Tri-Basin Irrigator

Volume 17, Issue 3 June 22, 2017

Program Information

EQIP & Farm Program Benefits:

EQIP – Ephemeral Gully Control Initiative

IF YOU FARM HIGHLY ERODIBLE LAND THAT MUST FOLLOW A CONSERVATION PLAN TO REMAIN IN COMPLIANCE FOR USDA PROGRAM BENEFITS, THEN YOU NEED TO KEEP READING.

In my first issue of this newsletter dated May 25, 2017, I mentioned that starting in 2017, ephemeral gully erosion is going to have to be controlled. These are the draws where runoff creates ditches that are disked in order to farm through them.

This EQIP Initiative is a program where you can receive financial assistance to help get you started in controlling these erosive areas. Financial assistance will be provided for such things as cover crops, grassed waterways, terraces, erosion control structures, etc.

APPLICATION CUTOFF FOR THIS PROGRAM IS JULY 21, 2017.

Calendar of Events

July 3: CNPPID Board of Directors Meeting 9 AM
July 4: Independence Day – Gov't offices closed
July 11: TBNRD Board Meeting 1:30 PM

Tool to Determine Crop Water Use – Part 2

In the last issue, you were introduced to the 2017 NAWMN. This network is a tool for area and participating producers to determine how much water their crops are using. The following is an example of how to use this tool.

Step 1: You need to know the crop stage of the crop in the field you are working with. There are descriptions at the bottom of page 3 in each issue of this newsletter to assist you. Once you know your crop stage, you can determine your crop coefficient (Kc), also found on page 3. In our example, corn is at 12 leaf, so the Kc equals 0.88.

Step 2: Go to one of the two websites found on page 3 of each newsletter (under "NAWMN Sites"). Select an atmometer station nearest your field and determine the amount of evaporation (reference ET) that has taken place. A general map of atmometer locations is shown on page 3. In this example, evaporation will be 1.8 inches for the week.

Step 3: Calculate ET or Crop Water Use. Multiply evaporation (reference ET) by your crop stage coefficient (Kc): 1.80 inches * 0.88 Kc = 1.584 inches used by your corn for the respective week. To calculate average daily water use, divide by 7 days: 1.584 inches / 7 days = 0.226 inches used per day.

As a side note, when you go to either of these websites, there will be charts showing you weekly crop water use, thus eliminating your need to calculate the weekly use.

As one gets used to this tool, one can tweak it to better work for their irrigation water management program. As shown above, one can calculate daily water use. Another option is by knowing the weather forecast, one can project an estimated crop water use over the next few days.

If questions, call Curtis Scheele at 308-995-6121, Ext. 3.

Curtis's Column

USDA United States Department of Agriculture
Natural Resources Conservation Service

100 Degree Heat – Irrigate or Not?:

Well this week we saw temperatures at or near 100 degrees. Should we be irrigating? Corn roots are 12-18 inches deep on average while soybeans are nearing a foot. Beans are still at 100% at all 4 depths. Corn is at 75% in the first foot and 100% deeper. Pivots have been running so that can play a factor in the 75% moisture in the first foot. One way to know if you need to be irrigating is through soil moisture sensors. Knowing what your moisture levels are along with your soil capacity will help you determine if you need to irrigate. Having 100 degree heat, leaves curling and the surface looks dry doesn't necessarily call for irrigation. *Here is a link for more information just written on June 16th: http://cropwatch.unl.edu/2017/how-much-irrigation-needed-corn-vegetative-growth-stage.*

Pivot Corn -- Holdrege Silt Loam	
Soil Depth	**June 19, 2017**
1 foot	75%
2 foot	100%
3 foot	100%
4 foot	100%
4 ft. avg.	94%

Pivot Soybeans -- Holdrege Silt Loam	
Soil Depth	**June 19, 2017**
1 foot	100%
2 foot	100%
3 foot	100%
4 foot	100%
4 ft. avg.	100%

Soil Health Series: Aggregate Stability

Soil aggregates are groups of soil particles that are bound together. They are like miniature clods. Another way to look at it is they are the crumbs in a nice crumbly soil.

Aggregate Stability is the ability of soil aggregates to hold together when disruptive forces such as rain or wind put the soil to the test. Tillage destroys these aggregates. Then when it rains, individual soil particles are easily moved forming crusts or the particles are washed away and soil deposition is left at the bottom of the hill. Or wind carries the particles in the air.

Ephemeral gullies are worsened when tillage is used to smooth out the gullies. The soil aggregates are broken down thus causing the soil to be washed away more readily. Also, pivot tracks that are tilled will continue to have tracks due to the breaking of down of soil aggregates.

You can click this link to watch a powerful short 1-minute video comparing tilled vs non-tilled soil with the Aggregate Stability test: https://www.youtube.com/watch?v=9_ItEhCrLoQ. Also, attached is a Soil Quality Indicator sheet and an Aggregate Stability sheet.

CNPPID Notes

Summer is here:

The corn needs water and producers are out in full force this week starting up pivots and laying out irrigation pipe for the gravity fed fields. Diversions into all three of our irrigation canals increased substantially this morning so it appears that summer is officially here!!

Inflows into Lake McConaughy remain over 1,000 cfs and the lake level has been holding steady to slightly increasing; current elevation is 3,258.1' or 88.3% of capacity and the lake is holding a volume of 1,539,900 acre-feet. Central water users have a full allocation this year and are nearly assured of the same for 2018.

Word from Al Dutcher, Nebraska Climate Center is that he agrees with the Climate Prediction Center's 3-month outlook for June – August. CDC is forecasting the probability of above normal precipitation for the entire state through that period and wetter conditions in the NE panhandle and the majority of the North and South Platte Basins. Areas of above normal temperatures for the same time frame miss Nebraska and the Platte Basins and are projected to the West, South and East of us. If these forecasted conditions hold through August, it puts our area into position for excellent yield potential with less energy requirements for irrigation.

For Central customers, we have field rain gauges if you need them; you can pick them up at the Holdrege office. Central customers with center pivot fields, may request a daily soil water balance Excel spreadsheet for your field(s) that is connected to a graph of the same. It requires daily entries of ET that I send you and entries of any irrigation or rainfall. It is simple and effective information for irrigation scheduling.

Tri-Basin NRD News

Check Chemigation Systems Before Using Them:

Do you plan to apply fertilizer or ag chemicals to your fields through your center pivot system? If so, you will need a chemigation permit from Tri-Basin NRD for each system you plan to use. Call our office at 1-877-995-6688 for more information about the permitting process.

If you already have chemigation permits, it's a good idea to check your safety equipment over at least once a year to make sure all the equipment is in working order.

When NRD staff conduct a chemigation safety equipment inspection, the well and pivot system need to be started and operating at normal operating pressure for at least one minute. NRD staff will then check the following:

- Did some water discharge from the low pressure drain and then stop as the system's pressure increased? (Also, remember that you're supposed to have 20 feet of hose attached to your low-pressure drain to carry contaminated water away from the well.)
- Is the chemical injection line check valve free of water leaks?

During shutdown of the system, NRD staff check:

- Does the injection pump shut off when the system shuts off?
- Was air drawn into the pipeline through the vacuum relief valve?
- Is the irrigation pipeline check valve watertight?
- Did some water discharge from the low pressure drain and then stop (this will occur if the pipeline check valve is not leaking)?

Nebraska Extension Extras

Expanding Growing Degree Days Usage:

Growing Degree Days (GDD) or Heat Units, which are useful for predicting corn hybrid comparative relative maturity, are now being used to predict insect activity. Since GDD accounts for average daily temperature accumulation, it may also predict potential insect outbreaks and prove more reliable than using a calendar. The main difference between crop and insect GDD models is baseline development threshold temperatures.

Altitude temperature variation cause insect development to vary across Nebraska. Insects are exothermic (cold-blooded); so their body growth is affected by surrounding temperatures. Every insect requires a consistent amount of heat accumulation to reach certain life stages regarding egg hatch or adult flight. Early in the season, numbers accumulate slowly; but as the average daily temperature increases, GDD accumulates quicker. Our *http://cropwatch.unl.edu/* website offers free "Insect Threshold Simulations" for managing many crop insect pests.

Alfalfa weevils spend the winter as adults and become active with the first warm days of spring as they move from overwintering sites into egg laying stages in the alfalfa plant stems. Research indicates that it takes approximately 300 GDD's for spring-deposited alfalfa weevil eggs to hatch. Alfalfa weevil lower temperature development threshold is 50°F

Bagworm insects emerge from previous year cocoons when GDD accumulate to 600 (June 5 in 2017); so insecticide treatment application was recommended to begin one to two weeks later based on timely insect windbreak scouting.

Western Bean Cutworm (WBC) lower temperature threshold is 38ºF with an upper threshold of 75ºF. Based on UNL models, 25% of the WBC insect flights will be completed in Holdrege on July 11, 2017 (2577 GDD's).

Day length affects corn maturity much less than soybeans and other crops. Therefore, corn tends to mature based on the amount of "heat units" encountered during development. Corn matures faster with warmer, rather than cooler, day and night temperatures (as long as they are not too hot so as to cause stress). Because corn plants tend *not* slow growth when the temperature exceeds **86°;** and growth effectively stops when the temperature falls below **50°F**, these limits are used in heat unit calculation.

Both Extension websites: *http:cropwatch.unl.edu/gdd-etdata* and *https://mygeohub.org/groups/u2u/gdd* provide up to 30-year historical GDD data based on zip code. Another free weather data source is the UNL High Plains Climate Center at: *http://climod.unl.edu/*

The U2U (useful to useable) website provides the free "Corn Growing Degree Day GDD decision support tool." This tool simulates average GDD's; average last Spring freeze; first Fall freeze; corn silking stage; and black layer (full maturity) stage development. It also provides 30-year historical trends; climate risk assessment; field activity planning; and marketing aids.

Irrigators may improve water application efficiency through adjusted irrigation amounts based on crop stage development. Based on planting date and GDD accumulation since planting; corn emergence to V10 development stage takes 82 GDDs per leaf. After V10 until tasseling, it takes about 50 GDDs per leaf.

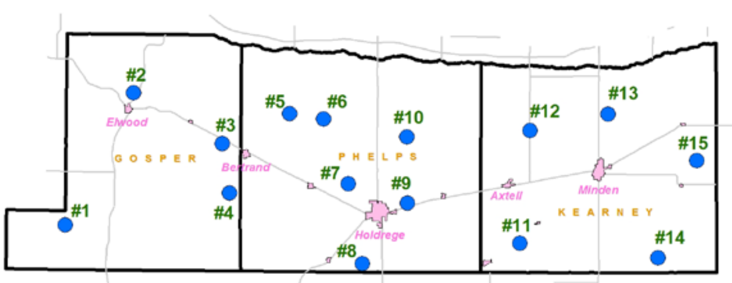
CornSoyWater.unl.edu/ and *SoyWater.unl.edu* are useful tools for both rain-fed and irrigated crop managers. Field-specific location data; predicted crop development and final yield predictions are also provided with these resources.

NAWMN Crop ET Information

Additional Information and other ET resources can be found at websites listed under “ET Information Sites” below.

Inches of Crop Water Use (ET) = Evaporation x Kc

	June 5 – June 11		June 12 – June 18	
Site	Evaporation	Rain	Evaporation	Rain
1	2.40	0.14	2.60	0.07
2	2.10	0.00	2.40	0.01
3	1.90	0.00	2.20	0.00
4	2.05	0.00	2.30	0.05
5	2.00	0.00	2.20	0.00
6	2.10	0.00	2.20	0.00
7	2.20	0.00	2.40	0.00
8	2.00	0.00	2.60	0.00
9	2.00	0.00	2.20	0.00
10	2.20	0.00	2.40	0.00
11	2.00	0.06	2.20	0.00
12	2.00	0.00	2.40	0.00
13	2.30	0.04	2.30	0.00
14	2.00	0.08	2.50	0.00
15	2.30	0.12	1.90	0.09



2017 Map of NAWMN Sites across the Tri-Basin NRD.

Crop Coefficients (Kc)

Corn Stage	Kc	Soybeans Stage	Kc
2 leaf	0.10	Cotyledon (VC)	0.10
4 leaf	0.18	1st Node (V1)	0.20
6 leaf	0.35	2nd Node (V2)	0.40
8 leaf	0.51	3rd Node (V3)	0.60
10 leaf	0.69	Beg. Bloom (R1)	0.90
12 leaf	0.88	Full Bloom (R2)	1.00
14 leaf	1.01	Beg. Pod (R3)	1.10
16 leaf	1.10	Full Pod (R4)	1.10
Silk – Beg. Dent	1.10	Beg. Seed (R5)	1.10
¼ Milk Line	1.04	Full Seed (R6)	1.10
Full Dent (½ Milk)	0.98	Yellow Leaf (R6.5)	1.00
¾ Milk Line	0.79	Beg. Mat. (R7)	0.90
Black Layer	0.60	Full Mat. (R8)	0.20
Full Maturity	0.10	Mature	0.10

Crop Stage Information

Corn (V6-6 Leaf to V12-12 Leaf stage): At V6, the growing point and tassel are above the ground and stalk elongation has begun. At V12, the number of potential kernels and the size of the ear are being determined.

Avg. daily water use from June 12 – June 18 was 0.10”-0.33”.

Soybeans (V2-Second Node to V4-Fourth Node stage): Nitrogen-fixation starts around the V2-V3 stages. The number of nodules formed and the amount of nitrogen fixed increases with time until R5.5 when it drops off sharply.

Avg. daily water use from June 12 – June 18 was 0.11”-0.24”.

June 12-June 18 (15 of 15 NAWMN sites reporting): Average weekly rainfall was 0.01 (range 0.00 to 0.09). Average weekly ET for corn was 1.19 and for soybeans was 1.43.

ET Information Sites

NAWMN Sites:

- http://www.cnppid.com/news-info/weatheret-data/nebraska-agricultural-water-management-network/
- https://nawmn.unl.edu/ETdata/DataMap

CropWatch: http://cropwatch.unl.edu/gdd-etdata
CNPPID: http://www.cnppid.com/news-info/weatheret-data/
Water Use Hotline: 1-800-993-2507

Corn Stage		DESCRIPTION
V8	8 Leaves	Leaf stage is defined by number of leaves with visible collars. The collar is a discolored line where the leaf meets the stalk. This line circles the stalk. TIP: Mark the 6th leaf or a higher leaf by cutting a notch in it or some other way so as to know that leaf number. Reason is the lower leaves will be lost as the plant develops. Flag or somehow mark the plant in the field as a reference plant when determining later leaf (vegetative) stages.
V10	10 Leaves	
V12	12 Leaves	

Soybean Stage		DESCRIPTION
V2	Second Node	V2 has two nodes on main stem, each with a trifoliate leaf with unfolded leaflets (leaflet edges not touching). Plant has 3 nodes total: 1 unifoliate and 2 trifoliates.
VN	Nth Node	Additional nodes on main stem continue to grow as plants develop until R1-Beginning Bloom.

Lake and River Levels

CNPPID Reservoir Elevation and Platte River Flow data listed below and other locations can be found on CNPPID's website at http://cnppid.com/wp-content/uploads/2016/06/lakeRiverData.html.

	June 22, 2017, 8:00 AM	1 Year Ago
Capacity of Lake McConaughy	88.3%	NA
Inflows to Lake McConaughy	1046 cfs	3636 cfs
Flows on the North Platte at North Platte	347 cfs	1958 cfs
Flows on the South Platte at North Platte	861 cfs	2585 cfs
Flows on the Platte at Overton	715 cfs	6335 cfs

Ask not what your country can do for you. Ask what you can do for your country.

- John F. Kennedy

Websites of Interest

Soil Health:
www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

Climate	agclimatenebraska.weebly.com
SAM Registration	www.sam.gov
NRCS Nebraska	www.ne.nrcs.usda.gov
Central Irrigation District	www.cnppid.com
TBNRD Home Page	www.tribasinnrd.org/
Farm Service Agency	www.fsa.usda.gov
UNL Cropwatch	cropwatch.unl.edu
UNL Extension	extensionpubs.unl.edu/
K-State SDI Website	www.ksre.ksu.edu/sdi
No-till On The Plains	www.notill.org

Rainfall

Rainfall amounts listed below and other locations come from NeRAIN which can be found at website https://nednr.nebraska.gov/NeRain/Maps/maps.

Location:	June 8 – June 21	May 1 – June 21
Arapahoe 6.9 NW:	0.00	5.42
Bertrand 6.1 mi. SE:	0.00	5.97
Funk 4.1 mi. NNE:	0.02	6.97
Minden 0.855 mi. W:	0.00	9.47
Minden 8.8 mi. ESE:	0.00	7.52

Average Rain for May-June in Holdrege = 8.04 Inches

****** If you wish to receive this newsletter via e-mail, or have any questions, comments or ideas, feel free to contact Curtis Scheele at the NRCS office in Holdrege or you can email him at curtis.scheele@ne.usda.gov. ******

USDA - Natural Resources Conservation Service

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PO Box 798
Holdrege, NE 68949-0798
308-995-6121, Ext. 3

309 Smith Street
PO Box 41
Elwood, NE 68937-0041
308-785-3307, Ext. 3

1005 South Brown Street
Minden, NE 68959-2601
308-832-1895, Ext. 3

Central Nebraska Public Power & Irrigation District

415 Lincoln Street
PO Box 740
Holdrege, NE 68949
308-995-8601

Tri-Basin Natural Resources District

1723 Burlington Street
Holdrege, NE 68949
308-955-6688

Nebraska Extension

1308 2nd Street
Holdrege, NE 68949
308-995-4222

PO Box 146
Elwood, NE 68937
308-785-2390

424 North Colorado
PO Box 31
Minden, NE 68959
308-832-0645

Soil Quality Indicators

Aggregate Stability

Soil aggregates are groups of soil particles that bind to each other more strongly than to adjacent particles. Aggregate stability refers to the ability of soil aggregates to resist disintegration when disruptive forces associated with tillage and water or wind erosion are applied. Wet aggregate stability suggests how well a soil can resist raindrop impact and water erosion, while size distribution of dry aggregates can be used to predict resistance to abrasion and wind erosion.

Long-term use of a conservation tillage system (no-till) and cover crops resulted in increased soil organic matter and improved soil structure and aggregate stability of this north Georgia (Cecil) soil. Photo courtesy James E. Dean, USDA NRCS (retired).

Factors Affecting

Inherent - Aggregation and stability of soil aggregates are affected by predominant type and amount of clay, adsorbed cations, such as calcium and sodium, and iron oxide content. Expansion and contraction of clay particles as they become moist and then dry can shift and crack the soil mass and create aggregates or break them apart. Calcium, magnesium, iron, and aluminum stabilize aggregates via the formation of organic matter – clay bridges. In contrast, aggregate stability decreases with increasing amounts of exchangeable sodium. Dispersion is promoted when too many sodium ions accumulate between soil particles.

Dynamic - Aggregate stability is highly dependent on organic matter and biological activity in soil, and it generally increases as they increase. Fungal hyphae, thread-like structures used to gather resources, bind soil particles to form aggregates. Other soil organisms, like earthworms, secrete binding materials. Soil particles are also aggregated and stabilized by organic “glues” resulting from biological decomposition of organic matter. Physical disturbance, e.g. tillage, accelerates organic matter decomposition rates, and destroys fungal hyphae and soil aggregates. Soil biota help create aggregates and use them as habitat or refugia to escape predation.

Relationship to Soil Function

Changes in aggregate stability may serve as early indicators of recovery or degradation of soils. Aggregate stability is an indicator of organic matter content, biological activity, and nutrient cycling in soil. Generally, the particles in small aggregates (<0.25 mm) are bound by older and more stable forms of organic matter. Microbial decomposition of fresh organic matter releases products (that are less stable) that bind small aggregates into large aggregates (>2-5 mm). These large aggregates are more sensitive to management effects on organic matter, serving as a better indicator of changes in soil quality. Greater amounts of stable aggregates suggest better soil quality. When the proportion of large to small aggregates increases, soil quality generally increases.

Stable aggregates can also provide a large range in pore space, including small pores within and large pores between aggregates. Pore space is essential for air and water entry into soil, and for air, water, nutrient, and biota movement within soil. Large pores associated with large, stable aggregates favor high infiltration rates and appropriate aeration for plant growth. Pore space also provides zones of weakness for root growth and penetration.

Problems with Poor Function

Aggregate stability is critical for infiltration, root growth, and resistance to water and wind erosion. Unstable aggregates disintegrate during rainstorms. Dispersed soil particles fill surface pores and a hard physical crust can develop when the soil dries. Infiltration is reduced, which can result in increased runoff and water erosion, and reduced water available in the soil for plant growth. A physical crust can also restrict seedling emergence.

Wind normally detaches only loosely held particles on the soil surface, but as blowing soil particles are accelerated by the wind they hit bare soil with sufficient energy to break additional particles loose from weakly aggregated soil. This action increases the number of particles that can be picked up by the wind and abrade a physically-unprotected soil surface.

Practices that lead to poor aggregate stability include:
- Tillage methods and soil disturbance activities that breakdown plant organic matter, prevent accumulation of soil organic matter, and disrupt existing aggregates,
- Cropping, grazing, or other production systems that leave soil bare and expose it to the physical impact of raindrops or wind-blown soil particles,
- Removing sources of organic matter and surface roughness by burning, harvesting or otherwise removing crop residues,
- Using pesticides harmful to beneficial soil microorganisms.

Improving Aggregate Stability

Practices that keep soil covered physically protect it from erosive forces that disrupt aggregation, while also building organic matter. Any practice that increases soil organic matter, and consequently biological activity, improves aggregate stability. However, it can take several growing seasons or years for significant organic matter gains. In contrast, management activities that disturb soil and leave it bare can result in a rapid decline in soil organic matter, biological activity and aggregate stability.

Aggregates form readily in soil receiving organic amendments, such as manure. They also form readily where cover and green manure crops and pasture and forage crops are grown, and where residue management and/or reduced tillage methods are used.

Improving aggregate stability on cropland typically involves cover and green manure crops, residue management, sod-based rotations, and decreased tillage and soil disturbance. Aggregate stability declines rapidly in soil planted to a clean-tilled crop.

Pasture and forage plants have dense, fibrous root systems that contribute organic matter and encourage microbial activity. However, grazing and fertility must be managed to maintain stands and prevent development of bare areas or sparse vegetation.

Conservation tillage systems, such as no-till with cover crops, reduce soil disturbance, and provide and manage residue for increased soil organic matter and improved aggregate stability. Additionally, surface roughness provided by crop residues protects soil from wind erosion.

Conservation practices resulting in aggregate stability favorable to soil function include:
- Conservation Crop Rotation
- Cover Crop
- Pest Management
- Prescribed Grazing
- Residue and Tillage Management
- Salinity and Sodic Soil Management
- Surface Roughening

Measuring Aggregate Stability

Measuring Water Stable Aggregates is described in the Soil Quality Test Kit Guide, Section I, Chapter 8, pp. 18 - 19. See Section II, Chapter 7, pp. 69 - 71 for interpretation of results.

Arshad MA, Lowery B, and Grossman B. 1996. Physical Tests for Monitoring Soil Quality. In: Doran JW, Jones AJ, editors. Methods for assessing soil quality. Madison, WI. p 123-41.

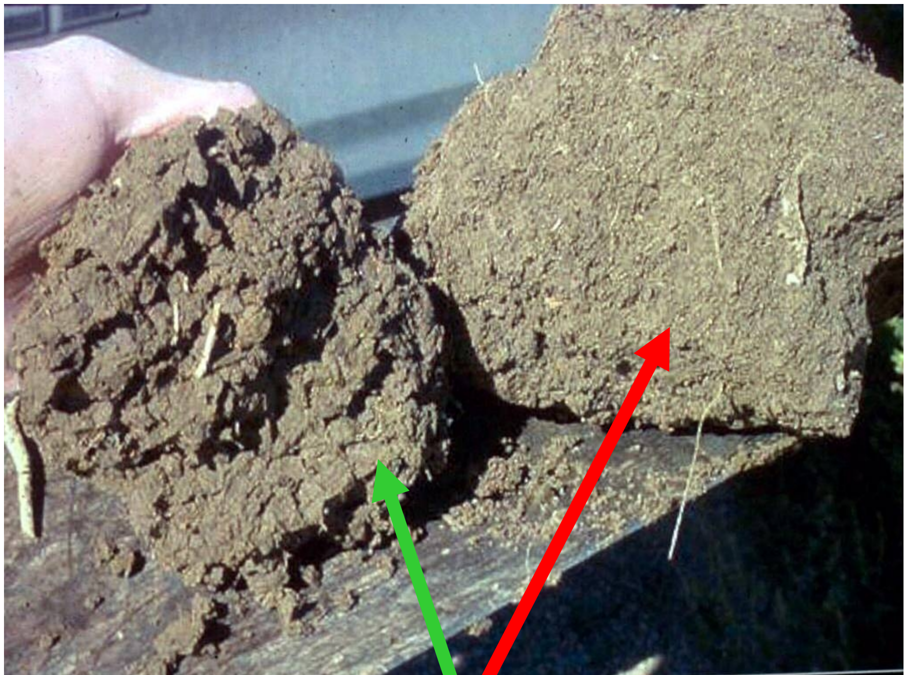
Kemper WD, Rosenau RC. 1986. Aggregate Stability and Size Distribution. In: Klute A, editor. Methods of soil analysis. Part 1. Physical and mineralogical methods. Madison, WI. p 425-42.

Specialized equipment, shortcuts, tips:

Determine for the top three inches of soil. However, in rangeland conditions determine for the top ¼ to ½ inch of soil as it is most likely to be removed by erosion. A 400-watt hairdryer and drying chamber are required to conduct the wet aggregate stability test.

Time needed: 2 hours

Aggregate Stability



No-Till Soil

Conventional Tilled Soil