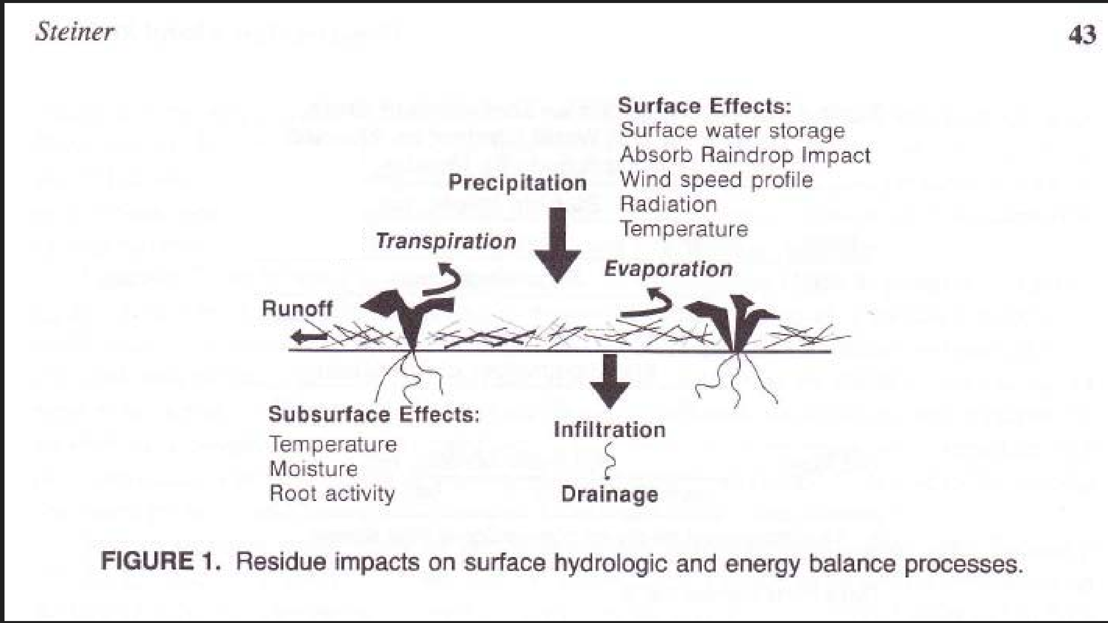


FIGURE 1. Residue impacts on surface hydrologic and energy balance processes.

Why no-till?

- reduced erosion, increased microbial diversity
- improved carbon retention, nutrient cycling (long term)
- improved water use efficiency, infiltration (long term)

Benefits of no-till are realized over the medium, long-term

- specialized equipment required
- short-term productivity losses
- residue, weed control are an issue for organic no-till

Variety Choice

ORGANIC seed ALLIANCE

Organic Seed Alliance

Advancing the ethical development and stewardship of the genetic resources of agricultural seed

PO Box 772, Port Townsend, WA 98368

2013 California North Coast Organic Wheat Trials

UC CE

In partnership with University of California Cooperative Extension

California WHEAT COMMISSION

COLUMBIA FOUNDATION

With support from the California Wheat Commission and Columbia Foundation

http://seedalliance.org/publications

Variety Choice

		Stripe rust	Relative maturity			Plant height			Lodging		Yield @ 13% moisture			Moisture		Test weight		Protein		
Variety	Type	CR	CR	FPF	ALL	CR	FPF	ALL	CR	FPF	CR	FPF	ALL	CR	FPF	CR	FPF	CR	FPF	ALL
		- % -	---- 1 to 9 scale ----			---------- in ----------			-- 1 to 9 scale --		-------- lbs / acre --------			-------- % --------		---- lbs / bu ----		---------- % ----------		
Yecora Rojo	HRS	76.7a	**3.0e**	**2.8e**	**2.9e**	18.0f	20.0f	19.0e	8.3bc	**6.5abc**	**3265ab**	**1908a**	**2587a**	13.1cd	11.7a	60.2c	**59.6ab**	12.6c	10.2e	11.4d
Canus	HRS	43.3b	5.0d	5.0d	5.0d	34.0c	30.0bc	32.0b	**7.0c**	3.0d	2609bc	1392b	2000b	13.1cd	**10.8e**	62.1b	**59.9a**	13.3b	13.5bc	13.4bc
Lassik	HRS	**0.0c**	4.8d	5.3d	5.0d	25.3d	24.0e	24.7d	8.8ab	**8.0ab**	**3585a**	**1816a**	**2701a**	**12.5d**	**10.9de**	**63.9a**	**60.0a**	12.7bc	12.6cd	12.7c
Red Fife	HRS	63.3a	7.3b	7.0b	7.1b	36.7b	30.5b	33.6b	8.0bc	6.3bc	1901de	616d	1258de	14.0ab	11.1cd	62b	**59.9a**	13.2b	14.2b	13.7b
Alturas	SWS	**3.3c**	5.0d	5.0d	5.0d	22.7e	26.3de	24.5d	**7.0c**	**8.5a**	2197cde	949c	1573cd	13.8bc	11.3bc	62.8b	58.1bc	11.1d	11.5de	11.3d
Diva	SWS	**10.0c**	6.0c	6.0c	6.0c	25.7d	27.5cd	26.6c	**7.3c**	5.75c	2465cd	896cd	1680c	13.9bc	11.2c	62.2b	**60.2a**	11.5d	11.5d	11.5d
Foisy	SWS	46.7b	9.0a	9.0a	9.0a	**45.3a**	**35.3a**	**40.3a**	9a	**7.5abc**	1692e	638cd	1165e	14.7a	11.5ab	60.8c	57.8c	**15.2a**	**17.1a**	**16.2a**
AVE		34.8	5.7	5.7	5.7	30	27.6	28.7	2.1	6.5	2531	1173	1852	13.6	11.2	62.0	59.4	12.8	12.9	12.9
CV (%)		25	5	5	5	6	7	6	45	22	23	18	23	3	2	1	2	3	7	5
LSD		12.7	0.4	0.4	0.3	2.5	3	1.9	1.4	2.1	791	314	411	0.76	0.3	0.7	1.7	0.5	1.3	0.7

CR = College of the Redwoods Farm

FPF = Front Porch Farm

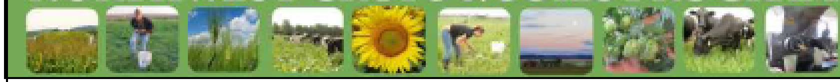
ALL = Combined results from CR and FPF

Numbers in **bold** are the optimum greatest or least trait value or are not significantly different from the optimum

Letters after trait value indicate groups of varieties whose means are not significantly different for that trait.

Variety Choice

NORTHWEST CROPS & SOILS PROGRAM



2014 Heirloom Spring Wheat Seeding Rate Trial

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Visit us on the web: http://www.uvm.edu/extension/cropsoil

UNIVERSITY OF VERMONT EXTENSION
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http://www.uvm.edu/extension/cropsoil/grains

The Whole Grain Connection

http://www.sustainablegrains.org/

List of available seeds

Common wheat (hexaploid, free threshing)
Triticum aestivum ssp aestivum

Variety (WGC catalog number) USDA accession number	*Bearded or beardless*	*Historical notes (year collected by USDA or other)*	*Seed color (white or red)*	*Spring (short season) or winter (long season) type*
Sonora (012) CItr 3036	beardless	Cultivar from landrace in Durango, Mexico. Perhaps the first successful wheat in Mexico from 1500. (1907)	Pale yellow (white)	Spring (shortest season)
Wit Wolkoring (013) PI 479660	beardless	Cultivar from South Africa. Presumed from landrace, but may be a cross.(1983)	Pale yellow (white)	Spring (shortest season)

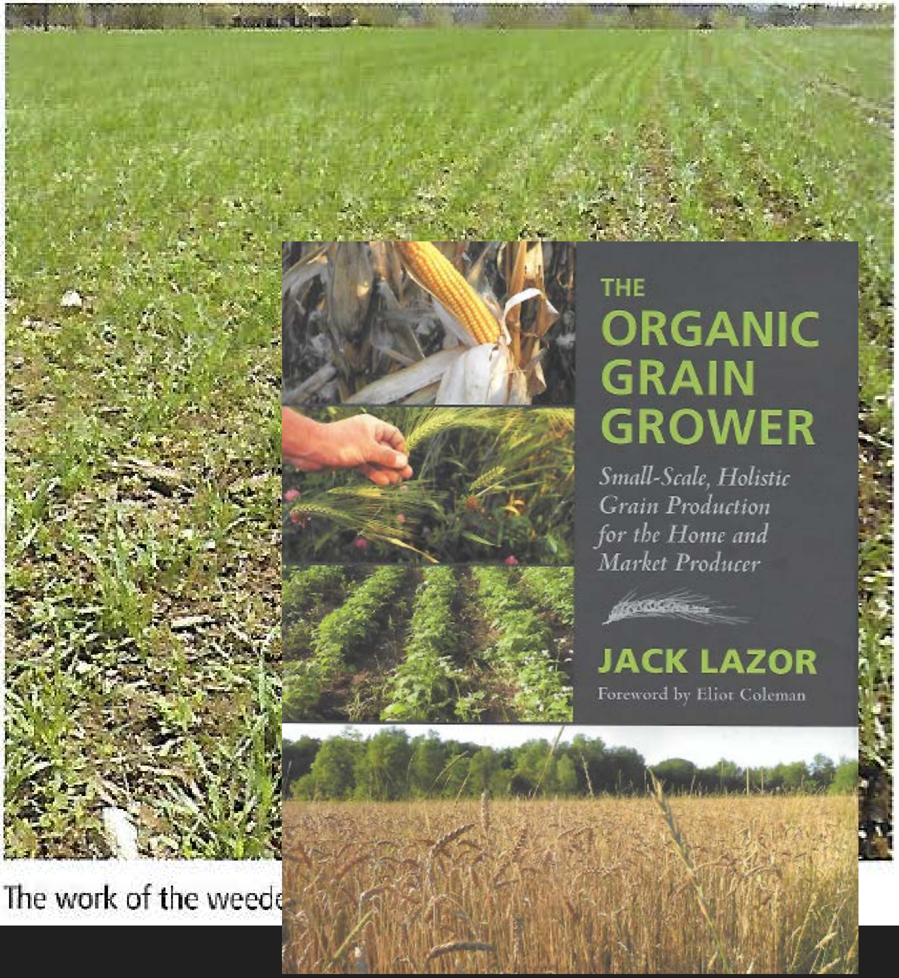
http://www.sustainablegrains.org/sitebuildercontent/sitebuilderfiles/wheatseedcatalog2015.pdf

Weed management

Tine weeding at early vegetative growth stage

- soil moisture, subsequent water will play into success/failure

First pass with the tine weeder after spring wheat emergence.

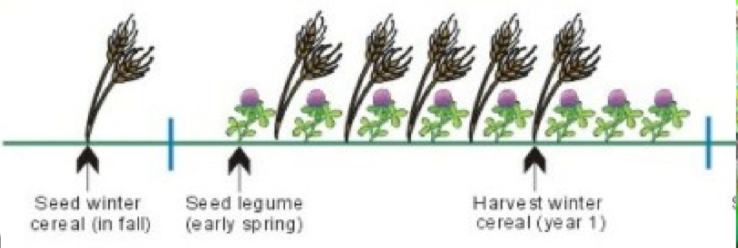


The work of the weede

From: Lazor, 2013. "The Organic Grain Grower."

Weed management

Inter-seeding / relay-seeding red clover



Gaudin A *et al.,* Agronomy (2013) 3: 148–180

Weed management

Stale seedbed techniques

- require precision in space and time

Image courtesy: http://store.farmstart.ca/

Weed management

Cultivar, moderate-residu ×

www.sare.org/Learning-Center/Books/Steel-in-the-Field/Text-Version/Row-Crop-Tools/Cultivar-moderate-residue

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Acknowledgments

Publisher's Foreword

Cultivation In Context

How to Use This Book

Introduction to Tools for Agronomic Row Crops

Row Crop Tools

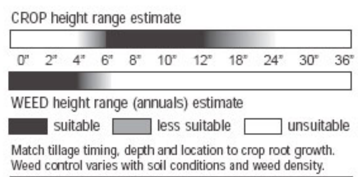
- Rotary hoe, standard
- Rotary hoe, high-residue
- Rotary hoe accessories
- Flex-tine weeder
- Spike-tooth harrow

Cultivar, moderate-residue

You are reading the SARE book *Steel in the Field*. Order this publication.

Agronomic Row Crops
Moderate-Residue Cultivator

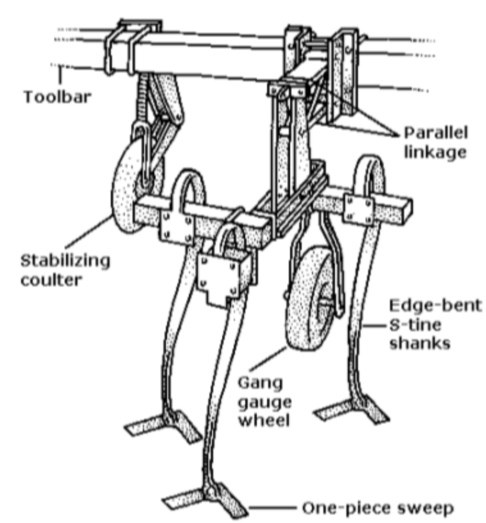
Units intended for conservation tillage conditions (tilled residue with 30 percent coverage) or an untilled corn crop yielding up to 120 bushels/acre in loose to moderate soils with occasional stones up to 10 pounds.



Overview: These cultivators are a popular step up from a conventional cultivator for their ability to handle moderate weed pressure and moderate residue for less cost than a high-residue tool. S-tine tools have three to five shanks per row middle and generally weigh less than single-shank units. Choose sweep shape for your desired weed impact (i.e., bury, slice or uproot) and degree of soil/residue mixing. (See 'Cultivator sweep options,') Operating depth is about 1"

http://www.sare.org/Learning-Center/Books/Steel-in-the-Field/Text-Version/Introduction-to-Tools-for-Agronomic-Row-Crops

- Introduction To Cultivators
- Cultivator, low-residue
- ***Cultivar, moderate-residue***
- Cultivator, high-residue
- Cultivator, maximum-residue
- Cultivator, rolling
- Cultivator, horizontal disk
- Cultivator sweeps, knives and wings
- Cultivator shields
- Cultivator components
- Hot-Tips for Flame Weeding
- Row-crop flamer
- Guidance Systems
- Guidance mirrors
- Guidance, furower/wheel
- Guidance, ridge mechanical
- Hitch-steer guidance
- Side-shift guidance



Design Features: Compared with *low-residue* S-tine cultivators, these units usually have higher toolbar clearance (24" to 32") and longer front-to-back clearance (40" to 52"), allowing better flow between shanks, and between shanks and coulters, and overall stronger construction. Most have parallel linkage. Close-coupled, single-shank units are highly maneuverable and reduce

Dual purpose wheat

Increased flexibility / risk mitigation for integrated crop-livestock systems

- generally fall-established wheat
- wait to graze until wheat is tillering
- grazing too long will severely reduce grain production
    - remove animals prior to first hollow stem

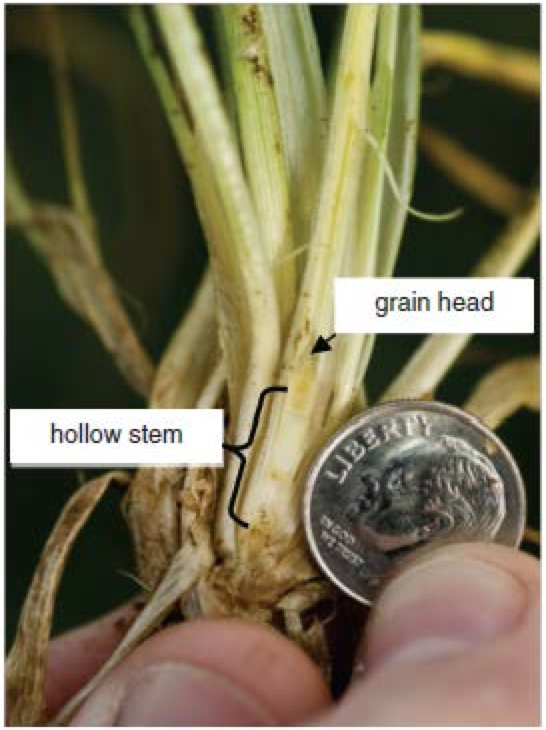
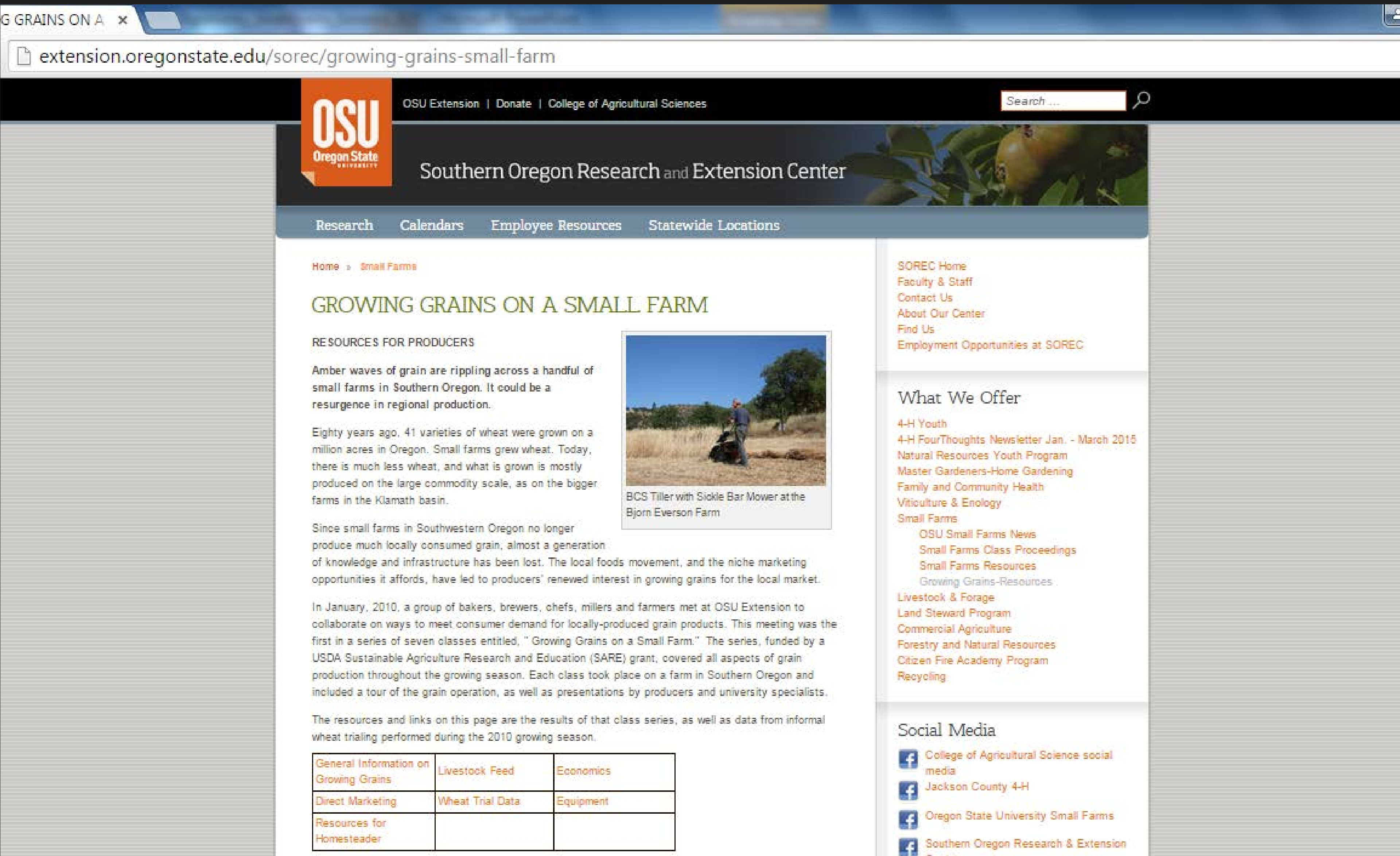


Figure 2. First hollow stem occurs when hollow stem equivalent to the diameter of a dime (1.5 cm) is present below the developing grain head.

Oklahoma State University: http://osufacts.okstate.edu/docushare/dsweb/Get/Document-6693/PSS_2147web.pdf

Additional resources & other cool things



G GRAINS ON A ×

extension.oregonstate.edu/sorec/growing-grains-small-farm

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GROWING GRAINS ON A SMALL FARM

RESOURCES FOR PRODUCERS

Amber waves of grain are rippling across a handful of small farms in Southern Oregon. It could be a resurgence in regional production.

Eighty years ago, 41 varieties of wheat were grown on a million acres in Oregon. Small farms grew wheat. Today, there is much less wheat, and what is grown is mostly produced on the large commodity scale, as on the bigger farms in the Klamath basin.

BCS Tiller with Sickle Bar Mower at the Bjorn Everson Farm

Since small farms in Southwestern Oregon no longer produce much locally consumed grain, almost a generation of knowledge and infrastructure has been lost. The local foods movement, and the niche marketing opportunities it affords, have led to producers' renewed interest in growing grains for the local market.

In January, 2010, a group of bakers, brewers, chefs, millers and farmers met at OSU Extension to collaborate on ways to meet consumer demand for locally-produced grain products. This meeting was the first in a series of seven classes entitled, " Growing Grains on a Small Farm." The series, funded by a USDA Sustainable Agriculture Research and Education (SARE) grant, covered all aspects of grain production throughout the growing season. Each class took place on a farm in Southern Oregon and included a tour of the grain operation, as well as presentations by producers and university specialists.

The resources and links on this page are the results of that class series, as well as data from informal wheat trialing performed during the 2010 growing season.

General Information on Growing Grains	Livestock Feed	Economics
Direct Marketing	Wheat Trial Data	Equipment
Resources for Homesteader		

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What We Offer

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4-H FourThoughts Newsletter Jan. - March 2015
Natural Resources Youth Program
Master Gardeners-Home Gardening
Family and Community Health
Viticulture & Enology
Small Farms
OSU Small Farms News
Small Farms Class Proceedings
Small Farms Resources
Growing Grains-Resources
Livestock & Forage
Land Steward Program
Commercial Agriculture
Forestry and Natural Resources
Citizen Fire Academy Program
Recycling

Social Media

College of Agricultural Science social media
Jackson County 4-H
Oregon State University Small Farms
Southern Oregon Research & Extension Center

http://extension.oregonstate.edu/sorec/growing-grains-small-farm

Additional resources & other cool things

http://www.tillersinternational.org/

Additional resources & other cool things

https://www.youtube.com/watch?v=hxNIeLUgYpg

Additional resources & other cool things

farmhack.org/tools/home-built-no-till-seed-drill

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Home built no-till seed drill

Short description:
This is my home built no-till seed drill I use for planting legume mix winter cover crop seed in our stone fruit orchard. It produces very uniform seed spacing and depth with minimal soil disturbance, allowing optimum germination in our dry farmed environment.

http://farmhack.org/tools/home-built-no-till-seed-drill

Additional resources & other cool things

owered thresher ×

farmhack.org/tools/bicycle-powered-thresherfan-mill-and-dehuller-1

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bicycle powered thresher,fan mill, and dehuller

Short description:
prototypes of a suite of bike powered tools for small scale grain processing; a thresher, a fan mill/winnower, and a dehuller. Many thanks to Olaf B-N for making this video:
https://www.youtube.com/watch?v=Lgnmhtbgyfg

http://farmhack.org/tools/bicycle-powered-thresherfan-mill-and-dehuller-1

Hope springs eternal…

Thank you!

contact: melundy@ucanr.edu