# FIELD INVESTIGATION OF THE VARIATION OF UNSATURATED FLOW UNDER SDI AND MESA IRRIGATED CULTIVATED FIELDS

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## ABSTRACT

The Texas High Plains (THP) are some of the most fertile spans of land for cultivated agriculture. But one hundred years of withdrawal from the Ogallala Aquifer, which underlies the THP, have decreased the saturated thickness of this aquifer by nearly ten percent. Modern irrigation methods, such as Subsurface Drip (SDI) and Mid-Elevation Spray (MESA), have been developed to maximize crop water use efficiency and minimize unnecessary volume withdrawal to conserve water. This study compares MESA and SDI flux rates at a soil depth of 220 cm to compare differences in total water drained from a 20-ha site in Bushland, Texas. Using the mean flux rate (cm/s) calculated from a network of neutron access tubes, a one-way Analysis of Variance (ANOVA) tested the mean flux rates between SDI and MESA irrigation by week of the growing season. The results of this study show there was no significant differences in field drainage between the two irrigation methods.

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# CHAPTER I

## HISTORY OF IRRIGATION ON THE TEXAS HIGH PLAINS

## DEVELOPMENT TO MODERN DAY

In 1854, the United States Army led an expedition across the Texas High Plains region in search of the source of the Red River. Led by Captain Randolph Marcy, men braved what was then called The Great American Desert. W.B. Parker, a member of the party, reported that

> *"For all purposes of human habitation-except it might be for a penal colony-those wilds are totally unfit. Destitute of soil, timber, water, game, and everything else that can sustain or make life tolerable; they must remain as they are, uninhabited and uninhabitable." (Green, 1973)*

Prior to Marcy's expedition, Spanish Conquistador Francisco Vazquez de Coronado describes the land to his Spanish King in 1541 thusly,

> *"I reached some plains so vast, that I did not find their limit anywhere I went, although I travelled over them for more than 300 leagues . . . with no more land marks than if we had been swallowed up by the sea . . . . there was not a stone, nor bit of rising ground, nor a tree, nor a shrub, nor anything to go by." (Green, 1973)*

The vast, desolate land would become known as the Llano Estacado roughly translated to English as 'staked plain' (Ashworth, 2006).The Llano Estacado is the largest plateau in

North America, covering approximately 83,000 square kilometers in Texas and New Mexico (Bell and Sechrist, 1972). The northernmost boundary is the Canadian River; while to the east and west are the Caprock and Mescalero Escarpments. The average elevation of the Llano is approximately 900 meters with a gentle slope of 1.5-1.8 meters per kilometer, with steeper slopes to the western side of the plateau. Perhaps the most dominant and spectacular feature of this land is Palo Duro Canyon, supposedly the second largest canyon in North America (Green, 1973). The climate of this region is arid to semi-arid, with an average annual precipitation of 35 to 51 centimeters and an evaporation rate of approximately 200 cm per year. The lack of rainfall is a challenge for those living in the plains area, and wind is also a nearly constant companion. The average wind velocity is 19 km/hr, but because of the dry nature of the land, sediment is frequently suspended in the air (NRCS, 2014).

By the early 1900's, settlers and explorers saw a different side of the Texas panhandle. Ample rainfall had quenched the dry land, and people saw the agricultural potential of the rich, loamy soil. Farming soon began in earnest. This, however, was not a permanent state of being. Semi-arid climates are known to have years of adequate rainfall followed by periods of drought, which makes farming difficult to say the least. How could such a seemingly inhospitable environment have become habitat for so many humans? The answer is in the region's underground treasure: The Ogallala Aquifer.

Migrants from the eastern United States began the westward trek to the High Plains around the early to mid-1880's. As the cattle industry became a more lucrative investment, Americans from all walks of life moved into the Plains region to graze livestock, and drive them northward to sell in the cattle markets of Dodge City and the like. To facilitate settlement of the Texas High Plains, the Texas Land Law of 1883 was passed (Green, 1973). Cheap land, abundant acreage, and fertile soil for farming soon turned the cattle industry into the farming industry. By 1887, the railroads had finally connected in the Texas Plains thus ending the semi-isolation which stood as a large barrier for many to settle and farm the land. Droves of wagons moved in to stake a claim on the Staked Plain.

At the time of peak migration, surface water was not necessarily sparse because at the time the plains were in a wet period, and most farmers dug small canals to divert water from surface sources such as the Canadian River (Green, 1973). Flood irrigation was the primary method used to bring water to precious crops, and it was very effective…for a short period of time. By the end of the 1880's, a period of drought settled into the area. High winds blew sandstorms across farms scouring away the top soil and destroying food crops. The influx of migrants to the area all but stopped completely, and in 1889 the Canadian River also stopped flowing (Green, 1973). What began as a period of prosperity, and land owning independence for many eastern American families was quickly becoming a mass exodus from the Plains region.

In 1888, Congress initiated an investigation for potential water reservoir sites in the west. This task was handed to the director of the United States Geological Survey: John Wesley Powell (Longo and Yoskowitz, 2002). In his report, Powell ultimately recommended the construction of reservoirs to supply irrigation water to the farming communities located within the western Rocky Mountain Valley. His focus on the arid mountainous regions was not unnoticed by plainsmen or the Congressmen who represented their interests, and when asked during a House Appropriations Committee meeting about the possibility for artisanal wells to supply water to the Plains region, Powell asserted that there was not enough spring water in all of the Dakotas to irrigate a single county within the arid plains. Powell's report was not received favorably by advocates for government subsidized research into water supply and irrigation for the Plains. Meanwhile, the Drought of 1886 was still crippling farmers in the area (Green, 1973).

By 1890, The Lincoln Group, a lobbying organization for irrigation and groundwater resource development had secured $70,000 from Congress for a new land survey (Ashworth, 2006). Unlike the survey of 1888, this survey was saddled with the task of finding and mapping artesian wells. In an effort to circumvent Powell's objections on the topic, the survey of 1890 was tasked to the office of Richard J. Hinton of the United States Department of Agriculture instead of John Wesley Powell's office. In the final report published in 1892, the Department of Agriculture cited 13,695 artesian wells within the survey area; few however were within the central plains (Green, 1973). These findings would ultimately be the end of the idea of irrigation from artesian wells in the central plains.

During a land survey in 1854, Geologist Jules Marcou noted and reported the abundant amount of water underground (Green, 1973). This "underground ocean" was the Ogallala, and the relationship between the Ogallala and the settlers of the central plains would be one marked with frustration. In areas with a shallow water table, first generation windmill technology could extract enough groundwater to irrigate two or three acres of cropland. Originally powered by a horse, these windmills were primitive machines consisting of a series of buckets attached to a belt which scooped water up from the well and deposited it into a man-made, earthen reservoir. Canals could then be dug to connect the crop to the reservoir for flood irrigation. This windmill technology was primitive and inefficient, but was used with relative success in the northern portions of the High Plains; Kansas and Nebraska especially.

The second generation of windmill technology took advantage of the advent of the mechanical pump (Green, 1973). Windmills powered by these pumps still required a reservoir and ditch irrigating, but horses were no longer powering the movement of the water (Green, 1973). Unfortunately, the first pumps also clogged with sediment regularly which would slow or even stop the flow of water.  This windmill technology was not prominent on the Texas Plains because the depth to water increases south of the Canadian River which in turn increases the cost to dig and case a well. In 1875, a new pump was patented in England. It was the centrifugal pump, and it would change agricultural life in the United States. By the early 1900’s centrifugal pumps were being installed on the Texas High Plains to replace second generation windmill pumps. The new pumps could move more water, at a faster rate, and with fewer mechanical failures such as sediment clogs in the pump valves. However, these pumps had to be installed no more than 20 feet above the water table, and since the pump itself was larger than the piston pumps of second generation windmills a pit had to be dug above the well to house the pump. Daily maintenance was also required which was often dangerous. Additionally, the pit needed for the pump was expensive to drill (Ashworth, 2006). Farmers would need a pit-less high capacity pump in order to move from subsistence farming to commercial farming.

The primary obstacle at this stage of irrigation technology was still one of volume. In order to extract more water, a larger diameter hole was needed, but drilling technology at the time didn’t have an economic solution to this dilemma. Most wells were drilled with a rig colloquially known as “the spudder” (Green, 1973). It consisted of a hollow bit which was driven into the ground and the soil or rock was extracted from it upon removal. The issue was that a larger diameter bit would require a higher amount of force to drive it into the ground which would require more energy. The larger diameter hole just wasn’t economical at the time. The spudder rig was replaced by more modern rotary rigs around 1890. The new steam powered rigs could drill small or large diameter holes, and were widely used in the oil fields of Louisiana at the time (Green, 1973). Then, in 1902 in Pierce, Texas a series of water wells were installed using rotary drilling technology. Centrifugal pumps were used in these wells, and although this was a major step forward in technology there were still problems that made this set up less than ideal such as cave-ins after a hard rain, and the need to manually re-prime the pump to maintain suction.

In 1907 the Layne pump was patented by the Layne and Bowler Company. The pump could extract 1,000 gallons per minute or more and was originally installed in the rice belt of Texas. The barrier to bringing this technology into the Texas Plains was cheap, reliable electricity. Since power plants at that time were very few and far between on the Texas Plains.

In his 1973 book, Land of the Underground Rain, Donald Green separates the development of irrigation on the Texas Plains into three distinct phases based on time period, land development, and technological advances.

Phase I, lasting from 1910-1920, is marked by the push to sell land in the Texas Plains. The Texas Land and Development Company was the largest company of land speculators pushing for pump irrigation to boost the selling value of the land, and to attract more potential buyers. By now, it was well known that there was an abundance of groundwater in the area for irrigation, and the idea of commercial farming operations which were independent of mother nature's unreliable rain was lucrative to say the least. This time period should have been a decade long push to develop technology to irrigate cheaply and efficiently, but World War I was looming on the horizon and it would have a profound effect on the agricultural industry. The conflict overseas between European countries caused the price of commercial crops, such as wheat, to skyrocket. In 1915, the value of wheat was $0.98/ bushel, but by 1917 the value had inflated to $2.48/bushel (Green, 1973). This drove farmers to plant more, but the Plains were in a wet period, which once again, diverted attention away from irrigation and dryland farming operations were producing wheat, sorghum, and milo in earnest. The increase in livestock meat also drove up the demand for cereal grains for feed. Secondly, the United States entering the war effort caused a scarcity of metal for non-war purposes. The Lane and Bowler Company issued a statement to its customers in 1916 that they were unable to source enough metals to build their pumps, and those orders they had been working on would require four to six months to complete. It was this combination of factors which halted the development of irrigation once again.

By the end of 1920, the wheat bubble popped and prices dropped to $1.43/bushel (Green, 1973). With the downward trend in price, any residual interest in irrigation development went with it. The value of farmsteads and the purchasing power of farmers declined, causing many farmers to overproduce their lands to make up the difference. These factors would bring about the agricultural depression in the Plains, followed by the Great Depression and Dustbowl.

The Agricultural Adjustment Act of 1933, part of Roosevelt's New Deal, prescribed allotment checks to relieve the financial crisis of the farmers in the High Plains (Longo and Yoskowitz, 2002). The Dustbowl and Great Depression spurred interest once again in irrigation technology and the New Deal subsidies were a resource many farmers chose to use to mechanize their operations. Unfortunately, as dust storms rolled into the region in place of much needed rain, the government subsidies were not enough to save agriculture on the High Plains. In a last desperate bid to hold on to their livelihood, some farmers began to drill wells in earnest. Once it was apparent that the New Deal subsidies were not going to save the world's Bread Basket, a new program of federally backed loans for farmers to install irrigation plants finally revived the crippled agricultural industry, and irrigation development was once again at the forefront of the Texas Farmer's mind. It was unfortunately too late to save the Midwestern United States from the Dustbowl, but rolling into the 1940s and 1950s, the stage was set for irrigation technology to progress.

Phase II of Green's timeline begins with a boom in pump irrigation expansion through the 1940's. There are a plethora of contributing factors to the expansion during this time including the end of the WWI era, socioeconomic impacts of WWII, the Korean War, and the need for grain in war torn European countries, but perhaps the most profound and far reaching is a general shift in the perception of irrigation by the farmer. For the first time irrigation was seen as a tool to boost crop productivity instead of merely a method to insure the farmer against drought induced crop failure. This important shift in perspective removed the 'on again, off again' attitude toward irrigation because the motivation for expansion was not dependent upon a dry or wet climate regime. Irrigation could be utilized every season to maximize the output of a commercial crop regardless of the weather. Thus, the farmer could utilize irrigation as a means to meet food demands from the post-war era.

Several other factors such as new fuel sources and new technological applications also had a profound effect on agriculture. Natural gas began to be widely utilized as a fuel source to run newer deep-well turbine pumps. At a cost of $5.15 per acre-foot using natural gas, compared to $8.70 per acre-foot using gasoline, the farmer could produce more by irrigating and decrease fuel costs to the pumping plant and his well (Green, 1973). Both World Wars in Europe lent themselves to new applications of raw materials such as rubber, aluminum, and plastic. The military used these materials for field combat applications and forward operating bases because they were lighter and more portable than their heavy metal predecessors. In the post-war era, the advent of new applications in irrigation came into reality because of their success in military application. Aluminum became widely used for lightweight pipe used for new sprinkler irrigation technology to reduce run off, and increase infiltration of water into sandy soils or rolling topography. Rubber and plastics became widely used for flexible and relatively water tight connection, and joints for irrigation systems. New conduit constructed from aluminum and concrete eliminated the need to ditch irrigate, reduced evaporative loss by an estimated 30% (Green, 1973), and allowed precision application of water to the crop for the first time. By 1958, natural gas powered pumps and sprinkler irrigated fields were the most widely used method of irrigation on the high plains (Green, 1973). By the end of the 1950's an era of relative prosperity had come to farming on the Texas High Plains, encouraged by cheap fuel resources and a decrease in labor cost due to new materials that required fewer man hours to maintain and move.

Finally, Phase III of Green's irrigation timeline is defined by the discovery of the decline of the Ogallala Aquifer. A problem that continues into the modern day. As early as 1904, people on the High Plains believed that the Ogallala was 'inexhaustible' (Green, 1973). There was simply no conceptual basis for understanding the vast store of water beneath the caprock of the Llano Estacado, nor was there an established understanding of soil water dynamics, soil physics as it applies to infiltration, or the fragile balance between withdrawal and recharge regimes. Originally, it was believed that the Ogallala was literally a river which originated as snow melt from the Rockies and flowed beneath the plains, emptying into the Gulf of Mexico (Gould, 1935). After nearly a decade of widespread pump irrigation on the Texas High Plains, and continuing trends of growth in population, increase in the number of new wells being dug, and increase of irrigated acres, the decline in the water table could be seen directly for the first time. To meet the demand for cotton and grain crops, farmers began to irrigate more than one crop which extended the irrigation season, and increased the volume of water extracted for irrigation. Farmers in areas outside of the so-called ‘shallow-water districts’ began to see a decrease in the gallons per minute output of their pumps as well as the need to drill deeper wells to hit saturated layers capable of producing the volume of water needed to effectively irrigate.

In addition to harmful cultural misunderstandings about the groundwater resource, there was no effective legislation for the conservation or management of the groundwater (Longo and Yoskowitz, 2002). As early as the mid to late 1930’s geoscientists pondered the exhaustibility of the Ogallala, but in the maelstrom of misguided origin hypotheses of the aquifer, challenges to its exhaustibility were not taken seriously enough to merit thorough investigation. This confusion came to a boil in the mid-1940’s when the idea of management of the groundwater came into the public forum. Without an understanding of the nature and origin of the water coming from the Ogallala, the state government had no way to draft legislation. Established water resource management legislation grouped groundwater, rivers, surface streams, and artesian wells as the same type of resource which led to one of three possible doctrines of ownership: absolute ownership, correlative rights, and prior appropriations.

The Doctrine of Absolute Ownership states that a land owner shall have completely unrestricted access to all groundwater beneath his land regardless of any potentially harmful effects to his neighbors well (Longo and Yoskowitz, 2002). The

Doctrine of Correlative Rights states that the only acceptable use of water beneath a man's property is that of beneficial purposes which in no way cause harm to his neighbor's well (Longo and Yoskowitz, 2002). Finally, the Doctrine of Prior Appropriations asserts that all water is the property of the state, and as such the state must issue water based upon prior claims per the estimated volume of water in the formation. Historically, Texas had favored a 'limited interference' attitude toward land ownership and management (Longo and Yoskowitz, 2002). With pressure building from fear of the loss of irrigation water, the Texas Legislature passed the District Groundwater Law of 1949. It was promoted as a means to manage the groundwater resource on the Plains, but it was unfortunately poorly drafted and completely toothless (Longo and Yoskowitz, 2002). Instead of giving managing authority to a central governing body, all it really did was prevent the state board from seizing control of the groundwater (Green, 1973). This was a positive legislative outcome for farmers in the area who worried about the future of their livelihood if government intervention cut their access to water, but it was not a sustainable management strategy and ultimately made minimal if any impact.

Today, farming on the Texas Plains is a careful production utilizing the least amount of water possible to achieve the plant density needed for maximum profitability. Agricultural engineers and agronomists call this crop water use efficiency. In a nutshell, crop water use efficiency (WUE) is a balance of water used by the plant compared to crop water lost by the plant. Evett, et. al. (2012) defined water use efficiency as:

$$\text{WUE} = \frac{economic\ yield}{crop\ water\ use}$$

For some operations, limiting crop water use is achieved by planting drought resistant crops. Other operations elect to utilize more efficient methods of irrigation for their region to reduce evaporative loss. The latter control is one used at the ARS station in Bushland. The two irrigation methods used in this study are Mid-Elevation Sprinkler Application (MESA) and Subsurface Drip Irrigation (SDI). Both were chosen to increase total WUE on corn and sorghum crops grown in the years 2013, 2014, 2015. SDI systems have an attainable field efficiency of 96% and MESA systems have an attainable field efficiency of 95% (Howell, 2002). The SDI method reduces evaporative losses by delivering water directly to the rooting zone of the plant; MESA reduces evaporative loss by delivering water under lower pressure closer to the soil surface than is achieved by impact sprinklers, thereby reducing the amount of water applied to the plant canopy.

# CHAPTER II

# GEOLOGY OF THE SOUTHERN HIGH PLAINS AND THE DECLINE OF THE OGALLALA AQUIFER

The Ogallala is part of an aquifer system known as the High Plains Aquifer (HPA). The HPA is located within the Great Plains Region of the United States, and covers approximately 450,658 $km^2$ of land within eight states of the central United States (Gutentag, et. al., 1985).

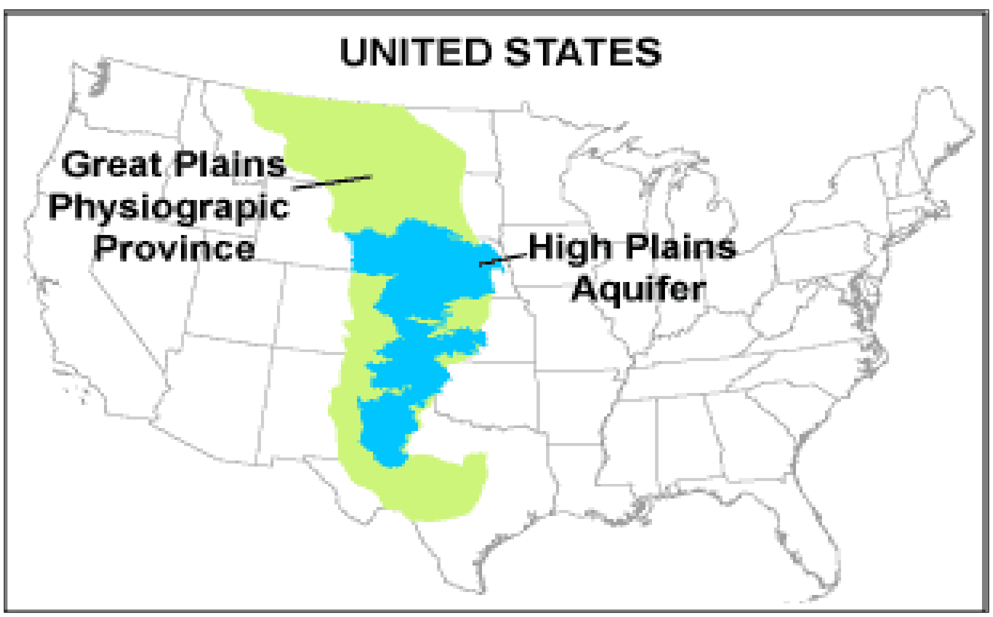



Figure 1: Generalized geographic span of the HPA within the Great Plains region. USGS, 2016

The Permian Red Beds of Texas, Kansas, and Oklahoma are the oldest rocks (290-240 mya) underlying the Ogallala Formation. The youngest are as recent as the Quaternary. Formed approximately 24 million-2 million years ago during the Miocene period the Ogallala is composed of gravels, silts, clays, and sands that eroded from the Rocky Mountain region and were transported to the Plains in sheets by wind and water. Areas rich in sand and gravels are the major contributors of water to wells (Luckey and Becker, 1999).

The base of the High Plains Aquifer is most often the Ogallala formation, and the depth to water is highly variable based on geographic location. On the easternmost edge of the Anadarko Basin depth to water averages approximately 10 feet; however depth to water increases to slightly over 300 feet in Cimarron and Texas Counties. Groundwater flow is generally west to east away from the Rocky Mountains at a rate of approximately one foot per day (Gutentag, et al, 1984). Finally, recharge to the Ogallala is variable due to the wide expanse of climate conditions from the northernmost to the southernmost boundaries; however, it is generally believed that recharge happens slower than the withdrawal rate can replenish (Luckey and Becker, 1999).

Table 1: Generalized Sections of Geologic Units; USGS modified from original in Gutentag, et. al., 1985

| System | Series | Geologic Unit | Thickness, in feet |
|---|---|---|---|
| QUATERNARY | Pleistocene and Holocene | Valley-fill deposits | 0 to 60 |
| | | Dune sand | 0 to 300 |
| | | Loess | 0 to 250 |
| | Pleistocene | Unconsolidated alluvial deposits | 0 to 550 |
| TERTIARY | Miocene | Ogallala Formation | 0 to 700 |
| | | Arikaree Group | 0 to 1,000 |
| | Oligocene | White River Group: Brule Formation | 0 to 700 |
| | | White River Group: Chadron Formation | |
| CRETACEOUS | Upper | Undifferentiated rocks | 0 to 8,000 |
| | Lower | Undifferentiated rocks | 0 to 700 |
| JURASSIC | Middle and Upper | Undifferentiated rocks | 0 to 600 |
| TRIASSIC | Upper | Dockum Group | 0 to 2,000 |
| PERMIAN | Lower and Upper | Undifferentiated rocks | 300 to 3,000 |

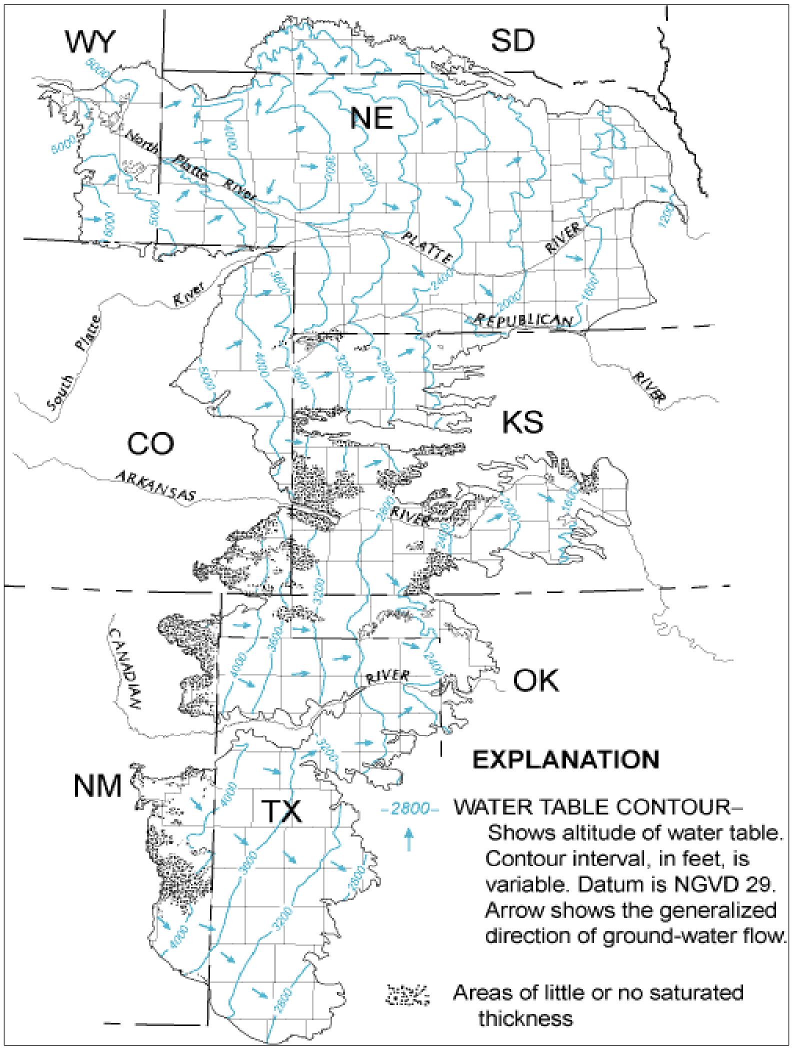
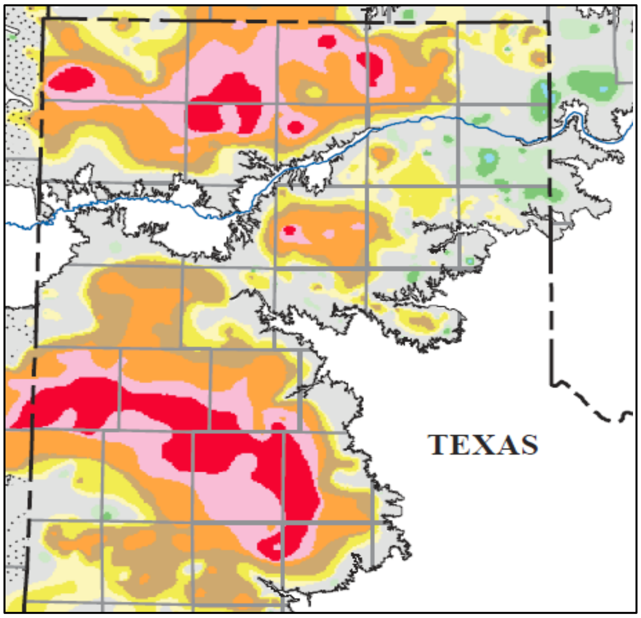



Figure 2: Water table contour from USGS;
Modified from Gutentag,et. al., 1985

## THE DECLINE IN SATURATED THICKNESS OF THE OGALLALA AQUIFER

A decrease in saturated thickness of the Ogallala Aquifer, especially in the Southern High Plains (SHP) region, has been a steady trend since the 1950's when it became cost effective to drill deeper wells and pump capacities doubled, or even tripled the volume of water a well could produce. Today this high rate of withdrawal is known as 'Groundwater Mining' because the resource is being removed for use much faster than it can be replenished. "More than a half-billion acre-feet of Ogallala water was consumed by irrigation farmers between 1960 and 1990" (Opie,1993). Kansas, as well as the Texas and Oklahoma panhandle regions are especially vulnerable to the consequences of groundwater mining as this region has the highest concentration of agricultural operations in the United States. Known colloquially as "The Bread Basket of America" this region was also the hardest hit during the dustbowl of the 1930's. Through the hardship farmers endured during this time, as well as the loss of irreplaceable resources such as fertile top soil, new methods of farming and irrigation were born in an effort to move toward a more sustainable system of farming and raising livestock.

But what exactly is sustainable farming? Opinions vary depending upon whom you are asking, but generally speaking a sustainable practice is one fitting the following basic criteria: production volume is balanced between demand/need of the present, and production is not carried to an extent such that future generations may not have the resource available for use (Opie, 1993). The High Plains of Texas have not been farming sustainably. The withdrawal rate from the aquifer far outweighs the recharge per year. In the figure 3 decline of the water level is mapped from well data from predevelopment to 2013. The estimated volume of the aquifer before development is 3.20 billion acre-feet, and current day estimates are 2.92 billion acre-feet (McGuire, 2014).




Darkest areas denote a decline of 150 or more feet.
(McGuire, 2014)

Figure 3: Map of water level changes in feet: From McGuire, 2014

The region of the Plains most vulnerable to groundwater loss is the Southern High Plains (SHP) which includes the Texas and Oklahoma panhandles as well as Southwestern Kansas. This region produces upwards of 40% of beef for human consumption in the United States as well as nearly all commercially grown cereal crops (Opie, 1993). This region was also the hardest hit by the Dustbowl of the 1930's (Ashworth, 2006). The Texas Panhandle region is also undergoing urban expansion, thereby reducing or even eliminating the available land area through which surface water can percolate to reach the water table. The dependence the nation has on this region for food products, the highly variable climate, and the urban growth and development are factors that must be taken into account when assessing the risk of current withdrawal rates from the aquifer.

One of the more recent irrigation technologies, subsurface drip irrigation (SDI), reduces loss from surface evaporation as well as more efficiently utilizing water by delivering it directly to the plants root system. The research station in Bushland, Texas installed an SDI system on a 10-hectare field in 2012 directly opposite an identical 10-hectare field which is equipped with a mid-elevation sprinkler application system (MESA). This 20-hectare field provides an opportunity to measure in-situ performance of SDI and MESA irrigation methods; additionally, one can also compare the effects (if any) to the water table based upon the method of irrigation.

REGIONAL SOIL PROFILE: PULLMAN CLAY LOAM

Pullman soils are a common soil type on the Texas High Plains. Collectively, they cover approximately 3.8 million acres of land, in 21 Texas counties, from the Texas-New Mexico border to the eastern escarpment (Unger and Pringle, 1981).


Figure 4: Distribution of Pullman soils in the Texas High Plains. From Unger and Pringle, 1981

The series official taxonomy is Pullman fine, mixed, super-active, thermic Torrertic Paleustoll (Evett, et. al., 2012). Pullman clay loam is a benchmark soil, first classified by the National Resource Conservation Service in Potter County, Texas in 1929 (NRCS, 2014). The parent material of this soil is from the Blackwater Draw Formation (Pleistocene age), and has a complex minerology. It is believed that wind both weathered the formation and provided transport of the clay sediment to Texas (Unger and Pringle, 1981). The most common use for this soil type is cultivated agriculture, and it is estimated that approximately 13% of the irrigated acreage in Texas is on Pullman series soil (Unger and Pringle, 1981).

| Minerals | Depth, inches | | | | | | |
|---|---|---|---|---|---|---|---|
| (percent)[2] | 0-8 | 8-23 | 23-33 | 33-46 | 46-62 | 62-67 | 82-85 |
| Heavy suite (sp. gr. >2.95) | | | | | | | |
| Opaque | 49.5 | 47.7 | 52.9 | 54.6 | 50.1 | 45.9 | 45.6 |
| Garnet | 2.1 | 1.9 | 4.1 | 2.6 | 2.4 | 2.6 | 3.8 |
| Epidote[3] | 17.3 | 15.7 | 16.2 | 15.6 | 17.2 | 10.3 | 12.2 |
| Amphibole | 6.6 | 13.0 | 7.4 | 7.2 | 8.7 | 15.5 | 12.7 |
| Pyroxene | 3.5 | 1.7 | 1.9 | 0.5 | 0.7 | 3.3 | 5.2 |
| Others | 5.4 | 4.8 | 4.3 | 4.6 | 4.7 | 5.7 | 5.2 |
| Zircon | 7.1 | 8.0 | 7.4 | 11.3 | 12.0 | 11.2 | 8.5 |
| Tourmaline | 8.5 | 7.2 | 5.8 | 3.6 | 4.2 | 5.5 | 6.8 |
| Zircon/ tourmaline | 0.84 | 1.10 | 1.28 | 3.14 | 2.84 | 2.04 | 1.24 |
| Light suite (sp. gr. <2.95) | | | | | | | |
| Quartz | 81.1 | 76.8 | 77.0 | 84.5 | 82.5 | 80.2 | 84.3 |
| Orthoclase | 13.6 | 18.3 | 16.1 | 14.0 | 14.7 | 15.1 | 9.7 |
| Microcline | 3.0 | 2.7 | 4.1 | 1.5 | 0.7 | 2.0 | 1.6 |
| Others | 2.3 | 2.2 | 2.8 | 0.0 | 2.1 | 2.7 | 4.4 |

[1]Unpublished data of F. B. Lotspeich. Samples were collected from native pasture site 200 feet south of the described profile.
[2]Calculated as percent of the total heavy or light mineral suite.
[3]Includes zoisite.

Figure 5: Mineralogy of Pullman Silty Clay Loam. From Taylor, et. al., 1963.

The three major morphological properties of Pullman soil are texture, permeability, and the depth to the calcic horizon. All three of these properties alter the capacity the soil has for water storage. Depth to the calcic horizon decreases to the southwestern areas of distribution, and the average $CaCO_3$ concentration of that horizon throughout the distribution area is 50% (Unger and Pringle, 1981). The hardness of the $CaCO_3$ effects the soil water storage capability by acting as a barrier to the downward flow of water.

The texture of the soil refers to the distribution and concentrations of silt, sand, and clay particles. The texture directly effects the water storage capacity of a soil by the volume and connectedness of pores between soil particles. Sand, being the largest soil particle, has a higher permeability than silt or clay (average of 5 cm/hr). As the particle size increases, the porosity of a soil will generally decrease. Clay rich soils have the highest porosity but the lowest permeability because although there is a high percentage of pore space for water to occupy, the pores are extremely narrow (Hillel, 1982). Additionally, clay particles have the highest amount of surface area which increases the effect of hysteresis in clay rich soils (Jury and Horton, 2004). A clay rich soil will have a high water storage capacity, as well as a high water retention ability which is part of why they can be so agriculturally productive in semi-arid regions.

When lysimeters were being installed at the research station in 1985, the soil horizons were recorded and described by Fred Pringle. In his report of all four lysimeter sites, he describes the Btka (or calcic horizon) as a pink clay loam, with moderate subangular blocky structures, with a gradual boundary. Additionally, Pringle estimates the $CaCO_3$ concentration for the calcic horizon to be 50% at a depth range of 58 to 71 inches (Pringle, 1989).

# CHAPTER III

# UNSATURATED FLOW, MEASUREMENT OF SOIL WATER CONTENT VIA THERMALIZED NEUTRONS, AND THE THEORETICAL EQUATIONS GOVERNING DERIVED SOIL WATER FLUX

Soil is composed of minerals, organic matter, water, and air. Together these solid constituents are what is called the soil matrix (Miller and Gardiner, 1998). In vadose zone hydrology, soils are an important subject of study because they are highly variable, critical to the survival of living organisms, and they are the medium through which surface water travels before reaching the saturated zone (Miller and Gardiner, 1998). From an environmental perspective, it is imperative to understand soil hydrology to prevent and treat contaminant migration from the soil surface to the saturated zone. In the THP, the biggest threat to potable water supplies in the Ogallala Aquifer are from nitrates ($NO_3$) and are strongly associated with crop production (DeLaune, et. al., 2013). Nitrate levels above 10 ppm exceed the allowable limit, and are a human health risk for women who are pregnant and young children (TCEQ, 2015). The nitrate molecule binds to the hemoglobin in the blood and restricts the body's ability to exchange and transport oxygen resulting in 'Blue Baby Syndrome" (Knobeloch, et. al., 2000). Blue Baby Syndrome can be fatal, and is commonly caused by high nitrates in privately owned well water. Understanding fundamental soil physics and hydrology are a pivotal step to minimizing the risk of well contamination by nitrates in the THP area.

Perhaps the most fundamental concept to soil hydrology is saturated versus unsaturated flow. Water will travel through soil differently according to specific soil properties (i.e. texture), composition, and the degree of saturation (Fetter, 1980). The texture of a soil refers to the percent composition of clay, silt, and sand particles, and can be determined using several simple methods such as a hydrometer, sieve, or a ribbon test. Once the composition is decided upon, the United States Department of Agriculture (USDA) has a standard soil classification chart to identify the texture classification of a soil (Miller and Gardiner, 1998)properties (i.e. texture), composition, and the degree of saturation (Fetter, 1980). The texture of a soil refers to the percent composition of clay, silt, and sand particles, and can be determined using several simple methods such as a hydrometer, sieve, or a ribbon test. Once the composition is decided upon, the United States Department of Agriculture (USDA) has a standard soil classification chart to identify the texture classification of a soil (Miller and Gardiner, 1998).

The soil texture effects the soil water movement by altering the volume and interconnectedness of void space between soil particles called pore space. The volume of pore space compared to total volume is called the porosity, and is a unit-less value represented as a percent (>0,<100) or fraction (>0, <1) (Pinder and Celia, 2006). Porosity can indicate the water storage capability that a soil has, but permeability is the primary property to determine flow. Permeability (also called hydraulic conductivity) is a property dependent upon the interconnectedness of the pore space within a soil (NRCS, 2004). The Pullman soils at our site of study have an average porosity of 45% as calculated from prior soil testing done by ARS-USDA by S.R. Evett.

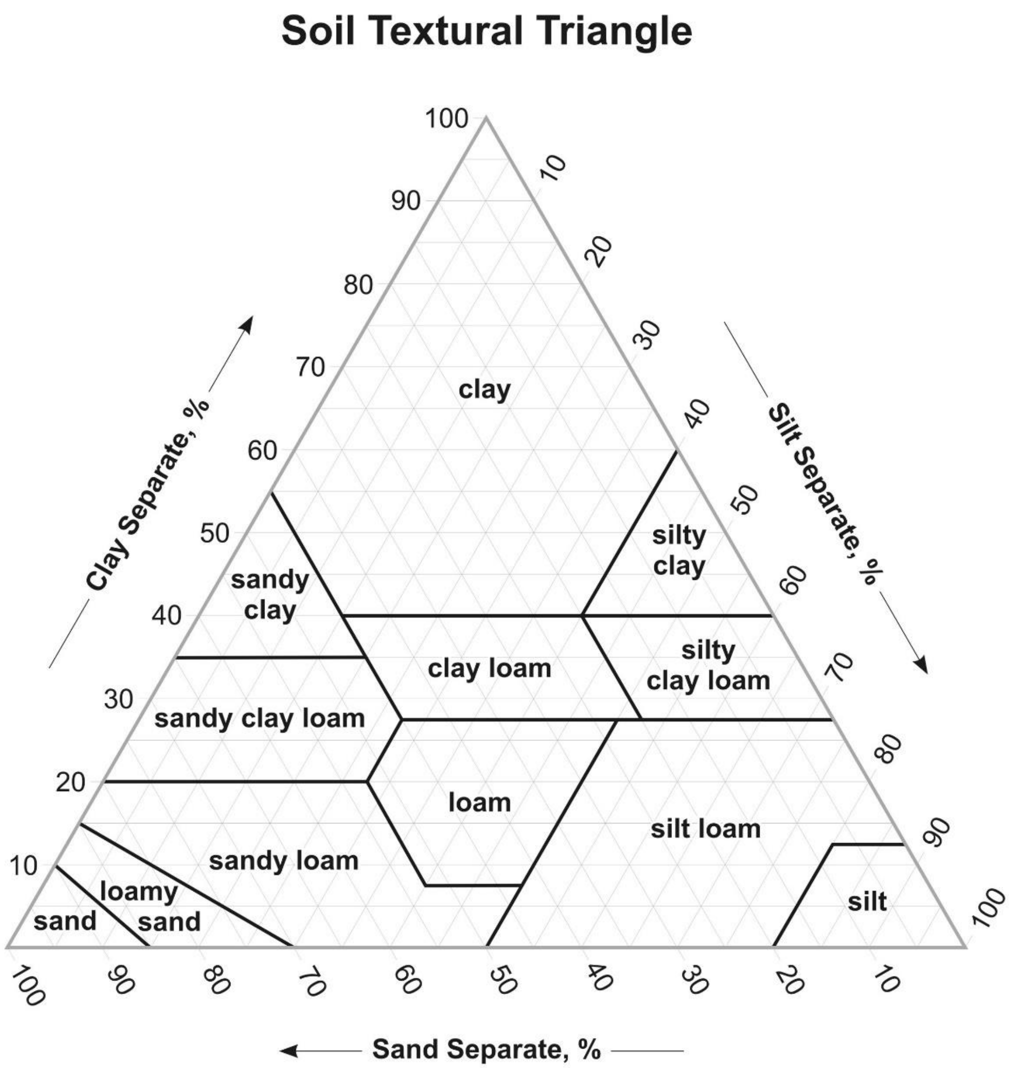



Figure 6: USDA Standard Soil Textural Triangle Chart. From Pinder and Celia, 2006.

Water contained in a soil can be described in one of four states of flow: mobile, capillary, adsorbed, or pendular (Pinder and Celia, 2006). Mobile water flows freely through a soil under hydrodynamic forces, and usually indicates the soil has reached saturation. Capillary water is under negative pressure (suction) moved by soil potential energy gradients. Capillary suction can be also be called matric potential ($\psi$) of a soil, and is usually a function of the degree of saturation of the soil. Adsorbed water is relatively immobile, and is under force from van de Waals and polar bonding. Since water is a polar molecule, it will bind to the soil particle surface at the molecular level. The amount of adsorbed water is dependent upon the soil texture. Clay rich soils have a higher potential for adsorbed water because they are typically charged, and have more surface area. Finally, Pendular water, which has the lowest movement potential, is water that has been isolated or otherwise hydrologically cut off from other water. Pendular water is found in pores of soil and rock that are unconnected to other pores, or adsorbed water in a soil that has drained all available pore water (Pinder and Celia, 1998).

Water content is measured using gravimetric and volumetric methods. Water content can be expressed as mass of water per mass of soil, as volume of water per unit volume of soil, the latter being the volumetric water content, which is more useful for flux calculations. There are many ways to measure water content in soils, and the method should be selected based upon careful consideration and a thorough understanding of the site, specific soil type, natural environment, research budget, etc.

To get a volumetric water content measurement, one needs to extract a measured volume of soil and then weigh the soil immediately upon extraction. Then, the soil is dried in an oven for a specified period at a constant temperature (most commonly 24 hours at 105 degrees Celsius) resulting in the soil water evaporating (Hillel, 1982). Once the sample has been oven dried, it is weighed again. The difference in mass from the initial measurement and the dried measurement is the mass of water contained in the soil. This mass can be used to calculate the volumetric water content, $\theta$ (-), using the following equation:

$$\theta_v = \frac{(Mwet - Mdry)}{\rho H_2 0 \times Vdry}$$

Where: $\theta_v$ is the volumetric moisture content

Mwet is the mass of the soil before oven drying (g)

Mdry is the mass after drying (g)

$\rho H_2O$ is the density of water, and

Vdry is the volume of the dry sample (L)

This method is very accurate when done correctly, however it is destructive and is difficult for measurements past the A horizon in most soils. It can also be labor intensive depending upon how many samples are needed and how frequently they are collected. Monetary cost is relatively low if access to a drying oven is already established. This is the only standardized method to measure water content; all other methods are sensing methods.

Volumetric water content may be obtained by several sensing methods depending upon the depth of measurement, the number of measurements needed, available man power, research budget, and time. Some of these methods include: neutron thermalization via neutron moisture meters, time domain reflectometry and frequency domain methods.

Neutron Moisture Meters (NMM) have been utilized as a tool to measure soil moisture since the 1960's (Evett, 2003). The meter consists of the gauge, probe tube, and data cable. The gauge contains the housing where the soil probe and source may be locked in place when not in use, as well as the microprocessor containing the calibration equation for the meter, the output display/operator interface, and a polypropylene shield.

The probe tube consists of the radioactive source and a detector, and a detector tube and associated circuitry. The detector detects thermalized neutrons scattered back to the probe. The data cable connects the probe tube to the gauge, and transmits a TTL pulse for each detected neutron to the gauge from the source tube. The meter used in this study emits neutrons from Americium 241/Beryllium.

Figure 7: NMM used in study close view of meter data cable and operator interface. Photo taken summer 2015 by A.R. Fenix.

A NMM generates a ratio of neutrons emitted versus thermalized neutrons passing through the detector tube. A thermalized neutron is a neutron that has been slowed down by interacting with other atoms in the soil such as carbon, hydrogen, nitrogen, and oxygen. Because of its size, hydrogen atoms have the greatest slowing effect on the neutrons. A fast moving neutron will become thermalized after approximately 19 collisions with hydrogen atoms compared to carbon, nitrogen, and oxygen at 120, 140, and 150 collisions respectively (Evett, 2003). To normalize the data for variations in neutron source strength and detector efficiency, a standard count (also referred to as a shield count) is taken with the NMM. The count ratio, *CR*, is the dividend of the count, *x*, and the mean standard count, $x_s$, and is represented thusly:

$$CR = {}^{x}/_{x_s}$$

Each site of study utilizing the NMM must have an accurate calibration specific to the soil as well as the soil horizons being studied. The quality of calibration is critical to the accuracy of data gathered with the NMM, (see wet site- dry site calibration procedure from Evett and Steiner, 1995).

The calibration linear regression is as follows:

$$\theta_v = b_0 + b_1(CR)$$

Where: $\theta_v$ is the volumetric water content

$b_0$ and $b_1$ are regression coefficients

CR is the count ratio

Neutron thermalization can be an accurate method of sensing volumetric soil water content, but the meter must be calibrated correctly. It is a nondestructive method, and the physics of neutron thermalization are well established and understood within scientific literature. Additionally, a soil moisture profile is easily constructed from the data, the probe reaches depths of measurement that are not possible with other methods, and it is a reliable method for soils with a high clay content.

However, initial installation of the access tubes, maintenance of tubes and access tube extensions, as well as the meter itself, are very costly. This is also a labor-intensive method to measure soil moisture. Depending on the purpose and scope of data needed from the system, a large operation may need more than one person for measurement and maintenance. Readings are also time intensive, since it is recommended to have a network of tubes in the field being observed. This method can be automated, but cannot be employed unattended. There are also strict state and federal regulatory guidelines for safe operation and transport of the meter because it is a known source of radiation. All persons handling the meter must undergo safety training, wear a dosimeter to monitor radiation exposure, strictly adhere to all regulatory and suggested practices for safe handling, and finally all handlers must work directly under a supervisor possessing a valid permit.

CHAPTER IV: METHODS AND MATERIALS

To assess whether the irrigation method influences field drainage, two data sets were used for analysis: precipitation and irrigation data from the lysimeters, and neutron moisture data from the field surrounding the lysimeter. The study was conducted on an irrigated field in Bushland, Texas at the USDA Agricultural Research Service Station located at 35° 11’ N, 102° 06’ W (Evett, et al., 2012). The site is a 20-hectare field divided in half based upon the irrigation method being used.

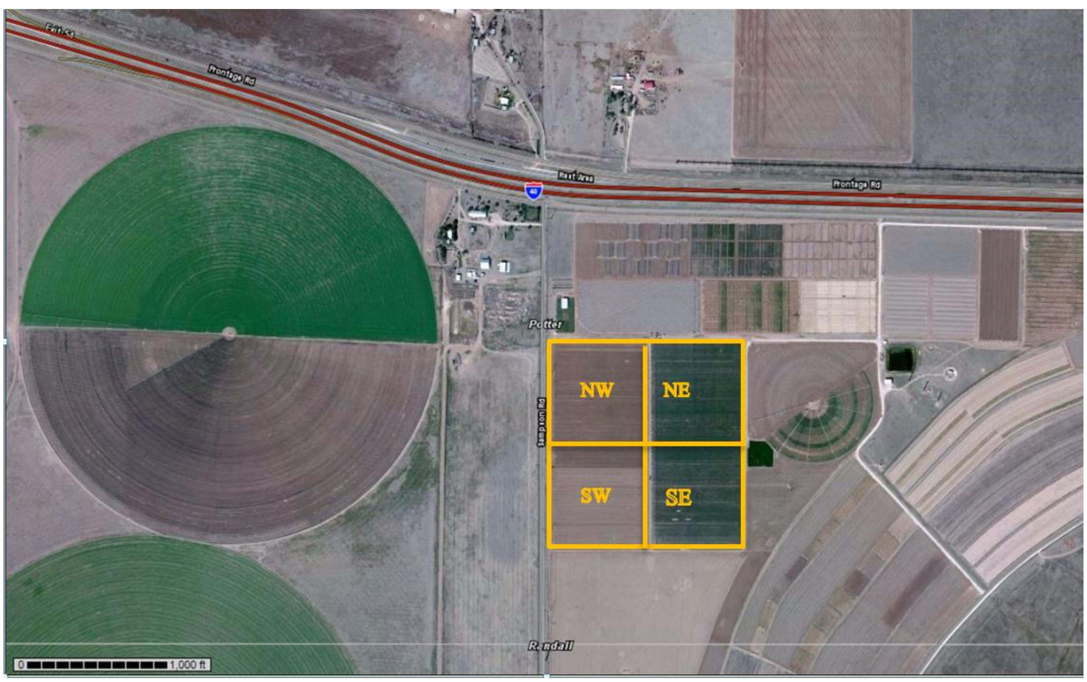



Figure 8: Aerial map of research location. Photo credit: Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [08/20/2016]

The east side is equipped with a subsurface drip irrigation system (SDI), and is composed of 20 independently operating zones, each with multiple lines of 210.3 m of drip tape. The drip tape was made by Netafilm, Inc, model Typhoon 990, and is 2.5 cm in diameter with 13 mil wall thickness (Evett, et. al., 2015). The lines are spaced 1.5 m apart and are buried approximately 0.30-0.38 m deep between plant rows, and the emitters are 0.31 m apart. The emitter flow rate is 0.68 liters per minute under 68.95 kPa (10 psi).

The west field is equipped with a ten-span linear-move lateral irrigation system equipped with mid-elevation sprinkler applicators (MESA) (Evett, et. al., 2015). Spray heads are attached to drop hoses, which are spaced 1.52 m apart along the lateral north to south. The spray heads (model D3000, Nelson Irrigation Corp., Washington) are equipped with medium grooved, concave spray plates, a 100 kPa pressure regulator, a 1 kg drop weight, and are 1.5 m above the soil surface. The lateral moves across the field east to west during irrigation with an emission rate of 2,839 liters per minute (B. Ruthardt, personal communication, 2016). The irrigation management plan for this site is scheduled weekly replenishment in the crop root zone to a mean water content 0.31 $m^3m^{-3}$, and most of the scheduled irrigation amounts were between 18 mm and 25 mm each. The two MESA fields alternated annually under 25% deficit managed irrigation. In 2013, the northwest quadrant received 25% less water from irrigation than the northwest did. In 2014 the northwest and southwest were swapped so the southwest quadrant received 25% less water, and finally in 2015 they were switched again. The analysis will not be modified to compensate for the difference between the two MESA quadrants.

The east and west fields are divided in half so that the entire 20- ha site is divided into four equal quadrants (fig. 9).In the center of each quadrant is a large monolithic weighing lysimeter (3mx3mx2.4m deep). Drainage from each lysimeter is discharged into two storage tanks suspended from the bottom of the lysimeter.

All reasonable measures were taken to ensure comparability of conditions between the field and the conditions in the lysimeter box. These measures include: simulating capillary suction of soil at the lysimeter bottom via a datalogger controlled-pump that applies an average of 10 kilopascals of suction, hand planting seed on the lysimeter and area immediately surrounding it, and then thinning to match seeded plant density of the field, and minimizing the potential for run on and run off from freeboard.on the lysimeter by furrow diking the field. The lysimeters used in this study were designed for minimal soil disturbance to preserve soil horizons and soil structure throughout the soil profile (Evett, et. al., 2012).

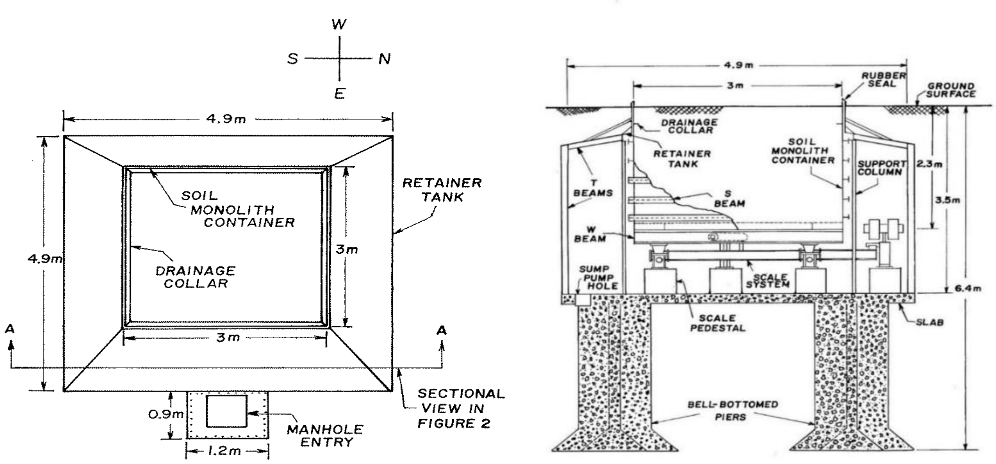



Figure 9: (left) Schematic of inner and outer boxes; (right)Schematic of lysimeter in cross section. Photo credit ARS, 2015.

They are composed of two boxes (inner and outer) which are nested into each other, an access hatch at the surface leading to the control room below the lysimeter, and an industrial scale which accurately measures changes in mass, and thus water content, to 0.04 mm (Fenix, A. field notes, 2015).

Figure 10: Scale (left) and loadcell counterweight (right) of lysimeter. Photo credit: ARS-USDA, 2015

The lysimeters were installed at the study site in 1985-1986 by pushing the bottomless (inner) box into the soil, excavating around and beneath the box to construct the control room (below deck work area), and then welding the bottom panel of the box *in situ*. This method of collecting a monolith is defined by Schneider et. al., in 1988 as *"the hydraulic pulldown procedure*." Each lysimeter weighs approximately 40 tons, and rests on an industrial scale, which is connected to a load cell manufactured by Interface in Arizona (SM-50 model), to measure changes in mass. There is a pump located in the bottom of the interior box which applies negative pressure at 10 kilopascals to mimic capillary suction, and water drained from the lysimeter is collected into two storage tanks which are both suspended from the bottom of the lysimeter.

Figure 11: Suspended drainage tank and load cell. Photo credit: ARS- 2015.

Each of the drainage collection tanks are connected to a load cell manufactured by Alphatron. There are also four soil probes which are connected to a Campbell Scientific (Logan, UT) CR 3000 micrologger. These probes are used to measure and monitor soil temperature and moisture conditions in the field (two probes) and inside the box (two probes). At the surface, the top of the lysimeter can be seen, and it looks on the surface like a box. A rubber seal is fitted over the space between the inner and outer boxes to seal out any moisture from irrigation or precipitation which would artificially inflate changes in mass measured on the scale.

Figure 12: Surface view of lysimeter with neutron access tubes and micrometeorological mast. Photo credit: ARS-USDA, 2015

Finally, there are two steel access tubes inserted into the soil from the surface to a depth of 190 cm within the box. These tubes are permanent fixtures used to lower the neutron probe into the soil column to sense water content.

In the field, there are an additional eight access tubes (four north of the box and four south) which are also used to lower the neutron probe for readings; however, the extensions on the access tubes in the field are not permanent fixtures. These extensions provide access from the soil surface, and are removed at the end of the season. The part of the tube left in the soil once the extension is removed is a permanent fixture, and is sealed with a rubber cap before covering it with soil from the field. All the tubes in the field are spaced approximately 30 meters apart (east to west) and have a maximum distance of sixty meters (north to south) from the lysimeter, and are located within plant rows.

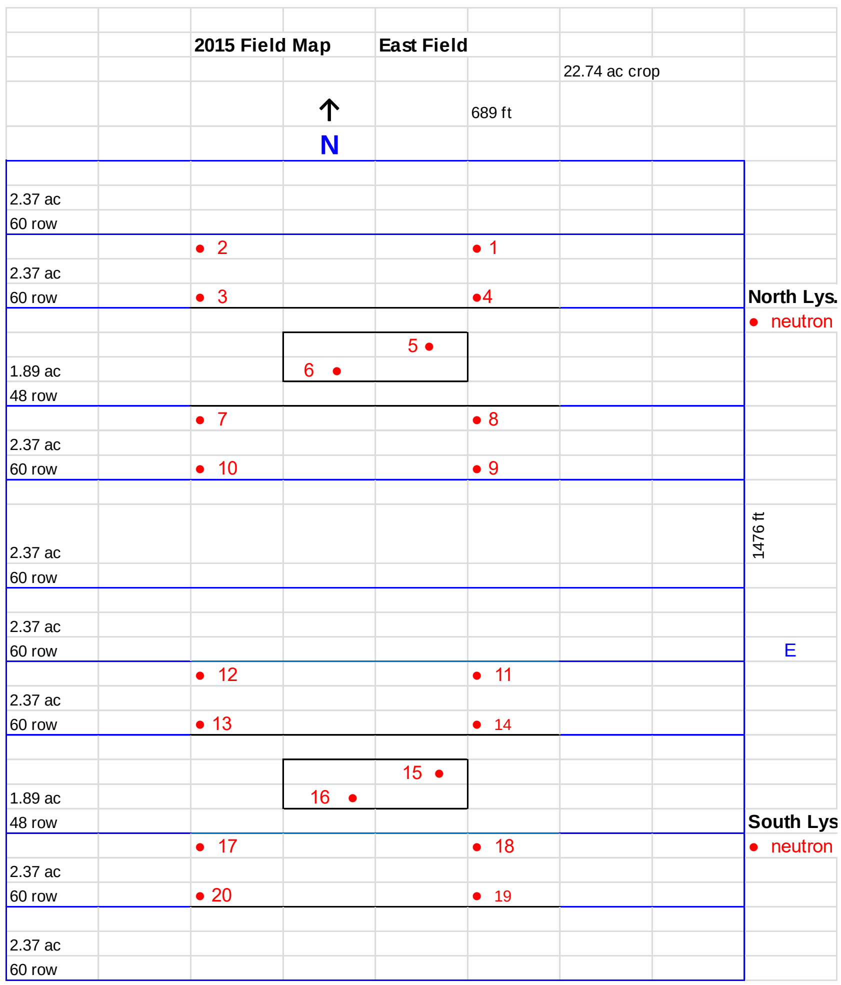



Figure 13: Tube map showing the locations of neutron access tubes for the 2015 growing season.

The neutron meter used in this study is a Model 503 DR Hydroprobe Neutron Depth Moisture Gauge manufactured by Campbell Pacific Nuclear International Inc. To ensure consistency in the soil moisture profile, as well as accuracy of near surface moisture content measurements, a depth control stand (Evett et al, 2003) was used.


Figure 14: Photograph of Campbell Scientific Neutron Meter set on top of depth control stand and stabilizing plate. Taken summer 2016

Additionally, the researcher taking moisture measurements was instructed to stand 91.44 cm away from the probe while measuring the Ap soil horizon (10 cm and 30 cm depths) to avoid moisture from the body interfering with near surface moisture content. The soil moisture profile was constructed from neutron data taken at 20 cm depth intervals beginning at 10 cm for all tubes to a depth of 230 cm in the field, and 190 cm on the lysimeter. The depth of each reading is kept consistent by using premeasured stations indicated by a clamp (cable stop) on the cable of the neutron probe which allows the probe to be suspended in the access tube. Each depth is measured for 30 seconds, and a standard count is taken to measure ambient moisture conditions before soil moisture content is sensed.


Figure 15: Close-up of meter cable showing cable stops (silver disks). Photo taken summer 2016

The soil type on site is Pullman fine, mixed, super-active, thermic Torrertic Paleustoll, or simply Pullman clay loam (Evett et al, 2012). The meter used to collect data for this study was calibrated at three depths for the three distinct soil horizons of Pullman clay loam on site: Ap, Bt, and Btka.

The Ap horizon is the uppermost horizon measuring an average depth of 20 cm from the soil surface. Below the Ap horizon is the Bt horizon which has an average depth of 130 cm below the surface, and the Btka horizon is the third horizon and averages 230 cm below the soil surface.

The Ap horizon is characterized by the National Resource Conservation Service as a brown to dark brown clay loam with moderate to fine and medium sub-angular blocky structures. Primary minerals are silicate clays, and the pH in this horizon may vary slightly but are generally neutral or modestly alkaline (NRCS, 2016). The Bt Horizon is also clay rich, with neutral pH. However, there are visible nodules of calcium carbonate that increase in size at depth. This horizon may also be slightly effervescent due to the variable concentration of calcium carbonate. Finally, the Btka horizon is characterized by its strong reaction to acids. The violent effervescence of this horizon is due to a high concentration of calcium carbonate. According to the soil series description, 50-70 percent by mass of this layer is composed of $CaCO_3$ (NRCS, 2016).

## NUMERIC MODEL FOR SOIL WATER POTENTIAL AND HYDRAULIC CONDUCTIVITY

Using data gathered with the neutron probe, matric potential in terms of pressure head (m) was calculated as a function of water content, $\theta_v$, using a derivation of van Genuchten's equation as stated in Evett, et. al. 2012.

$$h = \frac{\left[\left(\frac{\theta_s - \theta_r}{\theta_v - \theta_r}\right)^{1/m} - 1\right]^{\left(\frac{1}{n}\right)}}{\alpha}$$

Where *h* is pressure head (m)

$\theta s$ ($m^3 m^{-3}$) is the water content at saturation

$\theta r$ ($m^3 m^{-3}$) is the residual water content

$\theta_v$ is the soil water content

$\alpha$ and *n* are both dimensionless and are used as fitting parameters

$m = 1-1/n$

The soil relative hydraulic conductivity,$K_r$ (-), was calculated as a function of water content using Mualem's equation (Mualem, 1976).

$$Kr = \left\{1 - \left[1 - \left(\frac{\theta_v - \theta_r}{\theta_s - \theta_r}\right)^{\frac{1}{m}}\right]^m\right\} ^2 \left(\frac{\theta_v - \theta_r}{\theta_s - \theta_r}\right) ^ \frac{1}{2}$$

Where K*r* is the relative hydraulic conductivity

θs ($m^3m^{-3}$) is the water content at saturation

θr ($m^3m^{-3}$) is the residual water content (established via soil moisture curve)

θv is the soil water content

*m* = 1-1/*n*

Hydraulic conductivity, (K(θv)(m $s^{-1}$) was then calculated as the product of $K_s$ and $K_r$, where $K_s$ is the hydraulic conductivity of the soil at saturation. This is a necessary step to apply Darcy's Law to unsaturated flow.

To calculate flux between two adjacent measurement depths, Darcy's Law is applied thusly:

$$Q = K_m(\theta_v)\Delta H/\Delta z$$

Where: Q is the soil water flux rate (m $s^{-1}$)

*H* is the total hydraulic head

$\Delta H$ is the change in total hydraulic head between two adjacent depths

$\Delta z$ is the distance between two adjacent depths of measurement

$K_m$ is the mean hydraulic conductivity of 2 adjacent depths of measurement

Soil water retention coefficients used in this study are derived from soil moisture retention curves published in literature and are specific to each soil horizon. Ap horizon parameters are from Evett, et. al. (1999), Bt parameters are from Schwartz et. al., (2008), and Btka parameters are from Baumhardt and Lascano, 1993. To quantify cumulative drainage and flux rate out of the control volume, the only data points extracted from the soil profile data were from the bottom layer centered on 220 cm depth (210 cm to 230 cm). The calculated flux rate was an indicator of drainage past the plant rooting zone, the actual flux between measurements was the product of the flux rate and elapsed time between NMM measurements, and seasonal accumulative cumulative drainage was calculated as the summation of flux through the growing season.

Weeks within the growing season for each year where a complete set of neutron data for both irrigation methods was available were identified for comparisons of flux rates between irrigation methods. Each quadrant had eight neutron access tubes in the field so a mean flux rate was calculated for each quadrant at 220 cm. The mean flux rates for both irrigation methods at 220 cm are presented in the following tables:

Table 2: Mean flux rates, total drainage volume, and σ for 2013 at 220 cm depth.

| **2013** | | | | | | |
|---|---|---|---|---|---|---|
| **DOY - SDI** | **DOY - MESA** | **Week** | **Mean Flux Rate (cm/s) SDI** | **σ SDI** | **Mean Flux Rate (cm/s) MESA** | **σ MESA** |
| 171 | 170 | 3 | 2.44924E-09 | 3.24E-09 | 1.12968E-09 | 2.46E-09 |
| 176 | 175 | 4 | 2.0742E-09 | 3.36E-09 | 1.42062E-09 | 2.18E-09 |
| 183 | 182 | 5 | 2.62918E-09 | 3.29E-09 | 8.65128E-10 | 2.6E-09 |
| 189 | 189 | 6 | 2.44769E-09 | 2.78E-09 | 1.10615E-09 | 2.28E-09 |
| 203 | 203 | 8 | 2.31521E-09 | 3.07E-09 | 1.97287E-09 | 1.43E-09 |
| 210 | 210 | 9 | 2.4881E-09 | 3.4E-09 | 9.76418E-10 | 2.28E-09 |
| 218 | 217 | 10 | 1.98732E-09 | 3.88E-09 | 1.21748E-09 | 2.82E-09 |
| 269 | 267 | 17 | 9.25281E-10 | 3.87E-09 | 1.58384E-09 | 2.57E-09 |

| **2013** | **Estimated Field Drainage Volume** |
|---|---|
| 2.07335E-09 | SDI annual Mean Flux Rate (cm/s) |
| 1.23352E-09 | MESA annual Mean Flux Rate (cm/s) |
| 111 | # Observation Days |
| 19.88422732 | SDI: approximate water loss for 2013 season in m3 |
| 11.82997723 | MESA: approximate water loss for 2013 season in m3 |
| 19884.22732 | SDI loss 2013 season in liters |
| 11829.97723 | MESA loss 2013 season in liters |
| 804.6873727 | SDI loss per acre (L) |
| 478.7429323 | MESA loss per acre (L) |

Table 3: Mean flux rates, total drainage volume, and σ for 2014 at 220 cm depth.

| **2014** | | | | | | |
|---|---|---|---|---|---|---|
| **DOY - SDI** | **DOY - MESA** | **Week** | **Mean Flux Rate (cm/s) SDI** | **σ SDI** | **Mean Flux Rate (cm/s) MESA** | **σ MESA** |
| 188 | 188 | 3 | 2.77371E-09 | 3.17E-09 | 1.55185E-09 | 2.3E-09 |
| 195 | 195 | 4 | 4.67323E-09 | 4.33E-09 | 1.55975E-09 | 2.41E-09 |
| 202 | 202 | 5 | 3.13155E-09 | 3.03E-09 | 1.72298E-09 | 2.71E-09 |
| 210 | 209 | 6 | 2.97092E-09 | 2.73E-09 | 1.90729E-09 | 3.02E-09 |
| 216 | 216 | 7 | 2.39585E-09 | 2.93E-09 | 1.32722E-09 | 2.39E-09 |
| 223 | 223 | 8 | 2.20417E-09 | 3E-09 | 1.99794E-09 | 2.53E-09 |
| 230 | 230 | 9 | 9.63324E-10 | 1.75E-09 | 1.02798E-09 | 1.42E-09 |
| 234 | 234 | 10 | 2.43503E-09 | 3.46E-09 | 1.811E-09 | 2.22E-09 |
| 241 | 248 | 13 | 1.80418E-09 | 2.82E-09 | 1.16711E-09 | 1.56E-09 |
| 261 | 260 | 14 | 2.31438E-09 | 3.38E-09 | 3.55581E-09 | 3.32E-09 |
| 276 | 269 | 17 | 1.05006E-09 | 2.44E-09 | 2.85664E-09 | 2.77E-09 |
| 290 | 290 | 19 | 1.34869E-09 | 3.89E-09 | 2.8893E-09 | 2.73E-09 |
| 304 | 304 | 20 | 1.2224E-09 | 3.87E-09 | 1.95492E-09 | 2.59E-09 |

**2014 Estimated Field Drainage Volume**

2.21851E-09 SDI annual Mean Flux Rate (cm/s)

1.89321E-09 MESA annual Mean Flux Rate (cm/s)

126 # Observation Days

24.15158741 SDI: approximate water loss for 2013 season in m3

20.61020759 MESA: approximate water loss for 2013 season in m3

24151.58741 SDI loss 2013 season in liters

20610.20759 MESA loss 2013 season in liters

977.3815752 SDI loss per acre (L)

834.0667972 MESA loss per acre (L)

Table 4: Mean flux rates, total drainage volume, and σ for and σ for 2015 at 220 cm depth.

| **2015** | | | | | | |
|---|---|---|---|---|---|---|
| **DOY - SDI** | **DOY - MESA** | **Week** | **Mean Flux Rate (cm/s) SDI** | **σ SDI** | **Mean Flux Rate (cm/s) MESA** | **σ MESA** |
| 196 | 197 | 3 | 2.75958E-09 | 3.65E-09 | 3.0348E-09 | 2.88E-09 |
| 208 | 208 | 5 | 2.27903E-09 | 2.82E-09 | 2.72207E-09 | 2.75E-09 |
| 218 | 219 | 6 | 1.52657E-09 | 2.93E-09 | 2.25657E-09 | 2.82E-09 |
| 233* | 229 | 8 | 1.82309E-09 | 3.47E-09 | 2.76447E-09 | 2.89E-09 |
| 240* | 236 | 9 | 2.33658E-09 | 2.89E-09 | 2.66016E-09 | 2.78E-09 |
| 247* | 243 | 10 | 2.55811E-09 | 3E-09 | 2.51498E-09 | 3.15E-09 |
| 252 | 251 | 11 | 1.88106E-09 | 3.42E-09 | 2.57523E-09 | 3.02E-09 |
| 257 | 258 | 12 | 1.73451E-09 | 3.16E-09 | 2.3735E-09 | 2.29E-09 |
| 264 | 266 | 13 | 1.20633E-09 | 3.4E-09 | 2.31432E-09 | 2.76E-09 |
| 273 | 274 | 14 | 1.75543E-09 | 3.14E-09 | 2.30461E-09 | 2.87E-09 |
| 286 | 289 | 16 | 9.93042E-10 | 3.32E-09 | 2.33801E-09 | 2.32E-09 |
| | * tube 2 on east excluded due to leak in drip tape | | | | | |

**2015 Estimated Field Drainage Volume**

2.03205E-09 SDI annual Mean Flux Rate (cm/s)

2.42613E-09 MESA annual Mean Flux Rate (cm/s)

135 # Observation Days

23.70177877 SDI: approximate water loss for 2013 season in m3

28.29835466 MESA: approximate water loss for 2013 season in m3

23701.77877 SDI loss 2013 season in liters

28298.35466 MESA loss 2013 season in liters

959.1784373 SDI loss per acre (L)

1145.195551 MESA loss per acre (L)

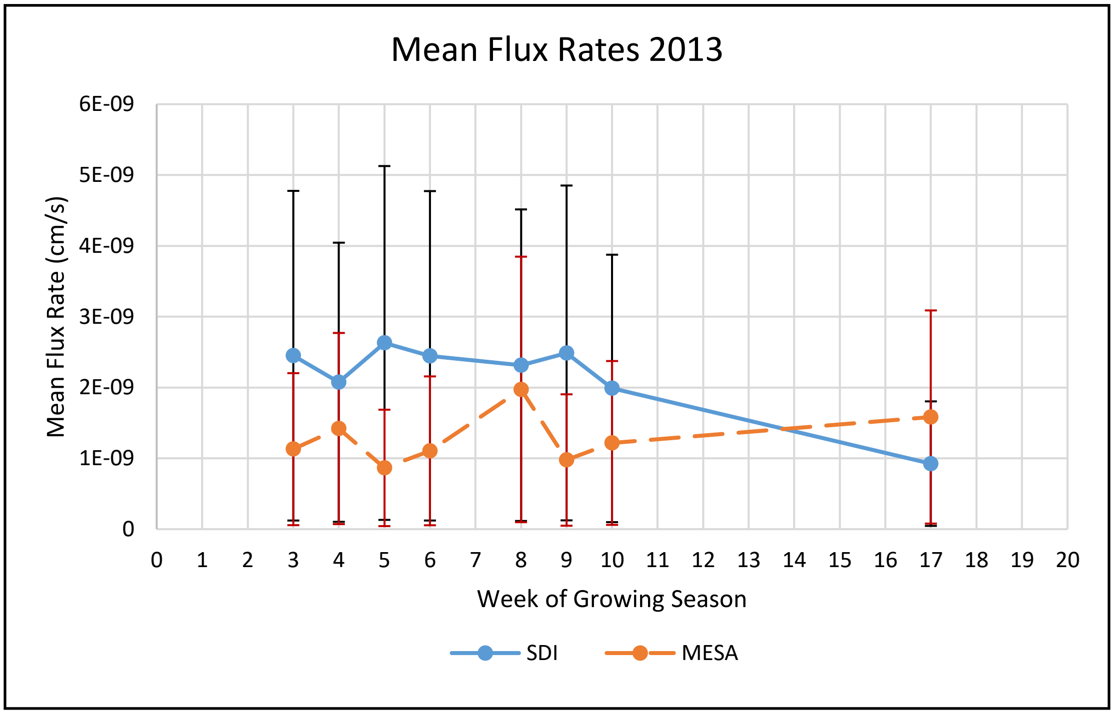



Figure 16: Comparison of mean flux rates (cm $s^{-1}$) at 220 cm depth from MESA and SDI irrigated fields in Bushland, Texas. 2013 growing season . Overlapping 95% Confidence Interval Error Bars indicate there is no significant difference between the means.

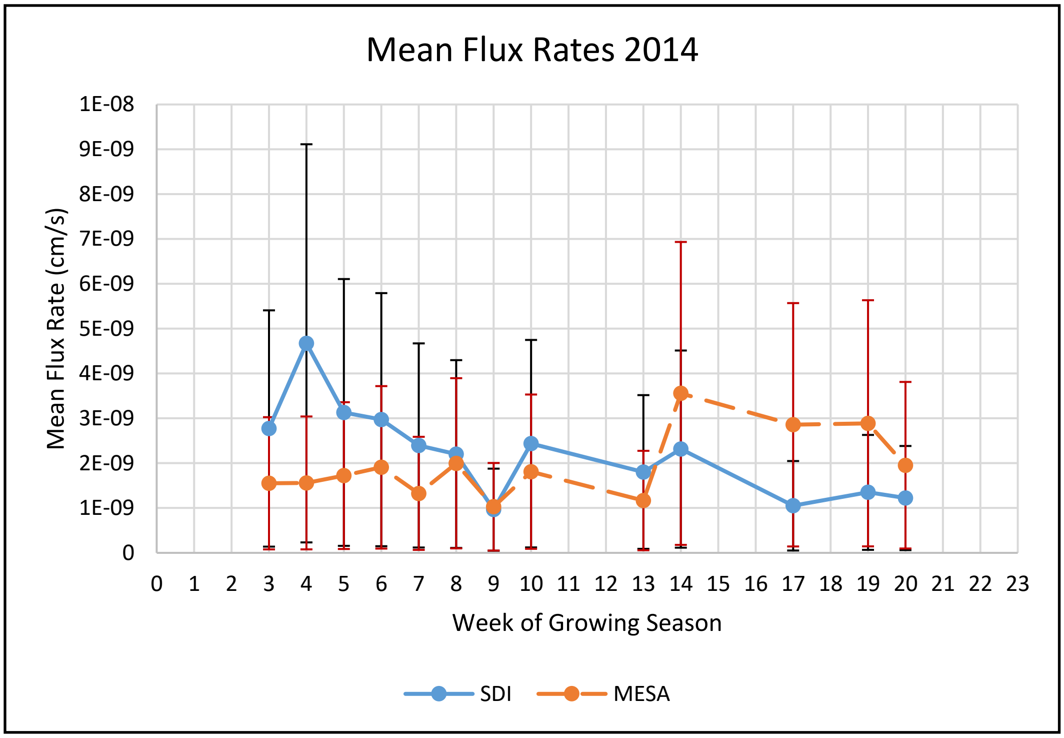



Figure 17: Comparison of mean flux rates (cm $s^{-1}$) at 220 cm depth from MESA and SDI irrigated fields
in Bushland, Texas. 2014 growing season.
Overlapping 95% Confidence Error Bars suggest no significant difference between the means

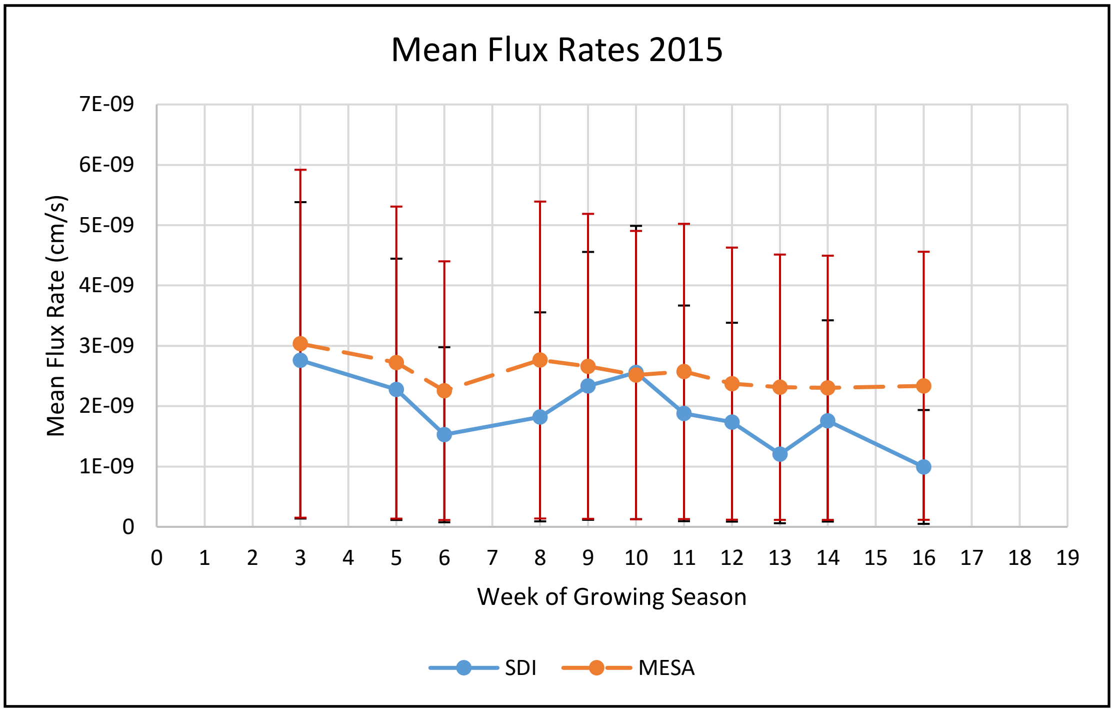



Figure 18: Comparison of mean flux rates (cm $s^{-1}$) at 220 cm depth from MESA and SDI irrigated fields
in Bushland, Texas. 2015 growing season.
Overlapping 95% Confidence Error Bars suggest no significant difference between the means

Each set of means was tested for normal distribution using the Kolmogorov-Smirnov test with an α value of 0.05. For all of the mean flux rate data sets a p-value was reported that failed to reject the null hypothesis that the data are normally distributed, except data from the MESA field (west) 2014 for which the p-value was 0.042, indicating this was not normally distributed. The KS statistic was 0.242 for a sample size of 13. To validate the results of the KS test, the KS statistic was compared to the critical value (CV) which is calculated as:

$$CV = \frac{1.36}{\sqrt{n}}$$

Where: CV is the critical value
n is the sample size
and 1.36 is the ratio constant

The critical value for this test was 0.377196, resulting in the following statement: $0.242<0.377196$ Since the KS statistic was less than the empirical critical value, the test was valid and the data for the mean flux rates in the west field for 2014 were not normally distributed. We used the "rule of thumb" ratio of standard deviations to assess population variance. The means for all three years had a population variance less than or equal to 2 indicating equal population variances. Finally, to compare the flux rates between treatments for a significant difference, a one-way Analysis of Variance (ANOVA) was completed on the flux rate means for each year by week of measurement.

The $\alpha$ value was set at 0.05 for all three ANOVAs. In all three cases, the reported p-value exceeded the limit to reject the null hypothesis, therefore there is no evidence to suggest a significant difference in the mean flux rates between MESA and SDI applications. The results of this study do not indicate that the irrigation method had a significant effect on the field drainage.

# CHAPTER V

# DISCUSSION OF RESULTS, CONCLUSIONS, AND FUTURE RESEARCH

We wanted to know if the irrigation method influenced field drainage below the plant rooting zone under irrigated fields when irrigations were managed to keep the crop equally well watered under both irrigation treatments. Weekly irrigations were scheduled to replenish water in the crop rooting zone to a mean water content 0.31 $m^3m^{-3}$, which is slightly less than the field capacity of 0.33 $m^3m^{-3}$. To reach a conclusion, several assumptions had to be made due to the high amount of natural variability that exists in nature.

The neutron data showed some of the access tube locations in both the east and west fields show higher or lower amounts of soil moisture. There are several potential causes such as human error, mechanical error from the meter, naturally occurring soil variability, uneven plant canopy coverage at that location, and uneven distribution of precipitation and irrigation. Because controls were in place to minimize human and mechanical errors and uneven distribution of irrigation and precipitation, the most likely cause is naturally occurring soil variability. Mice are frequent residents in these fields rich in food resources, and reasonable measures were taken to discourage rodent populations, including the use of bait packs, and limiting food sources on the ground. Even with these measures in place it is unreasonable to expect a rodent free field.

To minimize the effect of this variability only data from the bottom layer of the soil profile (220 cm) were used for calculating the mean flux rate by treatment method for each day of observation.

The results of this analysis are indicative of a need to further study the effects of soil water drainage and scheduled irrigation plans as they apply to risk assessment of nutrient leachate to a local water table. If the method of irrigation can be eliminated as a factor that increases the probability of contaminant migration, a more accurate risk assessment can be performed locally based upon soil saturation through the growing season. Once soil is at saturation, water will begin to flow freely between soil particles under the influence of gravity. Once this occurs, any fertilizer or pesticide applied to the soil can drain with the water past the rooting zone making it unavailable to the plant, and potentially contaminating local water wells.

The most effective way to prevent leaching is to avoid saturating the soil. The irrigation schedule at the research station in Bushland is set by weekly neutron meter data, and the amount of water applied to the field is decided upon by the difference between moisture in the soil and slightly under the field capacity of the soil. In this geographic region, it is unreasonable to rely on forecasted rain because when rain does show up it can be very spotty, and the farmer looking to protect his livelihood isn't likely to risk losing a viable crop due to lack of water. In such instances, it could be possible to satisfy the needs of both the grower and the public by electing to break up irrigation into multiple events over a period of days so the soil is not saturated if rain does come to the field.

It is to the farmer's advantage to maximize crop water use efficiency, however the ability to install soil moisture meters or monitoring devices is outside the reach of many growers. This leaves a gap in the ability of the public to apply scientific methods to their irrigation practices. There are several soil moisture monitoring options on the market that can be custom fitted to the needs of each field if needed. Time Domain Reflectometry and Capacitance probes can be extremely accurate and report soil temperature, conductivity, and soil moisture as a function of permittivity. They must be installed carefully to avoid bending or spreading the metal rods, and do have a reputation of having a finicky disposition, but several studies conducted at the research station in Bushland have shown them to be an accurate in-situ tool depending on specific soil parameters (Evett, et. al., 2003). Additionally, for continuous readout from these sensors, a data logger is necessary. Smaller operations may not find the investment needed for continuous data output feasible.

Opportunities for future research with the results of this study would be to compare the flux rates at depth on a privately owned and operated site would be beneficial in not only for the purposes of comparing scheduled irrigation between the public and private sector, but can also give a more accurate estimate of risk of groundwater contamination for the THP. Since the study site was on the Agricultural

Research Station in Bushland, irrigation practices are almost certainly different than within the private, for-profit sector. Perhaps the biggest limitation of this study is that it was planned and managed from a non-profit perspective. The irrigation schedule is strictly controlled to monitor evapotranspiration (ET) and soil water balance. Yield is studied as well, but ultimately the research goals of the Soil Water Management Unit (SWMU) at the Bushland Station are to compare irrigation methods to crop yield to maximize production while minimizing water use.

In conclusion, The Texas High Plains have a long agricultural history which has forced innovation and technological advancement in irrigation and water use efficiency. As innovative irrigation methods are applied to secure the future of water supplies on the THP, the demand for commercially grown grain crops is not likely to diminish. It is to the advantage of the agricultural industry, as well as the public, to be aware of preventative measures that may be taken to minimize negative environmental impacts such as nutrient leachate while also conserving water resources.

REFERENCES


Ashworth, William. *Ogallala Blue Water and Life on the High Plains*. Woodstock, VT: The Countryman Press, 2006.

Bell, Anne E., and Albert W. Sechrist. "Playas, Southern High Plains of Texas." *Playa Lake Symposium*. Lubbock: International Center for Arid and Semi-Arid Land Studies and Department of Geosciences, 1972. 35-39.

Baumhardt, R L., and Robert J. Lascano. "Physical and Hydraulic Properties of a Calcic Horizon." *Soil Science vol. 155 no.6*, May 1993, 367-75

DeLaune, Paul, Bridget R. Scanlon, Robert C. Reedy, Robert C. Schwartz, and Louis Baumhardt. "Groundwater Nitrogen Source Identification and Remediation in the Texas High Plains and Rolling Plains Region." *Texas Water Resources Institute Technical Report* (September 2013).

Evett, Steven R. "Soil Water Measurement by Neutron Thermalization." In *Encyclopedia of Water Science*, edited by B A. Stewart and Terry A. Howell, 889-93. New York: Marcel Dekker, Inc., 2003.

Evett, Steven R., David K. Brauer, Paul D. Colaizzi, and Susan A. O'Shaughnessy. "Corn and Sorghum Performance As Affected by Irrigation Application Method: SDI versus Mid-Elevation Spray Irrigation." *Proceedings of the 27th Annual Central Plains Irrigation Conference* (February 17, 2015): 83-95.

Evett, Steven R., Terry A. Howell, Arland D. Schneider, Karen S. Copeland, and Donald A. Dusek. "The Bushland weighing lyimeters: A quarter century of crop ET investigations to advance sustainable irrigation." *ASABE Presentation Meeting paper number 152141554* (November 10, 2015): 1-20.

Evett, S R., F H. Peters, O. R. Jones, and P W. Unger. "Soil Hydraulic Conductivity and Retension Curves from Tension Infiltrometer and Laboratory Data." *Workshop Characterization and Measurement of the Hydraulic Properties of Unsaturated Porous Media University of California* (1999): 541-551.

Evett, Steven R., Robert C. Schwartz, Terry A. Howell, R. Louis Baumhardt, and Karen S. Copeland. "Can weighing lysimeter ET represent surrounding field ET well enough to test flux station measurements of daily and sub-daily ET?" *Advances in Water Resources* (2012): 79-90.

Evett, S.R., J.L. Steiner, "Precision of Neutron Scattering and Capacitance Type Moisture Gages Based on Field Calibration." *Soil Science Society of America Journal no. 59* (1995) 961-968

Evett, S. R., J. A. Tolk, and T. A. Howell. "A Depth Control Stand for Improved Accuracy with the Neutron Probe." *Vadose Zone Journal* 2 (2003): 642-49.

Fetter, C. W. *Applied Hydrogeology*. 3rd ed. New York City: MacMillan College Publishing Company, Inc., 1980.

Gould, Charles N. *The Geology and Water Resources of the Western Portion of the Panhandle of Texas.* WASHINGTON DC: WASHINGTON GOVERNMENT PRINTING 1907, (1935.)

Green, Donald E. *Land of the Underground Rain*. Austin: University of Texas Press, 1973.

Gutentag, Edwin D., Fredrick J. Heimes, Noel C. Krothe, Richard R. Luckey, and John B. Weeks. "Geohydrology of the High PlainsAquifer In Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, andd Wyoming." *US Geological Survey Professional Paper 1400-B* (1985): 1-72.

Hillel, Daniel. *Introduction to Soil Physics*. New York City: Academic Press, 1982.

Howell, Terry A. "Irrigation System Efficiencies." In *Encyclopedia of Water Science,* edited by Terry A. Howell, 80-92. New York: Marcel Dekker, Inc, 2002

Howell, Terry A., Robert R. McCormick, and Claude J. Phene. "Design and Installation of Large Weighing Lysimeters." *Soil and Water Div. of ASAE paperNo. 832060* (October 1984): 106-17.

Jury, William A., and Robert Horton. *Soil Physics*. Hoboken: John Wiley and Sons, Inc., 2004.

Knobeloch, Lynda, Barbara Salna, Adam Hogan, Jeffrey Postle, and Henry Anderson. "Blue Babies and Nitrate-Contaminated Well Water." *Environmental Health Perspectives* 108, no. 7 (July 2000): 675-78.

Longo, Peter J., and David W. Yoskowitz. *Water on the Great Plains: Issues and Politics*. Lubbock: Texas Tech University Press, 2002.

Luckey, Richard R., and Mark F. Becker. "Hydrogeology, water use, and simulation of flow in the High Plains aquifer in northwestern Oklahoma, southeastern New Mexico, and northwestern Texas." *Water-Resources Investigations Report 99-4104* (1999).

McGuire, Virginia L. "Water-Level Changes and Change in Water in Storage in the High Plains Aquifer, Predevelopment to 2013-2011." *U.S. Geological Survey Scientific Investigations Report 2014-5218* (2014): 1-24.

Miller, R. W., and D. T. Gardiner. *Soils in Our Environment*. 8th ed. Upper Saddle River, NJ: Prentice-Hall Publishers, 1998.

Mualem, Yechezkel. "Model for Predicting the Hydraulic Conductivity of Unsaturated Porous Media." *American Geophysical Union* 12, no. 3 (June 1976): 513-22.

National Resource Conservation Service. "Soil Survey Technical Note No. 6." https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053573 (December 2004).

National Resource Conservation Service. "Official Soil Description Database: Pullman Series" (December 2014).

Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/ (2016).

Opie, John. *Ogallala Water for a Dry Land*. Lincoln: University of Nebraska Press, 1993.

Pinder, George F., and Michael A. Celia. *Subsurface Hydrology*. Hoboken: John Wiley and Sons, Inc., 2006.

Pringle, Fred. *Pullman Clay Loam- Lysimeter Installation Field Notes*. N.p.: unpublished field notes, 1989.

Schneider, A. D., T. A. Howell, A.T. A. Moustafa, S. R. Evett, and W. Abou-Zeid. "A Simplified Weighing Lysimeter for Monolithic or Reconstructed Soils." *American Society of Agricultural Engineers* 14, no. 3 (1998): 267-73.

Schwartz, R C., R L. Baumhardt, and T A. Howell. "Estimation of Soil Water Balance Components Using an Iterative Procedure." *Vadose Zone Journal* 7, no. 1 (February 2008): 115-23.

Schwartz, R. C., and S. R. Evett. "Conjunctive Use of Tension Infiltometry and Time-Domain Reflectometry for Inverse Estimation of Soil Hydraulic Properties." *Vadose Zone Journal* (March 2003): 530-38.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Series Descriptions. Available online. Accessed [09/2014].

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [11/2016].

Taylor, Howard M., C. E. Van Doren, Curtis L. Godfrey, and James R. Coover. "Soils of the Southwestern Great Plains Field Station." *Texas Agriculture Experiment Station* (June 1963): 1-14.

Texas Comission on Environmental Quality. *Chapter 290- Public Drinking Water Subchapter F: Drinking Water Standards Governing Drinking Water Quality and Reporting Requirements for Public Water Systems*. Austin: TCEQ, 2012.

Unger, Paul W., and Fred B. Pringle. "Pullman Soils: Distribution, Importance, Variability & Management." *The Texas Agricultural Experiment Station* (September 1981).

USDA-NASS. 2008. 2007 Census of Agriculture: 2008 Farm and Ranch Irrigation Survey. USDA National Agricultural Statistics Service.

USGCRP (2014). Shafer, M., D. Ojima, J.M. Antle, D. Kluck, R.A. McPherson, S. Petersen, B. Scanlon, and K. Sherman, 2014: Ch 19: Great Plains. Climate Change Impacts in the United States: The Third National Climate Assessment, J.M. Melillo, Terese (T.C.) Richmond, and G.W. Yohe, Eds., U.S. Global Change Research Program, 441-461.

Weinheimer, Justin A., Phillip Johnson, Donna Mitchell, Jeff Johnson, and Rick Kellison. "Texas High Plains Initiative for Strategic and Innovative Irrigation Management and Conservation." *Journal of Contemporary Water Research & Education* (August 2013): 43-92.

# APPENDIX A: ANOVA TABLES

Table 5 Anova: 2013 Mean Flux Rate between treatments

**Fail to reject null hypothesis**

**SUMMARY**

| Week | Count | Sum | Average | Variance |
|---|---|---|---|---|
| 3 | 2 | 3.58E-09 | 1.79E-09 | 8.71E-19 |
| 4 | 2 | 3.49E-09 | 1.75E-09 | 2.14E-19 |
| 5 | 2 | 3.49E-09 | 1.75E-09 | 1.56E-18 |
| 6 | 2 | 3.55E-09 | 1.78E-09 | 9E-19 |
| 8 | 2 | 4.29E-09 | 2.14E-09 | 5.86E-20 |
| 9 | 2 | 3.46E-09 | 1.73E-09 | 1.14E-18 |
| 10 | 2 | 3.2E-09 | 1.6E-09 | 2.96E-19 |
| 17 | 2 | 2.51E-09 | 1.25E-09 | 2.17E-19 |

**ANOVA**

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 8.4E-19 | 7 | 1.2E-19 | 0.18263 | 0.981429 | 3.500464 |
| Within Groups | 5.25E-18 | 8 | 6.57E-19 | | | |
| | | | | | | |
| Total | 6.09E-18 | 15 | | | | |

Table 6 Anova: 2014 Mean Flux Rate between treatments

**Fail to reject null hypothesis**

**<u>SUMMARY</u>**

| Week | Count | Sum | Average | Variance |
|---|---|---|---|---|
| 3 | 2 | 4.33E-09 | 2.16E-09 | 7.46E-19 |
| 4 | 2 | 6.23E-09 | 3.12E-09 | 4.85E-18 |
| 5 | 2 | 4.85E-09 | 2.43E-09 | 9.92E-19 |
| 6 | 2 | 4.88E-09 | 2.44E-09 | 5.66E-19 |
| 7 | 2 | 3.72E-09 | 1.86E-09 | 5.71E-19 |
| 8 | 2 | 4.2E-09 | 2.1E-09 | 2.13E-20 |
| 9 | 2 | 1.99E-09 | 9.96E-10 | 2.09E-21 |
| 10 | 2 | 4.25E-09 | 2.12E-09 | 1.95E-19 |
| 13 | 2 | 2.97E-09 | 1.49E-09 | 2.03E-19 |
| 14 | 2 | 5.87E-09 | 2.94E-09 | 7.71E-19 |
| 17 | 2 | 3.91E-09 | 1.95E-09 | 1.63E-18 |
| 19 | 2 | 4.24E-09 | 2.12E-09 | 1.19E-18 |
| 20 | 2 | 3.18E-09 | 1.59E-09 | 2.68E-19 |

**ANOVA**

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 7.79E-18 | 12 | 6.49E-19 | 0.703128 | 0.725501 | 2.603661 |
| Within Groups | 1.2E-17 | 13 | 9.23E-19 | | | |
| Total | 1.98E-17 | 25 | | | | |

Table 7 Anova: 2015 Mean Flux Rate between treatments

**Fail to reject null hypothesis**

**SUMMARY**

| Week | Count | Sum | Average | Variance |
|---|---|---|---|---|
| 3 | 2 | 5.79E-09 | 2.9E-09 | 3.79E-20 |
| 5 | 2 | 5E-09 | 2.5E-09 | 9.81E-20 |
| 6 | 2 | 3.78E-09 | 1.89E-09 | 2.66E-19 |
| 8 | 2 | 4.59E-09 | 2.29E-09 | 4.43E-19 |
| 9 | 2 | 5E-09 | 2.5E-09 | 5.24E-20 |
| 10 | 2 | 5.07E-09 | 2.54E-09 | 9.3E-22 |
| 11 | 2 | 4.46E-09 | 2.23E-09 | 2.41E-19 |
| 12 | 2 | 4.11E-09 | 2.05E-09 | 2.04E-19 |
| 13 | 2 | 3.52E-09 | 1.76E-09 | 6.14E-19 |
| 14 | 2 | 4.06E-09 | 2.03E-09 | 1.51E-19 |
| 16 | 2 | 3.33E-09 | 1.67E-09 | 9.04E-19 |

**ANOVA**

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 2.82E-18 | 10 | 2.82E-19 | 1.029801 | 0.477532 | 2.853625 |
| Within Groups | 3.01E-18 | 11 | 2.74E-19 | | | |
| Total | 5.83E-18 | 21 | | | | |

Table 8: 2015 mean flux rates between NW and SW for differences due to deficit irrigation

**Anova: Single Factor**

SUMMARY

| Groups | Count | Sum | Average | Variance |
|---|---|---|---|---|
| Row 1 | 2 | 6.0696E-09 | 3.0348E-09 | 4.79029E-18 |
| Row 2 | 2 | 5.44413E-09 | 2.72207E-09 | 1.6982E-18 |
| Row 3 | 2 | 4.51315E-09 | 2.25657E-09 | 3.87754E-18 |
| Row 4 | 2 | 5.52895E-09 | 2.76447E-09 | 4.39476E-18 |
| Row 5 | 2 | 5.32032E-09 | 2.66016E-09 | 3.1153E-18 |
| Row 6 | 2 | 5.02996E-09 | 2.51498E-09 | 2.6389E-18 |
| Row 7 | 2 | 5.15046E-09 | 2.57523E-09 | 3.17853E-18 |
| Row 8 | 2 | 4.74699E-09 | 2.3735E-09 | 2.00194E-18 |
| Row 9 | 2 | 4.62864E-09 | 2.31432E-09 | 4.38818E-18 |
| Row 10 | 2 | 4.60922E-09 | 2.30461E-09 | 1.19716E-18 |
| Row 11 | 2 | 4.67602E-09 | 2.33801E-09 | 1.87299E-18 |
| Row 12 | 2 | 4.03928E-09 | 2.01964E-09 | 1.37463E-18 |
| Row 13 | 2 | 3.3226E-09 | 1.6613E-09 | 3.18162E-18 |

2015 ANOVA

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 2.94836E-18 | 12 | 2.45697E-19 | 0.084700418 | 0.999932 | 2.603661 |
| Within Groups | 3.771E-17 | 13 | 2.90077E-18 | | | |
| Total | 4.06584E-17 | 25 | | | | |

Table 9: 2014 mean flux rates between NW and SW for differences due to deficit irrigation

**Anova: Single Factor**

SUMMARY

| Groups | Count | Sum | Average | Variance |
|---|---|---|---|---|
| Row 1 | 2 | 2.6E-09 | 1.3E-09 | 3.46E-18 |
| Row 2 | 2 | 3.1E-09 | 1.55E-09 | 3.45E-18 |
| Row 3 | 2 | 3.12E-09 | 1.56E-09 | 4.48E-18 |
| Row 4 | 2 | 3.45E-09 | 1.72E-09 | 5.93E-18 |
| Row 5 | 2 | 3.81E-09 | 1.91E-09 | 5.71E-18 |
| Row 6 | 2 | 2.65E-09 | 1.33E-09 | 3.44E-18 |
| Row 7 | 2 | 4E-09 | 2E-09 | 3.52E-18 |
| Row 8 | 2 | 2.06E-09 | 1.03E-09 | 1.24E-18 |
| Row 9 | 2 | 3.62E-09 | 1.81E-09 | 4.78E-18 |
| Row 10 | 2 | 3.53E-09 | 1.77E-09 | 4.25E-18 |
| Row 11 | 2 | 2.33E-09 | 1.17E-09 | 1.42E-18 |
| Row 12 | 2 | 7.11E-09 | 3.56E-09 | 3.71E-19 |
| Row 13 | 2 | 5.71E-09 | 2.86E-09 | 2.41E-19 |
| Row 14 | 2 | 5.78E-09 | 2.89E-09 | 7.82E-19 |
| Row 15 | 2 | 3.91E-09 | 1.95E-09 | 1.48E-18 |

2014 ANOVA

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | | | | | | |
| Within Groups | 1.39E-17 | 14 | 9.89E-19 | 0.333065 | 0.976748 | 2.424364 |
| | 4.46E-17 | 15 | 2.97E-18 | | | |
| Total | 5.84E-17 | 29 | | | | |

Table 10: 2013 Comparing NW to SW mean flux rates for significant difference due to deficit irrigation

**Anova: Single Factor**

SUMMARY

| Groups | Count | Sum | Average | Variance |
|---|---|---|---|---|
| Row 1 | 2 | 1.7E-09 | 8.52E-10 | 3.65E-18 |
| Row 2 | 2 | 5.64E-10 | 2.82E-10 | 7.89E-19 |
| Row 3 | 2 | 2.26E-09 | 1.13E-09 | 3.55E-18 |
| Row 4 | 2 | 2.84E-09 | 1.42E-09 | 3.7E-18 |
| Row 5 | 2 | 1.73E-09 | 8.65E-10 | 4.26E-18 |
| Row 6 | 2 | 2.21E-09 | 1.11E-09 | 2.7E-18 |
| Row 7 | 2 | 2.64E-09 | 1.32E-09 | 4.09E-18 |
| Row 8 | 2 | 3.95E-09 | 1.97E-09 | 2.26E-19 |
| Row 9 | 2 | 1.95E-09 | 9.76E-10 | 3.41E-18 |
| Row 10 | 2 | 2.43E-09 | 1.22E-09 | 5.62E-18 |
| Row 11 | 2 | 4.45E-09 | 2.22E-09 | 5.29E-19 |
| Row 12 | 2 | 2.38E-09 | 1.19E-09 | 2.73E-18 |

2013 ANOVA

| Source of Variation | SS | df | MS | F | P-value | F crit |
|---|---|---|---|---|---|---|
| Between Groups | 5.69E-18 | 11 | 5.18E-19 | 0.176171 | 0.996415 | 2.717331 |
| Within Groups | 3.53E-17 | 12 | 2.94E-18 | | | |
| Total | 4.1E-17 | 23 | | | | |

# APPENDIX B: EXPLORATORY STATISTICS OUTPUT

SW Field flux rate in 2015 @ 220 cm

SWfr_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -7.6836e-10 | 1.8950e-09 | 3.6254e-09 | 5.2014e-09 | 9.0726e-09 |

The mean for SW Field flux rate @ 220 cm is 0.000000003604

The median for SW Field flux rate @ 220 cm is 0.000000003625

The skewness for SW Field flux rate @ 220 cm is 0.136087674199

The kurtosis for SW Field flux rate @ 220 cm is 2.377519182354

The standard deviation for SW Field flux rate @ 220 cm is 2.394778302486e-09

The variance for SW Field flux rate @ 220 cm is 5.734963118059e-18

NW Field flux rate in 2015 @ 220 cm

NWfluxr_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -4.5253e-09 | 6.8435e-10 | 3.0396e-09 | 4.8359e-09 | 6.7399e-09 |

The mean for NW Field flux rate @ 220 cm is 0.000000002471

The median for NW Field flux rate @ 220 cm is 0.000000003040

The skewness for NW Field flux rate @ 220 cm is -0.673989305471

The kurtosis for NW Field flux rate @ 220 cm is 2.495013755943

The standard deviation for NW Field flux rate @ 220 cm is 2.873780807652e-09

The variance for NW Field flux rate @ 220 cm is 8.258616130427e-18

SE Field flux rate in 2015 @ 220 cm

SEfr_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -4.9506e-09 | 1.7582e-09 | 3.8412e-09 | 5.3243e-09 | 1.2555e-08 |

The mean for SE Field flux rate @ 220 cm is 0.000000003434

The median for SE Field flux rate @ 220 cm is 0.000000003841

The skewness for SE Field flux rate @ 220 cm is -0.328133110061

The kurtosis for SE Field flux rate @ 220 cm is 3.173475458734

The standard deviation for SE Field flux rate @ 220 cm is 3.324027608924e-09

The variance for SE Field flux rate @ 220 cm is 1.104915954489e-17

NE Field flux rate in 2015 @ 220 cm

NEfr_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -7.3473e-09 | -8.7956e-10 | 7.8431e-10 | 2.3456e-09 | 8.0662e-09 |

The mean for NE Field flux rate @ 220 cm is 0.000000000558

The median for NE Field flux rate @ 220 cm is 0.000000000784

The skewness for NE Field flux rate @ 220 cm is -0.299479313347

The kurtosis for NE Field flux rate @ 220 cm is 3.232880489284

The standard deviation for NE Field flux rate @ 220 cm is 2.823168834437e-09

The variance for NE Field flux rate @ 220 cm is 7.970282267738e-18

SW Field flux rate in 2014 @ 220 cm

SWfr_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 4.7343e-13 | 8.5171e-10 | 2.5175e-09 | 4.7709e-09 | 8.8591e-09 |

The mean for SW Field flux rate @ 220 cm is 0.000000002974

The median for SW Field flux rate @ 220 cm is 0.000000002517

The skewness for SW Field flux rate @ 220 cm is 0.414318873130

The kurtosis for SW Field flux rate @ 220 cm is 2.164978757757

The standard deviation for SW Field flux rate @ 220 cm is 2.196579549609e-09

The variance for SW Field flux rate @ 220 cm is 4.824961717759e-18

NW Field flux rate in 2014 @ 220 cm

NWfr_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -4.1678e-09 | 3.1185e-10 | 1.4122e-09 | 2.9214e-09 | 1.2474e-08 |

The mean for NW Field flux rate @ 220 cm is 0.000000001558

The median for NW Field flux rate @ 220 cm is 0.000000001412

The skewness for NW Field flux rate @ 220 cm is 0.505351052792

The kurtosis for NW Field flux rate @ 220 cm is 4.679218685626

An outlier for NW Field flux rate @ 220 cm is 87.000000000000

The standard deviation for NW Field flux rate @ 220 cm is 2.643665433856e-09

The variance for NW Field flux rate @ 220 cm is 6.988966926165e-18

SE Field flux rate in 2014 @ 220 cm

SEfr_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -4.2582e-09 | 1.9465e-09 | 4.3747e-09 | 6.0886e-09 | 1.2536e-08 |

The mean for SE Field flux rate @ 220 cm is 0.000000003805

The median for SE Field flux rate @ 220 cm is 0.000000004375

The skewness for SE Field flux rate @ 220 cm is -0.441367509597

The kurtosis for SE Field flux rate @ 220 cm is 3.148494427617

The standard deviation for SE Field flux rate @ 220 cm is 3.077552360021e-09

The variance for SE Field flux rate @ 220 cm is 9.471328528672e-18

NE Field flux rate in 2014 @ 220 cm

NEfr_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -6.1560e-09 | -1.1202e-09 | 5.4340e-10 | 1.6929e-09 | 6.7294e-09 |

The mean for NE Field flux rate @ 220 cm is 0.000000000411

The median for NE Field flux rate @ 220 cm is 0.000000000543

The skewness for NE Field flux rate @ 220 cm is -0.150749380711

The kurtosis for NE Field flux rate @ 220 cm is 3.182975887747

The standard deviation for NE Field flux rate @ 220 cm is 2.250519615463e-09

The variance for NE Field flux rate @ 220 cm is 5.064838539586e-18

SW Field flux rate in 2013 @ 220 cm

SWfr_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 3.0538e-11 | 4.7528e-10 | 2.4135e-09 | 3.5832e-09 | 6.0707e-09 |

The mean for SW Field flux rate @ 220 cm is 0.000000002398

The median for SW Field flux rate @ 220 cm is 0.000000002413

The skewness for SW Field flux rate @ 220 cm is 0.176066495535

The kurtosis for SW Field flux rate @ 220 cm is 2.104652472594

The standard deviation for SW Field flux rate @ 220 cm is 1.665529228879e-09

The variance for SW Field flux rate @ 220 cm is 2.773987612251e-18

NW Field flux rate in 2013 @ 220 cm

NWfr_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -6.1323e-09 | 2.3001e-10 | 1.2013e-09 | 2.5763e-09 | 5.6026e-09 |

The mean for NW Field flux rate @ 220 cm is 0.000000000852

The median for NW Field flux rate @ 220 cm is 0.000000001201

The skewness for NW Field flux rate @ 220 cm is -1.170055506930

The kurtosis for NW Field flux rate @ 220 cm is 4.124299045964

The standard deviation for NW Field flux rate @ 220 cm is 2.469618164065e-09

The variance for NW Field flux rate @ 220 cm is 6.099013876281e-18

SE Field flux rate in 2013 @ 220 cm

SEfr_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -6.8304e-09 | 2.7568e-09 | 4.2262e-09 | 5.6392e-09 | 9.0727e-09 |

The mean for SE Field flux rate @ 220 cm is 0.000000003386

The median for SE Field flux rate @ 220 cm is 0.000000004226

The skewness for SE Field flux rate @ 220 cm is -1.478025124264

The kurtosis for SE Field flux rate @ 220 cm is 4.747664948780

The standard deviation for SE Field flux rate @ 220 cm is 3.484170622044e-09

The variance for SE Field flux rate @ 220 cm is 1.213944492351e-17

NE Field flux rate in 2013 @ 220 cm

NEfr_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -6.5112e-09 | -1.6176e-09 | 7.3063e-11 | 2.2058e-09 | 4.9931e-09 |

The mean for NE Field flux rate @ 220 cm is 0.000000000169

The median for NE Field flux rate @ 220 cm is 0.000000000073

The skewness for NE Field flux rate @ 220 cm is -0.183197572709

The kurtosis for NE Field flux rate @ 220 cm is 2.492214901425

The standard deviation for NE Field flux rate @ 220 cm is 2.398043281010e-09

The variance for NE Field flux rate @ 220 cm is 5.750611577598e-18

SW Field flux in 2015 @ 220 cm

SWfd_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -7.3961e-08 | 2.7975e-09 | 3.0577e-08 | 5.4170e-08 | 1.6159e-07 |

The mean for SW Field flux @ 220 cm is 0.000000033132

The median for SW Field flux @ 220 cm is 0.000000030577

The skewness for SW Field flux @ 220 cm is 0.568973616304

The kurtosis for SW Field flux @ 220 cm is 4.234639292973

An outlier for SW Field flux @ 220 cm is 43.000000000000

The standard deviation for SW Field flux @ 220 cm is 4.217389443925e-08

The variance for SW Field flux @ 220 cm is 1.778637372173e-15

NW Field flux in 2015 @ 220 cm

NWfd_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -6.7710e-08 | 0 | 2.2591e-08 | 3.9320e-08 | 1.3501e-07 |

The mean for NW Field flux @ 220 cm is 0.000000022675

The median for NW Field flux @ 220 cm is 0.000000022591

The skewness for NW Field flux @ 220 cm is 0.272375543269

The kurtosis for NW Field flux @ 220 cm is 3.439173235275

The standard deviation for NW Field flux @ 220 cm is 4.052974381391e-08

The variance for NW Field flux @ 220 cm is 1.642660133621e-15

SE Field flux in 2015 @ 220 cm

SEfd_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -5.2490e-08 | 6.1762e-09 | 2.7997e-08 | 4.1598e-08 | 1.5402e-07 |

The mean for SE Field flux @ 220 cm is 0.000000026207

The median for SE Field flux @ 220 cm is 0.000000027997

The skewness for SE Field flux @ 220 cm is 0.707249098809

The kurtosis for SE Field flux @ 220 cm is 5.966637004451

An outlier for SE Field flux @ 220 cm is 2.000000000000

An outlier for SE Field flux @ 220 cm is 18.000000000000

An outlier for SE Field flux @ 220 cm is 34.000000000000

The standard deviation for SE Field flux @ 220 cm is 3.041740235979e-08

The variance for SE Field flux @ 220 cm is 9.252183663173e-16

NE Field flux in 2015 @ 220 cm

NEfd_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -8.0642e-08 | -5.6021e-09 | 4.3997e-09 | 2.0811e-08 | 7.1354e-08 |

The mean for NE Field flux @ 220 cm is 0.000000003941

The median for NE Field flux @ 220 cm is 0.000000004400

The skewness for NE Field flux @ 220 cm is -0.740015049794

The kurtosis for NE Field flux @ 220 cm is 5.000186687011

An outlier for NE Field flux @ 220 cm is 96.000000000000

An outlier for NE Field flux @ 220 cm is 110.000000000000

An outlier for NE Field flux @ 220 cm is 112.000000000000

The standard deviation for NE Field flux @ 220 cm is 2.343644848255e-08

The variance for NE Field flux @ 220 cm is 5.492671174754e-16

SW Field flux in 2014 @ 220 cm

SWfd_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 0 | 3.9839e-09 | 1.9253e-08 | 3.5805e-08 | 1.4120e-07 |

The mean for SW Field flux @ 220 cm is 0.000000024924

The median for SW Field flux @ 220 cm is 0.000000019253

The skewness for SW Field flux @ 220 cm is 1.943566165336

The kurtosis for SW Field flux @ 220 cm is 8.118802833345

An outlier for SW Field flux @ 220 cm is 29.000000000000

An outlier for SW Field flux @ 220 cm is 59.000000000000

An outlier for SW Field flux @ 220 cm is 74.000000000000

The standard deviation for SW Field flux @ 220 cm is 2.553831678996e-08

The variance for SW Field flux @ 220 cm is 6.522056244643e-16

NW Field flux in 2014 @ 220 cm

NWfd_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -5.0193e-08 | 3.4894e-10 | 9.1573e-09 | 2.3529e-08 | 1.5415e-07 |

The mean for NW Field flux @ 220 cm is 0.000000015844

The median for NW Field flux @ 220 cm is 0.000000009157

The skewness for NW Field flux @ 220 cm is 1.691551573925

The kurtosis for NW Field flux @ 220 cm is 7.580692978666

An outlier for NW Field flux @ 220 cm is 44.000000000000

An outlier for NW Field flux @ 220 cm is 89.000000000000

The standard deviation for NW Field flux @ 220 cm is 3.065038407016e-08

The variance for NW Field flux @ 220 cm is 9.394460436482e-16

SE Field flux in 2014 @ 220 cm

SEfd_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -5.0725e-08 | 1.3157e-08 | 3.2074e-08 | 4.7116e-08 | 1.2834e-07 |

The mean for SE Field flux @ 220 cm is 0.000000031850

The median for SE Field flux @ 220 cm is 0.000000032074

The skewness for SE Field flux @ 220 cm is 0.413291961478

The kurtosis for SE Field flux @ 220 cm is 4.040934504861

An outlier for SE Field flux @ 220 cm is 41.000000000000

The standard deviation for SE Field flux @ 220 cm is 3.184879479484e-08

The variance for SE Field flux @ 220 cm is 1.014345729884e-15

NE Field flux in 2014 @ 220 cm

NEfd_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -7.0844e-08 | -7.2000e-09 | 3.4728e-09 | 1.5191e-08 | 6.6720e-08 |

The mean for NE Field flux @ 220 cm is 0.000000002288

The median for NE Field flux @ 220 cm is 0.000000003473

The skewness for NE Field flux @ 220 cm is -0.727105819947

The kurtosis for NE Field flux @ 220 cm is 5.557791605419

An outlier for NE Field flux @ 220 cm is 56.000000000000

An outlier for NE Field flux @ 220 cm is 90.000000000000

An outlier for NE Field flux @ 220 cm is 105.000000000000

The standard deviation for NE Field flux @ 220 cm is 2.008739098523e-08

The variance for NE Field flux @ 220 cm is 4.035032765936e-16

SW Field flux in 2013 @ 220 cm

SWfd_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 0 | 2.0900e-09 | 1.6784e-08 | 2.7395e-08 | 1.5176e-07 |

The mean for SW Field flux @ 220 cm is 0.000000020884

The median for SW Field flux @ 220 cm is 0.000000016784

The skewness for SW Field flux @ 220 cm is 2.562486758306

The kurtosis for SW Field flux @ 220 cm is 11.603911759031

An outlier for SW Field flux @ 220 cm is 52.000000000000

An outlier for SW Field flux @ 220 cm is 65.000000000000

An outlier for SW Field flux @ 220 cm is 104.000000000000

The standard deviation for SW Field flux @ 220 cm is 2.481337043947e-08

The variance for SW Field flux @ 220 cm is 6.157033525663e-16

NW Field flux in 2013 @ 220 cm

NWfd_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -1.5462e-07 | 0 | 7.4484e-09 | 1.7254e-08 | 1.0286e-07 |

The mean for NW Field flux @ 220 cm is 0.000000008041

The median for NW Field flux @ 220 cm is 0.000000007448

The skewness for NW Field flux @ 220 cm is -1.296786101899

The kurtosis for NW Field flux @ 220 cm is 14.226560842082

An outlier for NW Field flux @ 220 cm is 13.000000000000

An outlier for NW Field flux @ 220 cm is 39.000000000000

The standard deviation for NW Field flux @ 220 cm is 2.792700932174e-08

The variance for NW Field flux @ 220 cm is 7.799178496567e-16

SE Field flux in 2013 @ 220 cm

SEfd_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -1.0856e-07 | 1.3693e-08 | 3.2734e-08 | 4.9186e-08 | 1.0797e-07 |

The mean for SE Field flux @ 220 cm is 0.000000030201

The median for SE Field flux @ 220 cm is 0.000000032734

The skewness for SE Field flux @ 220 cm is -0.641243969685

The kurtosis for SE Field flux @ 220 cm is 4.482273679357

An outlier for SE Field flux @ 220 cm is 44.000000000000

The standard deviation for SE Field flux @ 220 cm is 3.805784385341e-08

The variance for SE Field flux @ 220 cm is 1.448399478771e-15

NE Field flux in 2013 @ 220 cm

NEfd_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| -7.3382e-08 | -1.3150e-08 | 4.6882e-10 | 1.6030e-08 | 5.0516e-08 |

The mean for NE Field flux @ 220 cm is 0.000000000699

The median for NE Field flux @ 220 cm is 0.000000000469

The skewness for NE Field flux @ 220 cm is -0.645535147169

The kurtosis for NE Field flux @ 220 cm is 3.967793781229

An outlier for NE Field flux @ 220 cm is 74.000000000000

The standard deviation for NE Field flux @ 220 cm is 2.315555277289e-08

The variance for NE Field flux @ 220 cm is 5.361796242182e-16

SW Field hydraulic conductivity in 2015 @ 220 cm

SWhc_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 4.6747e-11 | 3.3427e-10 | 6.4768e-10 | 1.0829e-09 | 1.8708e-09 |

The mean for SW Field hydraulic conductivity @ 220 cm is 0.000000000710

The median for SW Field hydraulic conductivity @ 220 cm is 0.000000000648

The skewness for SW Field hydraulic conductivity @ 220 cm is 0.537754112971

The kurtosis for SW Field hydraulic conductivity @ 220 cm is 2.301963945839

The standard deviation for SW Field hydraulic conductivity @ 220 cm is 4.949261938768e-10

The variance for SW Field hydraulic conductivity @ 220 cm is 2.449519373854e-19

NW Field hydraulic conductivity in 2015 @ 220 cm

NWhc_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 4.8819e-10 | 8.5381e-10 | 1.2078e-09 | 1.5472e-09 | 4.0583e-09 |

The mean for NW Field hydraulic conductivity @ 220 cm is 0.000000001385

The median for NW Field hydraulic conductivity @ 220 cm is 0.000000001208

The skewness for NW Field hydraulic conductivity @ 220 cm is 1.587686293747

The kurtosis for NW Field hydraulic conductivity @ 220 cm is 4.998346776632

An outlier for NW Field hydraulic conductivity @ 220 cm is 42.000000000000

The standard deviation for NW Field hydraulic conductivity @ 220 cm is 7.683031393502e-10

The variance for NW Field hydraulic conductivity @ 220 cm is 5.902897139353e-19

SE Field hydraulic conductivity in 2015 @ 220 cm

SEhc_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 3.5806e-10 | 9.1488e-10 | 1.4905e-09 | 1.9462e-09 | 3.4980e-09 |

The mean for SE Field hydraulic conductivity @ 220 cm is 0.000000001526

The median for SE Field hydraulic conductivity @ 220 cm is 0.000000001491

The skewness for SE Field hydraulic conductivity @ 220 cm is 0.722896004877

The kurtosis for SE Field hydraulic conductivity @ 220 cm is 3.198421406806

The standard deviation for SE Field hydraulic conductivity @ 220 cm is 6.993657226774e-10

The variance for SE Field hydraulic conductivity @ 220 cm is 4.891124140561e-19

NE Field hydraulic conductivity in 2015 @ 220 cm

NEhc_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 5.5606e-11 | 5.4597e-10 | 1.4145e-09 | 2.3273e-09 | 4.4372e-09 |

The mean for NE Field hydraulic conductivity @ 220 cm is 0.000000001484

The median for NE Field hydraulic conductivity @ 220 cm is 0.000000001414

The skewness for NE Field hydraulic conductivity @ 220 cm is 0.483595829502

The kurtosis for NE Field hydraulic conductivity @ 220 cm is 2.233886854333

The standard deviation for NE Field hydraulic conductivity @ 220 cm is 1.066519281133e-09

The variance for NE Field hydraulic conductivity @ 220 cm is 1.137463377028e-18

SW Field hydraulic conductivity in 2014 @ 220 cm

SWhc_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 3.5791e-12 | 5.7831e-11 | 2.2224e-10 | 3.1144e-10 | 5.8588e-10 |

The mean for SW Field hydraulic conductivity @ 220 cm is 0.000000000221

The median for SW Field hydraulic conductivity @ 220 cm is 0.000000000222

The skewness for SW Field hydraulic conductivity @ 220 cm is 0.331719522420

The kurtosis for SW Field hydraulic conductivity @ 220 cm is 2.248900800964

The standard deviation for SW Field hydraulic conductivity @ 220 cm is 1.594686839249e-10

The variance for SW Field hydraulic conductivity @ 220 cm is 2.543026115274e-20

NW Field hydraulic conductivity in 2014 @ 220 cm

NWhc_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 4.7762e-11 | 1.3096e-10 | 2.6557e-10 | 5.1133e-10 | 1.7560e-09 |

The mean for NW Field hydraulic conductivity @ 220 cm is 0.000000000375

The median for NW Field hydraulic conductivity @ 220 cm is 0.000000000266

The skewness for NW Field hydraulic conductivity @ 220 cm is 1.737156091465

The kurtosis for NW Field hydraulic conductivity @ 220 cm is 6.692188920131

An outlier for NW Field hydraulic conductivity @ 220 cm is 58.000000000000

An outlier for NW Field hydraulic conductivity @ 220 cm is 59.000000000000

An outlier for NW Field hydraulic conductivity @ 220 cm is 60.000000000000

The standard deviation for NW Field hydraulic conductivity @ 220 cm is 3.288845747089e-10

The variance for NW Field hydraulic conductivity @ 220 cm is 1.081650634814e-19

SE Field hydraulic conductivity in 2014 @ 220 cm

SEhc_14_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 2.0000e-10 | 1.0651e-09 | 1.5735e-09 | 2.1384e-09 | 3.0645e-09 |

The mean for SE Field hydraulic conductivity @ 220 cm is 0.000000001631

The median for SE Field hydraulic conductivity @ 220 cm is 0.000000001573

The skewness for SE Field hydraulic conductivity @ 220 cm is 0.137352909866

The kurtosis for SE Field hydraulic conductivity @ 220 cm is 2.186500145835

The standard deviation for SE Field hydraulic conductivity @ 220 cm is 6.620645737954e-10

The variance for SE Field hydraulic conductivity @ 220 cm is 4.383294998749e-19

NE Field hydraulic conductivity in 2014 @ 220 cm

NEhc_15_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 1.1264e-10 | 5.9315e-10 | 1.2289e-09 | 2.2102e-09 | 3.7207e-09 |

The mean for NE Field hydraulic conductivity @ 220 cm is 0.000000001445

The median for NE Field hydraulic conductivity @ 220 cm is 0.000000001229

The skewness for NE Field hydraulic conductivity @ 220 cm is 0.495392749435

The kurtosis for NE Field hydraulic conductivity @ 220 cm is 2.137350925679

The standard deviation for NE Field hydraulic conductivity @ 220 cm is 9.669921393894e-10

The variance for NE Field hydraulic conductivity @ 220 cm is 9.350737976408e-19

SW Field hydraulic conductivity in 2013 @ 220 cm

SWhc_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 5.7038e-13 | 2.0034e-11 | 1.9718e-10 | 2.7168e-10 | 5.0082e-10 |

The mean for SW Field hydraulic conductivity @ 220 cm is 0.000000000182

The median for SW Field hydraulic conductivity @ 220 cm is 0.000000000197

The skewness for SW Field hydraulic conductivity @ 220 cm is 0.353180615745

The kurtosis for SW Field hydraulic conductivity @ 220 cm is 2.325787318129

The standard deviation for SW Field hydraulic conductivity @ 220 cm is 1.409547361706e-10

The variance for SW Field hydraulic conductivity @ 220 cm is 1.986823764892e-20

NW Field hydraulic conductivity in 2013 @ 220 cm

NWhc_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 1.0793e-11 | 1.1482e-10 | 1.6274e-10 | 3.7170e-10 | 9.2148e-10 |

The mean for NW Field hydraulic conductivity @ 220 cm is 0.000000000269

The median for NW Field hydraulic conductivity @ 220 cm is 0.000000000163

The skewness for NW Field hydraulic conductivity @ 220 cm is 1.249114078683

The kurtosis for NW Field hydraulic conductivity @ 220 cm is 3.585726597785

The standard deviation for NW Field hydraulic conductivity @ 220 cm is 2.206048756137e-10

The variance for NW Field hydraulic conductivity @ 220 cm is 4.866651114453e-20

SE Field hydraulic conductivity in 2013 @ 220 cm

SEhc_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 6.4858e-10 | 1.2799e-09 | 1.6537e-09 | 1.9572e-09 | 2.5470e-09 |

The mean for SE Field hydraulic conductivity @ 220 cm is 0.000000001630

The median for SE Field hydraulic conductivity @ 220 cm is 0.000000001654

The skewness for SE Field hydraulic conductivity @ 220 cm is -0.090804583176

The kurtosis for SE Field hydraulic conductivity @ 220 cm is 2.247531458059

The standard deviation for SE Field hydraulic conductivity @ 220 cm is 4.437355151411e-10

The variance for SE Field hydraulic conductivity @ 220 cm is 1.969012073976e-19

NE Field hydraulic conductivity in 2013 @ 220 cm

NEhc_13_z =

| 0% | 25% | 50% | 75% | 100% |
|---|---|---|---|---|
| 1.4511e-10 | 7.3498e-10 | 1.2724e-09 | 2.1296e-09 | 3.6415e-09 |

The mean for NE Field hydraulic conductivity @ 220 cm is 0.000000001488

The median for NE Field hydraulic conductivity @ 220 cm is 0.000000001272

The skewness for NE Field hydraulic conductivity @ 220 cm is 0.484378441293

The kurtosis for NE Field hydraulic conductivity @ 220 cm is 2.165580472231

The standard deviation for NE Field hydraulic conductivity @ 220 cm is 9.273540237148e-10

The variance for NE Field hydraulic conductivity @ 220 cm is 8.599854853000e-19

# APPENDIX C: NEUTRON DATA 2013-2015

| 2013 | | | VWC (cm) | | | | Mean Flux Rate (cm/day) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | *East* | | *West* | | *East* | | *West* | |
| *Week of Season* | *DOY - East* | *DOY - West* | *1 NE* | *2 SE* | *3 NW* | *4 SW* | *1 NE* | *2 SE* | *3 NW* | *4 SW* |
| 1 | | 156 | | | 0.255626627 | 0.241562612 | | | -4.99728E-10 | 2.20394E-09 |
| 1 | | 157 | | | 0.225498942 | 0.213052819 | | | -3.46405E-10 | 9.10119E-10 |
| 2 | | | | | | | | | | |
| 3 | 171 | 170 | 0.295097946 | 0.299925199 | 0.25553848 | 0.242443439 | 1.31757E-09 | 3.58092E-09 | -2.02207E-10 | 2.46157E-09 |
| 4 | 176 | 175 | 0.290788801 | 0.297703973 | 0.255291881 | 0.242001683 | 1.19873E-09 | 2.94967E-09 | 6.01935E-11 | 2.78104E-09 |
| 5 | 183 | 182 | 0.293334159 | 0.300597924 | 0.257206103 | 0.244632698 | 1.2652E-09 | 3.99316E-09 | -5.94465E-10 | 2.32472E-09 |
| 6 | 189 | 189 | 0.295409931 | 0.29957436 | 0.257697351 | 0.242955272 | 1.34127E-09 | 3.55412E-09 | -5.47449E-11 | 2.26705E-09 |
| 7 | | 196 | | | 0.257000788 | 0.244047298 | | | -1.1203E-10 | 2.7496E-09 |
| 8 | 203 | 203 | 0.295475325 | 0.300196454 | 0.252824629 | 0.242209324 | 1.03269E-09 | 3.59773E-09 | 1.63666E-09 | 2.30907E-09 |
| 9 | 210 | 210 | 0.289985723 | 0.298119356 | 0.257756633 | 0.242436953 | 1.37779E-09 | 3.59841E-09 | -3.29394E-10 | 2.28223E-09 |
| 10 | 218 | 217 | 0.289087786 | 0.297258215 | 0.258936087 | 0.244854075 | 5.06202E-10 | 3.46844E-09 | -4.58723E-10 | 2.89368E-09 |
| 11 | | 224 | | | 0.256399656 | 0.245402947 | | | 1.70989E-09 | 2.73848E-09 |
| 12 | 231 | | 0.288399421 | 0.296175253 | | | 6.45508E-10 | 4.18982E-09 | | |
| 13 | | 239 | | | 0.257340159 | 0.246641321 | | | 2.12952E-11 | 2.35973E-09 |
| 14 | 246 | | 0.286476278 | 0.290354203 | | | -2.78759E-10 | 2.9791E-09 | | |
| 15 | 253 | | 0.282470484 | 0.288998656 | | | 1.74833E-10 | 2.51889E-09 | | |
| 16 | | | | | | | | | | |
| 17 | 269 | 267 | 0.282820575 | 0.286519029 | 0.255697283 | 0.244101851 | -9.59917E-10 | 2.81048E-09 | 2.72035E-10 | 2.89564E-09 |

| Week | NE | SE | NW | SW | NE | SE | NW | SW |
|---|---|---|---|---|---|---|---|---|
| 3 | 0.295097946 | 0.299925199 | 0.25553848 | 0.242443439 | 1.31757E-09 | 3.58092E-09 | -2.02207E-10 | 2.46157E-09 |
| 4 | 0.290788801 | 0.297703973 | 0.255291881 | 0.242001683 | 1.19873E-09 | 2.94967E-09 | 6.01935E-11 | 2.78104E-09 |
| 5 | 0.293334159 | 0.300597924 | 0.257206103 | 0.244632698 | 1.2652E-09 | 3.99316E-09 | -5.94465E-10 | 2.32472E-09 |
| 6 | 0.295409931 | 0.29957436 | 0.257697351 | 0.242955272 | 1.34127E-09 | 3.55412E-09 | -5.47449E-11 | 2.26705E-09 |
| 8 | 0.295475325 | 0.300196454 | 0.252824629 | 0.242209324 | 1.03269E-09 | 3.59773E-09 | 1.63666E-09 | 2.30907E-09 |
| 9 | 0.289985723 | 0.298119356 | 0.257756633 | 0.242436953 | 1.37779E-09 | 3.59841E-09 | -3.29394E-10 | 2.28223E-09 |
| 10 | 0.289087786 | 0.297258215 | 0.258936087 | 0.244854075 | 5.06202E-10 | 3.46844E-09 | -4.58723E-10 | 2.89368E-09 |
| 17 | 0.282820575 | 0.286519029 | 0.255697283 | 0.244101851 | -9.59917E-10 | 2.81048E-09 | 2.72035E-10 | 2.89564E-09 |

| 2014 | | | VWC (cm) | | | | Mean Flux Rate (cm/day) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ***East*** | | ***West*** | | ***East*** | | ***West*** | |
| *Week of Season* | *DOY - East* | *DOY - West* | *1 NE* | *2 SE* | *3 NW* | *4 SW* | *1 NE* | *2 SE* | *3 NW* | *4 SW* |
| 1 | 178 | | 0.291872429 | 0.298545742 | | | 9.548E-10 | 3.56712E-09 | | |
| 2 | | 181 | | | 0.254764116 | 0.244519303 | | | -1.35974E-11 | 2.6168E-09 |
| 3 | 188 | 188 | 0.290691305 | 0.299163452 | 0.255305408 | 0.243280683 | 1.43467E-09 | 4.11274E-09 | 2.38748E-10 | 2.86494E-09 |
| 4 | 195 | 195 | 0.296273378 | 0.304402494 | 0.257418206 | 0.24744535 | 2.81118E-09 | 6.53528E-09 | 6.37248E-11 | 3.05577E-09 |
| 5 | 202 | 202 | 0.299653409 | 0.303261879 | 0.258373686 | 0.248068582 | 1.56369E-09 | 4.69941E-09 | 1.43758E-12 | 3.44452E-09 |
| 6 | 210 | 209 | 0.297611013 | 0.303094469 | 0.257713611 | 0.246986061 | 2.14205E-09 | 3.79979E-09 | 2.17055E-10 | 3.59753E-09 |
| 7 | 216 | 216 | 0.293562063 | 0.300070523 | 0.255646999 | 0.250090591 | 5.83606E-10 | 4.20808E-09 | 1.6233E-11 | 2.63821E-09 |
| 8 | 223 | 223 | 0.290257555 | 0.297782251 | 0.257104381 | 0.249535666 | 4.32004E-10 | 3.97633E-09 | 6.71605E-10 | 3.32428E-09 |
| 9 | 230 | 230 | 0.271666095 | 0.27668579 | 0.241457462 | 0.235380013 | 1.77465E-10 | 1.74918E-09 | 2.40066E-10 | 1.8159E-09 |
| 10 | 234 | 234 | 0.288621804 | 0.295842535 | 0.25705892 | 0.249747716 | 8.03745E-10 | 4.06632E-09 | 2.6536E-10 | 3.35664E-09 |
| 11 | | 241 | | | 0.258614079 | 0.250158513 | | | 3.08207E-10 | 3.22522E-09 |
| 12 | | | | | | | | | | |
| 13 | 241 | 248 | 0.286968836 | 0.294350952 | 0.247896617 | 0.242231939 | 9.33875E-11 | 3.51497E-09 | 3.23742E-10 | 2.01048E-09 |
| 14 | 261 | 260 | 0.28876374 | 0.293950203 | 0.268870646 | 0.250808073 | 4.01212E-10 | 4.22754E-09 | 3.98644E-09 | 3.12518E-09 |
| 15 | 268 | | 0.285551185 | 0.293636708 | | | 3.53063E-10 | 3.10535E-09 | | |
| 16 | | | | | | | | | | |
| 17 | 276 | 269 | 0.276674408 | 0.282752779 | 0.276350982 | 0.250577758 | -3.49871E-10 | 2.45E-09 | 2.50923E-09 | 3.20405E-09 |
| 18 | | | | | | | | | | |
| 19 | 290 | 290 | 0.286055872 | 0.290962747 | 0.278297305 | 0.248634801 | -1.0202E-09 | 3.71758E-09 | 2.26411E-09 | 3.51449E-09 |
| 20 | 304 | 304 | 0.28135661 | 0.287651779 | 0.277000109 | 0.248448156 | -8.95031E-10 | 3.33983E-09 | 1.0936E-09 | 2.81623E-09 |

| Week | *1 NE* | *2 SE* | *3 NW* | *4 SW* | *1 NE* | *2 SE* | *3 NW* | *4 SW* |
|---|---|---|---|---|---|---|---|---|
| 3 | 0.290691305 | 0.299163452 | 0.255305408 | 0.243280683 | 1.43467E-09 | 4.11274E-09 | 2.38748E-10 | 2.86494E-09 |
| 4 | 0.296273378 | 0.304402494 | 0.257418206 | 0.24744535 | 2.81118E-09 | 6.53528E-09 | 6.37248E-11 | 3.05577E-09 |
| 5 | 0.299653409 | 0.303261879 | 0.258373686 | 0.248068582 | 1.56369E-09 | 4.69941E-09 | 1.43758E-12 | 3.44452E-09 |
| 6 | 0.297611013 | 0.303094469 | 0.257713611 | 0.246986061 | 2.14205E-09 | 3.79979E-09 | 2.17055E-10 | 3.59753E-09 |
| 7 | 0.293562063 | 0.300070523 | 0.255646999 | 0.250090591 | 5.83606E-10 | 4.20808E-09 | 1.6233E-11 | 2.63821E-09 |
| 8 | 0.290257555 | 0.297782251 | 0.257104381 | 0.249535666 | 4.32004E-10 | 3.97633E-09 | 6.71605E-10 | 3.32428E-09 |
| 9 | 0.271666095 | 0.27668579 | 0.241457462 | 0.235380013 | 1.77465E-10 | 1.74918E-09 | 2.40066E-10 | 1.8159E-09 |
| 10 | 0.288621804 | 0.295842535 | 0.25705892 | 0.249747716 | 8.03745E-10 | 4.06632E-09 | 2.6536E-10 | 3.35664E-09 |
| 13 | 0.286968836 | 0.294350952 | 0.247896617 | 0.242231939 | 9.33875E-11 | 3.51497E-09 | 3.23742E-10 | 2.01048E-09 |
| 14 | 0.28876374 | 0.293950203 | 0.268870646 | 0.250808073 | 4.01212E-10 | 4.22754E-09 | 3.98644E-09 | 3.12518E-09 |
| 17 | 0.276674408 | 0.282752779 | 0.276350982 | 0.250577758 | -3.49871E-10 | 2.45E-09 | 2.50923E-09 | 3.20405E-09 |
| 19 | 0.286055872 | 0.290962747 | 0.278297305 | 0.248634801 | -1.0202E-09 | 3.71758E-09 | 2.26411E-09 | 3.51449E-09 |
| 20 | 0.28135661 | 0.287651779 | 0.277000109 | 0.248448156 | -8.95031E-10 | 3.33983E-09 | 1.0936E-09 | 2.81623E-09 |

| 2015 | | | VWC (cm) | | | | Mean Flux Rate (cm/day) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ***East*** | | ***West*** | | ***East*** | | ***West*** | |
| *Week of Season* | *DOY - East* | *DOY - West* | *1 NE* | *2 SE* | *3 NW* | *4 SW* | *1 NE* | *2 SE* | *3 NW* | *4 SW* |
| 1 | 182 | | 0.303447878 | 0.307872333 | | | 3.12194E-09 | 6.66252E-09 | | |
| 2 | | | | | | | | | | |
| 3 | 196 | 197 | 0.301166477 | 0.303539752 | 0.294945871 | 0.280977205 | 1.16636E-09 | 4.3528E-09 | 1.48717E-09 | 4.58243E-09 |
| 4 | 201 | | 0.297379076 | 0.302263348 | | | 1.75851E-09 | 4.02789E-09 | | |
| 5 | 208 | 208 | 0.292718605 | 0.2975474 | 0.295945274 | 0.278806291 | 8.44649E-10 | 3.71342E-09 | 1.8006E-09 | 3.64353E-09 |
| 6 | 218 | 219 | 0.287000844 | 0.294415077 | 0.293180437 | 0.278220518 | -1.10713E-10 | 3.16385E-09 | 8.64178E-10 | 3.64897E-09 |
| 7 | *226** | | 0.288278745 | 0.293126642 | | | 1.36125E-09 | 3.40044E-09 | | |
| 8 | *233** | 229 | 0.290962087 | 0.293339607 | 0.291443045 | 0.275841703 | -8.18134E-11 | 3.72799E-09 | 1.28212E-09 | 4.24683E-09 |
| 9 | *240** | 236 | 0.287765721 | 0.29232266 | 0.291167586 | 0.274730926 | 1.73397E-09 | 2.93919E-09 | 1.4121E-09 | 3.90822E-09 |
| 10 | *247** | 243 | 0.28683169 | 0.2924162 | 0.294779225 | 0.27655664 | 1.63403E-09 | 3.48219E-09 | 1.36631E-09 | 3.66366E-09 |
| 11 | 252 | 251 | 0.287635476 | 0.293295584 | 0.29257229 | 0.273400075 | -5.1641E-11 | 3.81375E-09 | 1.31457E-09 | 3.83589E-09 |
| 12 | 257 | 258 | 0.285860902 | 0.292732498 | 0.288033747 | 0.268611982 | 7.96191E-11 | 3.3894E-09 | 1.37301E-09 | 3.37398E-09 |
| 13 | 264 | 266 | 0.286691486 | 0.293246721 | 0.287913617 | 0.269878749 | -5.70625E-10 | 2.98328E-09 | 8.33074E-10 | 3.79557E-09 |
| 14 | 273 | 274 | 0.282866803 | 0.288168411 | 0.290083412 | 0.26981321 | 4.35707E-10 | 3.07515E-09 | 1.53093E-09 | 3.07829E-09 |
| 15 | | | | | | | | | | |
| 16 | 286 | 289 | 0.278011379 | 0.286168432 | 0.285620661 | 0.265454036 | -1.38648E-10 | 2.12473E-09 | 1.37028E-09 | 3.30574E-09 |
| 17 | 293 | | 0.277730283 | 0.28572212 | | | -4.77965E-10 | 2.03364E-09 | | |
| 18 | | 301 | | | 0.286392774 | 0.264161249 | | | 1.19059E-09 | 2.84868E-09 |
| 19 | 307 | | 0.265936567 | 0.274015718 | | | -6.19136E-10 | 2.04972E-09 | | |
| 20 | | 317 | | | 0.287404888 | 0.265746349 | | | 4.00028E-10 | 2.92257E-09 |

| Week | *1 NE* | *2 SE* | *3 NW* | *4 SW* | *1 NE* | *2 SE* | *3 NW* | *4 SW* |
|---|---|---|---|---|---|---|---|---|
| 3 | 0.301166477 | 0.303539752 | 0.294945871 | 0.280977205 | 1.16636E-09 | 4.3528E-09 | 1.48717E-09 | 4.58243E-09 |
| 5 | 0.292718605 | 0.2975474 | 0.295945274 | 0.278806291 | 8.44649E-10 | 3.71342E-09 | 1.8006E-09 | 3.64353E-09 |
| 6 | 0.287000844 | 0.294415077 | 0.293180437 | 0.278220518 | -1.10713E-10 | 3.16385E-09 | 8.64178E-10 | 3.64897E-09 |
| 8 | 0.290962087 | 0.293339607 | 0.291443045 | 0.275841703 | -8.18134E-11 | 3.72799E-09 | 1.28212E-09 | 4.24683E-09 |
| 9 | 0.287765721 | 0.29232266 | 0.291167586 | 0.274730926 | 1.73397E-09 | 2.93919E-09 | 1.4121E-09 | 3.90822E-09 |
| 10 | 0.28683169 | 0.2924162 | 0.294779225 | 0.27655664 | 1.63403E-09 | 3.48219E-09 | 1.36631E-09 | 3.66366E-09 |
| 11 | 0.287635476 | 0.293295584 | 0.29257229 | 0.273400075 | -5.1641E-11 | 3.81375E-09 | 1.31457E-09 | 3.83589E-09 |
| 12 | 0.285860902 | 0.292732498 | 0.288033747 | 0.268611982 | 7.96191E-11 | 3.3894E-09 | 1.37301E-09 | 3.37398E-09 |
| 13 | 0.286691486 | 0.293246721 | 0.287913617 | 0.269878749 | -5.70625E-10 | 2.98328E-09 | 8.33074E-10 | 3.79557E-09 |
| 14 | 0.282866803 | 0.288168411 | 0.290083412 | 0.26981321 | 4.35707E-10 | 3.07515E-09 | 1.53093E-09 | 3.07829E-09 |
| 16 | 0.278011379 | 0.286168432 | 0.285620661 | 0.265454036 | -1.38648E-10 | 2.12473E-09 | 1.37028E-09 | 3.30574E-09 |

Neutron Data

2013 East Data

Depths (cm)

| DOY | Tube | 230 | 210 | 190 | 170 | 150 | 130 | 110 | 90 | 70 | 50 | 30 | 10 | Std | Probe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 171 | 1 | 17615 | 17978 | 17440 | 16580 | 19651 | 18210 | 19045 | 18959 | 19269 | 19610 | 19310 | 14163 | 9878 | 5446 |
| 176 | 1 | 17813 | 17975 | 17101 | 16684 | 19541 | 18288 | 19245 | 19089 | 19267 | 19361 | 19291 | 12237 | 9982 | 5446 |
| 183 | 1 | 17832 | 17912 | 17014 | 16615 | 19782 | 18583 | 19142 | 19243 | 19395 | 19255 | 17791 | 8324 | 9917 | 5446 |
| 189 | 1 | 17824 | 17989 | 17412 | 16779 | 19628 | 18438 | 19278 | 19331 | 19321 | 19185 | 17546 | 12841 | 9901 | 5446 |
| 203 | 1 | 17790 | 17758 | 17048 | 16689 | 19785 | 18610 | 19292 | 19297 | 19454 | 19289 | 18433 | 13462 | 9874 | 5446 |
| 210 | 1 | 17713 | 17867 | 16938 | 16445 | 19638 | 18731 | 19200 | 18887 | 18663 | 17935 | 16910 | 8478 | 9915 | 5446 |
| 218 | 1 | 17542 | 17775 | 16933 | 16258 | 19422 | 18530 | 18959 | 18876 | 18683 | 18185 | 17318 | 8624 | 9903 | 5446 |
| 231 | 1 | 17654 | 17766 | 16673 | 16401 | 19412 | 18522 | 19055 | 19033 | 19041 | 18862 | 18294 | 12072 | 9894 | 5446 |
| 246 | 1 | 17485 | 17584 | 16651 | 15876 | 18815 | 18026 | 18706 | 17547 | 16821 | 16542 | 16131 | 10300 | 9932 | 5446 |
| 253 | 1 | 17317 | 17693 | 16282 | 15850 | 19001 | 18024 | 18234 | 17328 | 16746 | 16633 | 16399 | 8452 | 9931 | 5446 |
| 269 | 1 | 17361 | 17340 | 16345 | 15805 | 18751 | 17839 | 18335 | 16802 | 16210 | 16385 | 16144 | 11660 | 9909 | 5446 |
| 171 | 2 | 17879 | 17789 | 17356 | 16296 | 19333 | 18255 | 18727 | 18953 | 19567 | 19746 | 18819 | 13639 | 9878 | 5446 |
| 176 | 2 | 17853 | 17816 | 17283 | 16442 | 19214 | 18463 | 18873 | 19332 | 19549 | 19937 | 18900 | 11450 | 9982 | 5446 |

183 2 17781 18008 17286 16293 19261 18227 18992 19207 19709 19832
17493 9322 9917 5446

189 2 18070 17740 17513 16184 19384 18330 19085 19360 19668 19707
17489 13290 9901 5446

203 2 17917 17669 17580 16344 19479 18379 18996 19531 19645 19661
18512 14334 9874 5446

210 2 17676 17903 17203 16438 19282 18172 18877 18796 18520 18024
16358 9564 9915 5446

218 2 17607 17473 17027 16087 19265 18099 18798 18543 18403 18243
17144 9810 9903 5446

231 2 17734 17712 16814 16104 18952 18081 18717 18706 18435 18821
18206 13796 9894 5446

246 2 17758 17480 17007 15674 18532 17809 17800 16200 16486 16874
15923 10541 9932 5446

253 2 17595 17369 16520 15620 18564 17285 17455 15941 16190 17020
16285 9156 9931 5446

269 2 17416 17341 16463 15142 18365 17380 17390 15659 16165 16516
15615 12540 9909 5446

171 3 17277 16534 17505 17444 18476 18137 18468 18917 19329 19682
19612 14278 9878 5446

176 3 17193 16737 17561 17354 18317 18006 18468 18816 19404 19751
19564 11661 9982 5446

183 3 17105 16545 17281 17366 18503 17997 18539 19032 19235 19657
18365 9223 9917 5446

189 3 17253 16607 17519 17825 18268 18111 18629 18847 19346 19431
17960 13791 9901 5446

203 3 17434 16812 17464 17487 18460 18201 18596 18887 19458 19655
19421 15263 9874 5446

210 3 17049 16478 17399 17222 18212 18084 18295 18418 18181 18467
17720 10295 9915 5446

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 218 | 3 | 16982 | 16302 | 17393 | 16991 | 17901 | 17881 | 18174 | 17751 | 17659 | 18222 | 17730 | 10056 | 9903 | 5446 |
| 231 | 3 | 16724 | 16205 | 17019 | 17099 | 17896 | 17852 | 18246 | 18292 | 18273 | 18764 | 18949 | 14263 | 9894 | 5446 |
| 246 | 3 | 16843 | 15914 | 16564 | 17042 | 17323 | 17601 | 17716 | 15974 | 16194 | 17583 | 17184 | 11414 | 9932 | 5446 |
| 253 | 3 | 16551 | 15865 | 16802 | 16524 | 17413 | 17442 | 17318 | 15371 | 16173 | 17336 | 16898 | 9607 | 9931 | 5446 |
| 269 | 3 | 16510 | 15578 | 16207 | 16616 | 16933 | 17169 | 17279 | 15438 | 15795 | 16883 | 16863 | 12720 | 9909 | 5446 |
| 171 | 4 | 17122 | 17372 | 17695 | 17598 | 17913 | 17976 | 18680 | 18756 | 18868 | 19195 | 18409 | 11322 | 9878 | 5446 |
| 176 | 4 | 17033 | 17347 | 17770 | 17674 | 17637 | 18136 | 18802 | 19023 | 18973 | 19251 | 18289 | 9905 | 9982 | 5446 |
| 183 | 4 | 17015 | 17337 | 17466 | 17532 | 17682 | 18193 | 18941 | 18887 | 19172 | 19190 | 17257 | 8236 | 9917 | 5446 |
| 189 | 4 | 17096 | 17584 | 17677 | 17729 | 17836 | 18251 | 19018 | 19113 | 19005 | 19131 | 17337 | 11635 | 9901 | 5446 |
| 203 | 4 | 17082 | 17332 | 17596 | 17356 | 17654 | 18225 | 18910 | 19112 | 19045 | 18877 | 18814 | 13659 | 9874 | 5446 |
| 210 | 4 | 16850 | 17420 | 17591 | 17375 | 17633 | 18364 | 18908 | 18486 | 18039 | 17902 | 16722 | 9534 | 9915 | 5446 |
| 218 | 4 | 16931 | 17187 | 17469 | 17198 | 17432 | 18271 | 18855 | 18390 | 17556 | 17608 | 16359 | 9227 | 9903 | 5446 |
| 231 | 4 | 16868 | 17173 | 17249 | 17100 | 17410 | 18016 | 18875 | 18367 | 18103 | 17888 | 17943 | 12491 | 9894 | 5446 |
| 246 | 4 | 16643 | 16840 | 17181 | 17073 | 16810 | 17637 | 18055 | 16319 | 15967 | 16712 | 15924 | 9605 | 9932 | 5446 |
| 253 | 4 | 16642 | 17044 | 17162 | 16975 | 16757 | 17762 | 17980 | 16012 | 15675 | 16544 | 15457 | 7930 | 9931 | 5446 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 269 | 4 | 16310 | 16593 | 16816 | 16738 | 16484 | 17351 | 17699 | 15804 | 15542 | 16321 | 15568 | 11903 | 9909 | 5446 |
| 171 | 7 | 17082 | 17030 | 17086 | 17791 | 19200 | 18549 | 19170 | 19225 | 19423 | 19816 | 19058 | 14247 | 9878 | 5446 |
| 176 | 7 | 17221 | 17124 | 17191 | 17924 | 19383 | 18497 | 19305 | 19306 | 19519 | 19984 | 18970 | 10215 | 9982 | 5446 |
| 183 | 7 | 17150 | 16910 | 16903 | 17650 | 19180 | 18409 | 19316 | 19344 | 19554 | 19812 | 18414 | 10546 | 9917 | 5446 |
| 189 | 7 | 17294 | 17099 | 17196 | 17838 | 19319 | 18763 | 19186 | 19453 | 19416 | 19625 | 18421 | 14033 | 9901 | 5446 |
| 203 | 7 | 17004 | 16854 | 16932 | 17773 | 19046 | 18761 | 19053 | 19284 | 19368 | 19574 | 18677 | 14359 | 9874 | 5446 |
| 210 | 7 | 16766 | 16683 | 16907 | 17611 | 18984 | 18277 | 18938 | 18683 | 18526 | 18300 | 17009 | 10396 | 9915 | 5446 |
| 218 | 7 | 16609 | 16239 | 16570 | 17429 | 18987 | 18127 | 18646 | 17661 | 17828 | 18123 | 17405 | 10828 | 9903 | 5446 |
| 231 | 7 | 16493 | 16155 | 16353 | 17404 | 18967 | 18269 | 18407 | 17804 | 17735 | 18553 | 18113 | 13878 | 9894 | 5446 |
| 246 | 7 | 16434 | 15857 | 16186 | 17356 | 18506 | 18292 | 18127 | 16131 | 16398 | 16941 | 16589 | 11310 | 9932 | 5446 |
| 253 | 7 | 16104 | 15813 | 16170 | 17389 | 18602 | 17893 | 18082 | 15825 | 16258 | 17124 | 16921 | 9824 | 9931 | 5446 |
| 269 | 7 | 16095 | 15504 | 15935 | 17056 | 18371 | 18121 | 17997 | 15664 | 16020 | 16626 | 16158 | 13290 | 9909 | 5446 |
| 171 | 8 | 18372 | 17907 | 17721 | 18244 | 19848 | 19815 | 19087 | 19029 | 18958 | 19177 | 19081 | 12518 | 9878 | 5446 |
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2013 West

Depths (cm)

| DOY | Tube | 230 | 210 | 190 | 170 | 150 | 130 | 110 | 90 | 70 | 50 | 30 | 10 | Std | Probe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 156 | 1 | 16183 | 14566 | 14854 | 15518 | 15328 | 15665 | 15068 | 14998 | 15154 | 18570 | 19286 | 12023 | 9911 | 5446 |
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2014 East

Depths (cm)

| DOY | Tube | 230 | 210 | 190 | 170 | 150 | 130 | 110 | 90 | 70 | 50 | 30 | 10 | Std | Probe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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17916 12006 9866 5446

304 20 17528 17436 17439 18315 19284 16873 17685 17869 17975 18512
16893 8950 9921 5446

2014 West

Depths (cm)

| DOY | Tube | 230 | 210 | 190 | 170 | 150 | 130 | 110 | 90 | 70 | 50 | 30 | 10 | Std | Probe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 181 | 1 | 15858 | 14336 | 14394 | 15437 | 15056 | 15611 | 15388 | 15131 | 15554 | 17371 | 12533 | 8284 | 9922 | 5446 |
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| 269 | 20 | 15851 | 16293 | 17210 | 17247 | 17571 | 17222 | 17231 | 17059 | 18166 | 18677 | 14652 | 10552 | 9899 | 5446 |

290 20 15573 16421 17064 17080 18013 17096 17401 16046 16203 16836
13234 11564 9866 5446

304 20 15768 16342 17030 17018 17740 16944 16988 15736 15953 16413
11569 7354 9921 5446

2015 East

Depths (cm)

| DOY | Tube | 230 | 210 | 190 | 170 | 150 | 130 | 110 | 90 | 70 | 50 | 30 | 10 | Std | Probe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| 226 | 10 | 15702 | 16247 | 17575 | 18520 | 20539 | 18746 | 19149 | 19124 | 18960 | 19039 | 18173 | 7110 | 9941 | 5446 |

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| 273 | 10 | 15184 | 15739 | 17272 | 17608 | 19249 | 17743 | 17948 | 17664 | 17450 | 17358 | 15662 | 5982 | 9900 | 5446 |
| 286 | 10 | 14895 | 15506 | 17010 | 17672 | 19291 | 17589 | 17726 | 17240 | 17371 | 17311 | 17082 | 10605 | 9946 | 5446 |
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| | 15079 | 11178 | 9924 | 5446 | | | | | | | |
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| 196 | 12 | 17980 | 18570 | 18638 | 19574 | 20477 | 17824 | 18871 | 19131 | 19234 | 19375 |
| | 19039 | 13041 | 9862 | 5446 | | | | | | | |
| 201 | 12 | 17993 | 18588 | 18728 | 19669 | 20095 | 17873 | 18891 | 19340 | 19140 | 19669 |
| | 18619 | 10631 | 9862 | 5446 | | | | | | | |
| 208 | 12 | 17921 | 18440 | 18526 | 19685 | 19863 | 17569 | 19175 | 19021 | 19108 | 19450 |
| | 17254 | 9143 | 9895 | 5446 | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 218 | 12 | 17783 | 18124 | 18516 | 19511 | 19772 | 17453 | 18813 | 18793 | 18678 | 19275 |
| | 16874 | 9562 | 9948 | 5446 | | | | | | | |
| 226 | 12 | 17641 | 18339 | 18382 | 19755 | 20028 | 17940 | 19208 | 18943 | 18733 | 18836 |
| | 15868 | 7123 | 9941 | 5446 | | | | | | | |
| 233 | 12 | 17742 | 18284 | 18612 | 19534 | 20074 | 17545 | 19040 | 18948 | 19045 | 19153 |
| | 17504 | 12581 | 9926 | 5446 | | | | | | | |
| 240 | 12 | 17710 | 18220 | 18499 | 19600 | 19550 | 17595 | 18971 | 18972 | 18750 | 18718 |
| | 16358 | 8533 | 9953 | 5446 | | | | | | | |
| 247 | 12 | 17807 | 18151 | 18356 | 19476 | 19916 | 17219 | 18777 | 18667 | 18541 | 18539 |
| | 16155 | 8788 | 9924 | 5446 | | | | | | | |
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| | 16359 | 10486 | 9950 | 5446 | | | | | | | |
| 257 | 12 | 17653 | 18148 | 18488 | 19238 | 19691 | 17319 | 18852 | 18532 | 17871 | 18101 |
| | 15478 | 9278 | 9950 | 5446 | | | | | | | |
| 264 | 12 | 17629 | 18078 | 18126 | 19274 | 19435 | 17057 | 18519 | 18079 | 17465 | 17557 |
| | 14897 | 7605 | 9853 | 5446 | | | | | | | |
| 273 | 12 | 17300 | 17810 | 17987 | 18972 | 19288 | 16890 | 18226 | 17268 | 16829 | 16990 |
| | 14081 | 7833 | 9900 | 5446 | | | | | | | |
| 286 | 12 | 17287 | 17787 | 18151 | 19072 | 19110 | 16587 | 17977 | 16887 | 16480 | 16758 |
| | 14591 | 11826 | 9946 | 5446 | | | | | | | |
| 293 | 12 | 17155 | 17620 | 18077 | 19162 | 18979 | 16633 | 17908 | 16516 | 16275 | 16627 |
| | 14478 | 9973 | 9924 | 5446 | | | | | | | |
| 307 | 12 | 16804 | 17582 | 17732 | 19107 | 18849 | 16473 | 17943 | 17632 | 18341 | 19046 |
| | 17738 | 12970 | 10183 | 5446 | | | | | | | |
| 182 | 13 | 17463 | 18194 | 18002 | 18578 | 18206 | 18698 | 19015 | 18703 | 19024 | 18551 |
| | 13870 | 9209 | 9807 | 5446 | | | | | | | |
| 196 | 13 | 17421 | 18101 | 17565 | 18155 | 18071 | 18679 | 19082 | 18651 | 18638 | 18885 |
| | 16039 | 12158 | 9862 | 5446 | | | | | | | |
| 201 | 13 | 17497 | 17854 | 17747 | 18052 | 18135 | 18901 | 18822 | 18695 | 18873 | 18756 |
| | 14952 | 9068 | 9862 | 5446 | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 208 | 13 | 17182 | 17806 | 17321 | 17998 | 18120 | 18643 | 18846 | 18852 | 18910 | 18701 |
| | 14385 | 9696 | 9895 | 5446 | | | | | | | |
| 218 | 13 | 17037 | 17487 | 17425 | 17848 | 17927 | 18675 | 18694 | 18562 | 18715 | 18598 |
| | 14926 | 9818 | 9948 | 5446 | | | | | | | |
| 226 | 13 | 17031 | 17527 | 17219 | 17844 | 18112 | 18620 | 18759 | 18933 | 18915 | 18832 |
| | 14983 | 7755 | 9941 | 5446 | | | | | | | |
| 233 | 13 | 17072 | 17457 | 17190 | 17834 | 17985 | 18927 | 18893 | 18448 | 18856 | 18823 |
| | 15719 | 12503 | 9926 | 5446 | | | | | | | |
| 240 | 13 | 17063 | 17340 | 16922 | 17790 | 17999 | 18815 | 18843 | 18793 | 18879 | 18370 |
| | 15115 | 9066 | 9953 | 5446 | | | | | | | |
| 247 | 13 | 16973 | 17540 | 17149 | 17752 | 18125 | 18455 | 18724 | 18458 | 18441 | 18636 |
| | 15078 | 9818 | 9924 | 5446 | | | | | | | |
| 252 | 13 | 17032 | 17497 | 17476 | 17786 | 17995 | 18755 | 18761 | 18488 | 18762 | 18410 |
| | 15114 | 10711 | 9950 | 5446 | | | | | | | |
| 257 | 13 | 16934 | 17428 | 17223 | 17598 | 17752 | 18638 | 18743 | 17889 | 18069 | 17639 |
| | 13827 | 9959 | 9950 | 5446 | | | | | | | |
| 264 | 13 | 16811 | 17202 | 16720 | 17189 | 17618 | 18466 | 18477 | 17831 | 17692 | 17079 |
| | 13364 | 8029 | 9853 | 5446 | | | | | | | |
| 273 | 13 | 16702 | 17180 | 16867 | 17387 | 17426 | 18231 | 17978 | 16881 | 16654 | 16182 |
| | 12713 | 8285 | 9900 | 5446 | | | | | | | |
| 286 | 13 | 16872 | 17162 | 16834 | 17036 | 17437 | 18505 | 17773 | 16606 | 16643 | 15989 |
| | 12946 | 11924 | 9946 | 5446 | | | | | | | |
| 293 | 13 | 16610 | 17050 | 16727 | 17069 | 17202 | 18259 | 17483 | 16483 | 16245 | 15942 |
| | 12828 | 10365 | 9924 | 5446 | | | | | | | |
| 307 | 13 | 16457 | 17101 | 16713 | 16817 | 17219 | 18031 | 17721 | 17884 | 18368 | 18411 |
| | 15429 | 12741 | 10183 | 5446 | | | | | | | |
| 182 | 14 | 17680 | 16966 | 18380 | 19082 | 18525 | 18685 | 18811 | 18981 | 19295 | 18907 |
| | 15119 | 11018 | 9807 | 5446 | | | | | | | |
| 196 | 14 | 17488 | 16685 | 17881 | 19104 | 18585 | 18553 | 18663 | 18555 | 19352 | 19077 |
| | 16330 | 12318 | 9862 | 5446 | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | 14 | 17443 | 16448 | 18051 | 18855 | 18230 | 18602 | 18698 | 18664 | 19300 | 18623 |
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| 208 | 14 | 17098 | 16532 | 17753 | 18756 | 18486 | 18561 | 18770 | 18659 | 19369 | 18497 |
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| 218 | 14 | 16949 | 16205 | 17863 | 18822 | 18093 | 18547 | 18381 | 18441 | 18803 | 17951 |
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| 226 | 14 | 16911 | 16228 | 17644 | 18734 | 18169 | 18410 | 18517 | 18429 | 18720 | 17943 |
| | 13441 | 7996 | 9941 | 5446 | | | | | | | |
| 233 | 14 | 16949 | 16472 | 17739 | 18626 | 18565 | 18385 | 18740 | 18921 | 19196 | 18982 |
| | 16193 | 13785 | 9926 | 5446 | | | | | | | |
| 240 | 14 | 16890 | 16291 | 17787 | 18563 | 18022 | 18431 | 18455 | 18318 | 18857 | 17135 |
| | 13918 | 9466 | 9953 | 5446 | | | | | | | |
| 247 | 14 | 17044 | 16288 | 17563 | 18768 | 18296 | 18222 | 18535 | 18067 | 18486 | 17581 |
| | 14274 | 9564 | 9924 | 5446 | | | | | | | |
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| 257 | 14 | 16963 | 16338 | 17630 | 18714 | 18316 | 18437 | 18342 | 17628 | 18145 | 16945 |
| | 13619 | 9733 | 9950 | 5446 | | | | | | | |
| 264 | 14 | 16729 | 15913 | 17359 | 18388 | 17792 | 18234 | 17834 | 17261 | 17492 | 15974 |
| | 12789 | 7879 | 9853 | 5446 | | | | | | | |
| 273 | 14 | 16651 | 15758 | 17252 | 18298 | 17848 | 18067 | 17630 | 16193 | 16721 | 15649 |
| | 12471 | 8138 | 9900 | 5446 | | | | | | | |
| 286 | 14 | 16607 | 15866 | 17208 | 18276 | 17649 | 18178 | 17390 | 15963 | 16673 | 15219 |
| | 12707 | 11994 | 9946 | 5446 | | | | | | | |
| 293 | 14 | 16717 | 15537 | 17370 | 18431 | 17589 | 17956 | 17211 | 15883 | 16458 | 15099 |
| | 12327 | 9847 | 9924 | 5446 | | | | | | | |
| 307 | 14 | 16543 | 15731 | 17319 | 18434 | 17381 | 18127 | 17574 | 17665 | 18643 | 18191 |
| | 15557 | 13107 | 10183 | 5446 | | | | | | | |
| 182 | 17 | 18201 | 18529 | 19158 | 19181 | 19351 | 18657 | 19197 | 19325 | 19420 | 20182 |
| | 19496 | 10780 | 9807 | 5446 | | | | | | | |

196 17 18243 18357 19027 18958 19331 18520 19123 19253 19417 20239
20318 14034 9862 5446

201 17 18198 18193 18895 18837 19394 18463 19286 19124 19529 20094
19715 11314 9862 5446

208 17 17977 18002 19179 18728 18968 18486 19021 19156 19189 20160
18922 11372 9895 5446

218 17 17962 18134 18787 18788 18836 18545 19106 18880 19296 19528
17768 10564 9948 5446

226 17 17735 18134 18810 18790 18818 18416 19259 18950 19182 19567
18589 8515 9941 5446

233 17 17784 18078 18613 18456 19043 18519 19110 19046 19171 19469
19061 12644 9926 5446

240 17 17956 18150 18715 18791 18667 18323 18889 18888 18850 19282
18452 9595 9953 5446

247 17 17551 18116 18808 18656 18894 18321 19149 18921 18749 19115
18285 10009 9924 5446

252 17 17839 18117 18841 18812 18962 18451 19212 19075 18841 19388
18595 11437 9950 5446

257 17 18000 18245 18816 18704 18952 18477 19052 18460 18346 18968
17740 10500 9950 5446

264 17 17715 17854 18627 18604 18408 18126 18758 18014 17943 18413
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16347 8592 9900 5446

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16171 11994 9946 5446

293 17 17499 17688 18633 18383 18387 17828 17780 16547 16529 17519
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307 17 17318 17722 18443 18245 18176 17752 17709 17717 18891 19708
18987 13563 10183 5446

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 182 | 18 | 18318 | 18544 | 18628 | 19824 | 19725 | 18597 | 19151 | 19008 | 19000 | 19380 | 19271 | 9967 | 9807 | 5446 |
| 196 | 18 | 18146 | 18219 | 18462 | 19359 | 19755 | 18403 | 19101 | 19225 | 18936 | 19433 | 20091 | 14663 | 9862 | 5446 |
| 201 | 18 | 18094 | 18172 | 18378 | 19496 | 19646 | 18424 | 19140 | 18985 | 19027 | 19474 | 19218 | 10969 | 9862 | 5446 |
| 208 | 18 | 17885 | 18126 | 18316 | 19395 | 19553 | 18352 | 18943 | 18958 | 0 | 19070 | 17967 | 9833 | 9895 | 5446 |
| 218 | 18 | 17966 | 18009 | 18456 | 19189 | 19190 | 18210 | 18868 | 18762 | 18541 | 18931 | 17223 | 9765 | 9948 | 5446 |
| 226 | 18 | 17862 | 18045 | 18345 | 19270 | 19429 | 18413 | 18911 | 18703 | 18497 | 18778 | 17521 | 8050 | 9941 | 5446 |
| 233 | 18 | 17665 | 18009 | 18320 | 19327 | 19635 | 18214 | 18964 | 18744 | 18514 | 18619 | 17864 | 12074 | 9926 | 5446 |
| 240 | 18 | 17851 | 18081 | 18260 | 19132 | 19340 | 18200 | 18865 | 18466 | 18190 | 18424 | 17259 | 9486 | 9953 | 5446 |
| 247 | 18 | 17862 | 17901 | 18344 | 18943 | 19580 | 18021 | 18794 | 18274 | 18370 | 18540 | 17625 | 10161 | 9924 | 5446 |
| 252 | 18 | 17880 | 18245 | 18428 | 19206 | 19319 | 18217 | 18858 | 18637 | 18589 | 18625 | 17634 | 10204 | 9950 | 5446 |
| 257 | 18 | 17903 | 17947 | 18221 | 19231 | 19619 | 18207 | 18828 | 18151 | 17851 | 18270 | 17537 | 10462 | 9950 | 5446 |
| 264 | 18 | 17831 | 17791 | 18043 | 18964 | 18983 | 17834 | 18381 | 17499 | 17404 | 17664 | 16393 | 7935 | 9853 | 5446 |
| 273 | 18 | 17507 | 17873 | 18043 | 18994 | 18933 | 17875 | 17739 | 16474 | 16534 | 17259 | 16078 | 7547 | 9900 | 5446 |
| 286 | 18 | 17360 | 17584 | 17863 | 18646 | 18740 | 17444 | 17521 | 16264 | 16211 | 17096 | 16089 | 11032 | 9946 | 5446 |
| 293 | 18 | 17258 | 17595 | 18011 | 18742 | 18834 | 17290 | 17532 | 16273 | 16229 | 17087 | 16173 | 9896 | 9924 | 5446 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 307 | 18 | 17093 | 17548 | 17917 | 18742 | 18935 | 17275 | 17880 | 17022 | 17980 | 19057 | 19204 | 14311 | 10183 | 5446 |
| 182 | 19 | 18265 | 18341 | 18430 | 19036 | 20380 | 18398 | 18903 | 19066 | 19242 | 19850 | 18839 | 10606 | 9807 | 5446 |
| 196 | 19 | 17792 | 17993 | 18437 | 18757 | 19621 | 18301 | 19129 | 18949 | 18988 | 19743 | 19269 | 14028 | 9862 | 5446 |
| 201 | 19 | 17384 | 17907 | 18319 | 18575 | 19585 | 18407 | 18885 | 18863 | 18745 | 19529 | 18700 | 12577 | 9862 | 5446 |
| 208 | 19 | 17446 | 17703 | 18111 | 18351 | 19412 | 18195 | 19001 | 18971 | 18974 | 19483 | 18175 | 10119 | 9895 | 5446 |
| 218 | 19 | 17217 | 17767 | 18110 | 18468 | 19382 | 18058 | 18955 | 18741 | 18871 | 19502 | 18419 | 11396 | 9948 | 5446 |
| 226 | 19 | 17196 | 17715 | 18096 | 18508 | 19535 | 18245 | 19203 | 19074 | 18803 | 18911 | 16413 | 8005 | 9941 | 5446 |
| 233 | 19 | 17209 | 17811 | 18012 | 18268 | 19329 | 18193 | 18944 | 18779 | 18686 | 19279 | 18902 | 14294 | 9926 | 5446 |
| 240 | 19 | 17001 | 17438 | 18069 | 18619 | 18324 | 19218 | 18096 | 18766 | 18497 | 18181 | 18512 | 10052 | 9953 | 5446 |
| 247 | 19 | 17079 | 17521 | 17991 | 18382 | 19179 | 18079 | 18804 | 18443 | 18176 | 18676 | 17323 | 9914 | 9924 | 5446 |
| 252 | 19 | 17205 | 17578 | 17872 | 18306 | 19607 | 18268 | 18972 | 18702 | 18488 | 18630 | 17655 | 11117 | 9950 | 5446 |
| 257 | 19 | 17053 | 17636 | 17842 | 18442 | 19354 | 17959 | 18795 | 18366 | 17996 | 18403 | 17082 | 10258 | 9950 | 5446 |
| 264 | 19 | 16889 | 17353 | 17816 | 18100 | 19203 | 17808 | 18432 | 17818 | 17235 | 17662 | 16165 | 8224 | 9853 | 5446 |
| 273 | 19 | 16749 | 17137 | 17654 | 18057 | 19113 | 17463 | 18155 | 17000 | 16442 | 17203 | 15566 | 7919 | 9900 | 5446 |
| 286 | 19 | 16729 | 16805 | 17458 | 18106 | 18768 | 17560 | 18027 | 16548 | 15946 | 17035 | 15435 | 11974 | 9946 | 5446 |

293 19 16645 17056 17511 17923 19038 17315 17824 16546 16212 16958
15459 10682 9924 5446

307 19 16558 16907 17270 17864 18637 17175 17938 17669 18225 19238
18646 13232 10183 5446

182 20 17926 18259 18457 18904 19775 18493 19115 19092 19134 19624
17832 11064 9807 5446

196 20 18376 18195 18403 18922 20585 18214 18888 19067 19172 19897
19735 12455 9862 5446

201 20 18346 18204 19148 19115 19040 18605 19314 19275 19632 20247
19534 11694 9862 5446

208 20 17963 17846 18035 18773 19952 18081 18706 18845 18972 19566
17638 9642 9895 5446

218 20 18021 17975 17930 18775 19981 17659 18561 18579 18876 19683
17401 9657 9948 5446

226 20 17977 17509 17892 18516 19918 17925 18905 18756 18629 18676
17794 7449 9941 5446

233 20 17849 17857 17844 18647 19990 18108 18605 18894 18661 18991
18638 11600 9926 5446

240 20 17839 17724 17907 18813 19667 17952 18552 18811 18342 18787
17385 8973 9953 5446

247 20 17733 17693 18152 18575 19573 17808 18581 18514 18499 18657
17529 9364 9924 5446

252 20 17946 17784 17854 18614 19936 18262 18713 18677 18768 18858
17714 9783 9950 5446

257 20 17980 17869 18001 18781 19907 17961 18233 18463 18426 18670
17054 9249 9950 5446

264 20 17794 17535 17621 18475 19437 17453 18279 18298 17847 18153
16301 7793 9853 5446

273 20 17674 17422 17757 18330 19343 16889 17783 17562 17218 17818
15973 7527 9900 5446

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 286 | 20 | 17419 | 17266 | 17352 | 18051 | 19237 | 16567 | 17346 | 17059 | 17071 | 17537 | 15600 | 10448 | 9946 | 5446 |
| 293 | 20 | 17508 | 17271 | 17382 | 18205 | 18972 | 16751 | 17235 | 16814 | 16996 | 17838 | 15799 | 9941 | 9924 | 5446 |
| 307 | 20 | 17498 | 17264 | 17329 | 18082 | 19246 | 16377 | 17230 | 18043 | 18764 | 19452 | 18276 | 12028 | 10183 | 5446 |

*Values in red were omitted from mean calculations due to a leak in the drip tape

2015 West

Depths (cm)

| DOY | Tube | 230 | 210 | 190 | 170 | 150 | 130 | 110 | 90 | 70 | 50 | 30 | 10 | Std | Probe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 197 | 1 | 17245 | 16562 | 16998 | 17821 | 18092 | 18669 | 18232 | 18945 | 19228 | 18674 | 16619 | 12303 | 9871 | 5446 |
| 219 | 1 | 17391 | 16616 | 16809 | 18032 | 18602 | 18401 | 18973 | 19389 | 18687 | 15999 | 10642 | 10338 | 9953 | 5446 |
| 208 | 1 | 17399 | 16758 | 17108 | 17851 | 18286 | 18513 | 18317 | 18894 | 18962 | 18033 | 13895 | 7739 | 9862 | 5446 |
| 229 | 1 | 17174 | 16570 | 16930 | 17743 | 18160 | 18392 | 17925 | 18684 | 18880 | 18782 | 16537 | 12176 | 9948 | 5446 |
| 236 | 1 | 17163 | 16424 | 17045 | 17706 | 18137 | 18721 | 18121 | 18992 | 19207 | 18817 | 16366 | 11497 | 9953 | 5446 |
| 243 | 1 | 17349 | 16400 | 16881 | 17744 | 17917 | 18362 | 18130 | 18776 | 19154 | 18992 | 17074 | 13377 | 9856 | 5446 |
| 251 | 1 | 17314 | 16514 | 16800 | 17402 | 17694 | 18239 | 17871 | 18673 | 18619 | 18430 | 15811 | 11563 | 9908 | 5446 |
| 258 | 1 | 17393 | 16719 | 16713 | 17725 | 17855 | 18080 | 17690 | 18371 | 18839 | 18448 | 16700 | 13205 | 9983 | 5446 |
| 266 | 1 | 17172 | 16406 | 16578 | 17384 | 17431 | 18036 | 17378 | 18380 | 18348 | 18051 | 15560 | 11261 | 9929 | 5446 |
| 274 | 1 | 17046 | 16429 | 16493 | 17331 | 17285 | 17710 | 17298 | 17816 | 17826 | 17083 | 14088 | 9867 | 9893 | 5446 |
| 289 | 1 | 16967 | 16295 | 16250 | 17205 | 17150 | 17514 | 17003 | 17313 | 17233 | 16676 | 13963 | 10594 | 9939 | 5446 |
| 301 | 1 | 16963 | 16252 | 16410 | 17099 | 17179 | 17326 | 17442 | 18676 | 19159 | 19053 | 17245 | 13734 | 9941 | 5446 |
| 317 | 1 | 16952 | 16003 | 16135 | 17052 | 16944 | 17368 | 17231 | 18296 | 18803 | 18530 | 16336 | 11532 | 9877 | 5446 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 197 | 2 | 16832 | 17166 | 17480 | 17989 | 18293 | 17601 | 17954 | 18463 | 18439 | 18486 | 14638 | 10176 | 9871 | 5446 |
| 219 | 2 | 17170 | 17339 | 17558 | 18007 | 18224 | 17514 | 18149 | 18537 | 18612 | 18427 | 13740 | 9805 | 9953 | 5446 |
| 208 | 2 | 16920 | 17150 | 17454 | 17965 | 18115 | 17624 | 18146 | 18491 | 18500 | 17278 | 11397 | 5240 | 9862 | 5446 |
| 229 | 2 | 17012 | 17166 | 17381 | 17920 | 18030 | 17518 | 17955 | 18178 | 18489 | 18541 | 14611 | 11670 | 9948 | 5446 |
| 236 | 2 | 16896 | 17277 | 17366 | 17867 | 18226 | 18092 | 18199 | 18667 | 18731 | 18439 | 14339 | 10841 | 9953 | 5446 |
| 243 | 2 | 17024 | 17314 | 17439 | 17874 | 18324 | 17600 | 17823 | 18038 | 17978 | 17673 | 13750 | 11782 | 9856 | 5446 |
| 251 | 2 | 17065 | 17259 | 17372 | 17648 | 18145 | 17570 | 17706 | 17515 | 17064 | 16916 | 12930 | 10849 | 9908 | 5446 |
| 258 | 2 | 16956 | 17343 | 17355 | 17563 | 18095 | 17478 | 17356 | 17444 | 16817 | 17647 | 14576 | 11517 | 9983 | 5446 |
| 266 | 2 | 17033 | 17084 | 17354 | 17522 | 17843 | 17143 | 17165 | 16765 | 16468 | 17114 | 13401 | 10184 | 9929 | 5446 |
| 274 | 2 | 16780 | 17111 | 17204 | 17574 | 17676 | 16963 | 17201 | 16795 | 16004 | 16557 | 12268 | 8399 | 9893 | 5446 |
| 289 | 2 | 16587 | 16891 | 16872 | 17259 | 17503 | 16784 | 16922 | 16324 | 15715 | 16276 | 12140 | 9901 | 9939 | 5446 |
| 301 | 2 | 16740 | 16977 | 16862 | 17402 | 17441 | 16614 | 16916 | 18062 | 18370 | 18611 | 15209 | 12639 | 9941 | 5446 |
| 317 | 2 | 16556 | 16559 | 16796 | 17099 | 17281 | 16743 | 16966 | 17608 | 18005 | 18399 | 14300 | 10626 | 9877 | 5446 |
| 197 | 3 | 17736 | 17950 | 18504 | 18438 | 19696 | 20387 | 18482 | 19073 | 19210 | 19311 | 18428 | 13825 | 9871 | 5446 |
| 219 | 3 | 17709 | 18004 | 18316 | 17901 | 18851 | 19642 | 17778 | 18686 | 18551 | 19113 | 17125 | 12479 | 9953 | 5446 |

208 3 17867 18160 18446 18257 19078 19745 17904 18527 18795 18897
16005 9690 9862 5446

229 3 17582 18022 17938 17591 18715 19490 17375 18185 18560 19078
17620 14137 9948 5446

236 3 17607 17952 18141 18137 19063 19919 18078 18617 18790 18951
17281 12810 9953 5446

243 3 17617 18034 18007 17749 18723 19469 17526 18307 18348 18720
17203 14130 9856 5446

251 3 17535 17847 17926 17614 18367 19304 17172 17901 18310 18648
16864 13955 9908 5446

258 3 17274 17700 17883 17553 18097 19322 17114 18146 18307 18713
17245 13719 9983 5446

266 3 17124 17607 17794 17317 18056 19238 16864 17884 18004 18605
16556 12913 9929 5446

274 3 17419 17819 17940 17269 17803 18921 16831 17425 17493 17691
14812 10453 9893 5446

289 3 17051 17714 17554 17007 17866 18750 16182 16960 16868 17361
14762 12048 9939 5446

301 3 17096 17484 17486 16929 17539 18938 17375 18479 18800 19231
17819 15141 9941 5446

317 3 17080 17455 17609 17054 17686 18726 16987 17930 18442 18694
16905 12640 9877 5446

197 4 18448 18390 18381 17719 14684 15763 18432 19169 19336 19456
17321 13738 9871 5446

219 4 18519 18129 18265 17503 14231 15327 18039 18989 19020 19127
16618 12283 9953 5446

208 4 18598 18279 18471 17554 14575 15585 18122 19015 18835 18711
14972 10450 9862 5446

229 4 18401 18358 18205 17142 14131 14856 17943 18432 18858 19026
16532 13350 9948 5446

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 236 | 4 | 18313 | 18288 | 18135 | 17271 | 14451 | 15285 | 17894 | 19039 | 19233 | 19174 | 16357 | 12650 | 9953 | 5446 |
| 243 | 4 | 18383 | 18402 | 18081 | 17147 | 14081 | 15003 | 18000 | 18584 | 18685 | 18998 | 16270 | 13060 | 9856 | 5446 |
| 251 | 4 | 18426 | 18339 | 17914 | 17245 | 13811 | 14733 | 17725 | 18459 | 18686 | 18630 | 16024 | 13799 | 9908 | 5446 |
| 258 | 4 | 18349 | 18200 | 17912 | 17482 | 14000 | 14378 | 17224 | 18487 | 18465 | 18718 | 16570 | 13199 | 9983 | 5446 |
| 266 | 4 | 18228 | 17960 | 17949 | 16838 | 13684 | 14479 | 17400 | 18273 | 18305 | 18337 | 15808 | 12395 | 9929 | 5446 |
| 274 | 4 | 18508 | 17902 | 17855 | 17030 | 13599 | 14195 | 17360 | 17725 | 17688 | 17569 | 14514 | 10713 | 9893 | 5446 |
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| 258 | 20 | 16460 | 17252 | 17918 | 17732 | 18622 | 17668 | 17646 | 15472 | 15228 | 15939 | 11529 | 8756 | 9983 | 5446 |
| 266 | 20 | 16593 | 17149 | 17831 | 17782 | 18599 | 17890 | 17219 | 15096 | 15196 | 15496 | 10883 | 8278 | 9929 | 5446 |
| 274 | 20 | 16377 | 17090 | 17869 | 17762 | 18337 | 17563 | 16940 | 14807 | 14903 | 14968 | 10492 | 7229 | 9893 | 5446 |
| 289 | 20 | 16434 | 16998 | 17663 | 17704 | 18442 | 17275 | 16730 | 14849 | 14728 | 14888 | 10758 | 9631 | 9939 | 5446 |
| 301 | 20 | 16272 | 17016 | 17489 | 17701 | 18388 | 17618 | 16626 | 15938 | 18486 | 19092 | 15251 | 12736 | 9941 | 5446 |
| 317 | 20 | 16342 | 17031 | 17760 | 17601 | 18217 | 17599 | 16453 | 16146 | 18085 | 18858 | 14231 | 10418 | 9877 | 5446 |

[i] *Values omitted from mean calculations due to a leak in the drip tape