

***Sandy Land Underground Water Conservation District
Agricultural Water Conservation Program
Drip Irrigation Project - Cotton***

TWDB Contract Number: 2005-358-018

Contract Name: Agricultural Water Conservation Program
Drip Irrigation Project on Cotton Grown in
Yoakum County

Contractor's Vendor Identification: 75-2309394

Address: Sandy Land Underground Water Conservation District
P.O. Box 130
Plains, TX 79355

FINAL
REPORT

***Sandy Land Underground Water Conservation District
Agricultural Water Conservation Program
Drip Irrigation Project***

TWDB Contract Number: 2005-358-018

Contractor's Vendor Identification: 75-2309394

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Plains, TX 79355**

2005 Season

Sandy Land Underground Water Conservation District Agricultural Water Conservation Project Drip Irrigation Project ~ Cotton



Tractor with 5 reels attached to a toolbar

to plow drip tape into the field.



Closeup of tape as it is plowed into the field.



Drip tape at the end of a row.



Filter system used in the drip project for cotton.



Layflat line - Drip lines attach here in the middle of the field.



Picture taken of cotton on drip irrigation during the first week of July.

The cotton is beginning to bloom.

Sandy Land Underground Water Conservation District Agricultural Water Conservation Project Drip Irrigation Project ~ Cotton



Cotton on drip tape during the month of June. You can see

the drip tape at the end of the row.



Picture taken of cotton on drip irrigation during the first

week of July. The cotton is beginning to bloom.



July 22, 2005 cotton with blooms and

bolls on lower branches.



July 29, 2005 cotton



Cotton at first boll opening.



Drip irrigated cotton after defoliant and boll openers have

been applied.

Sandy Land Underground Water Conservation District Agricultural Water Conservation Project Drip Irrigation Project ~ Cotton



Another picture of drip irrigated cotton as it opens.



Drip cotton a few days before cotton strippers

enter the field.



Drip irrigated cotton just prior to harvest.



Size variation in drip cotton due to leaks

in the drip tape.



Another view of size variation in drip cotton due to leaks in the drip tape.



Drip irrigated cotton ready for harvest.

Sandy Land Underground Water Conservation District Agricultural Water Conservation Project Drip Irrigation Project ~ Cotton



Drip cotton harvested, in modules, ready for the
cotton gin to pick up.

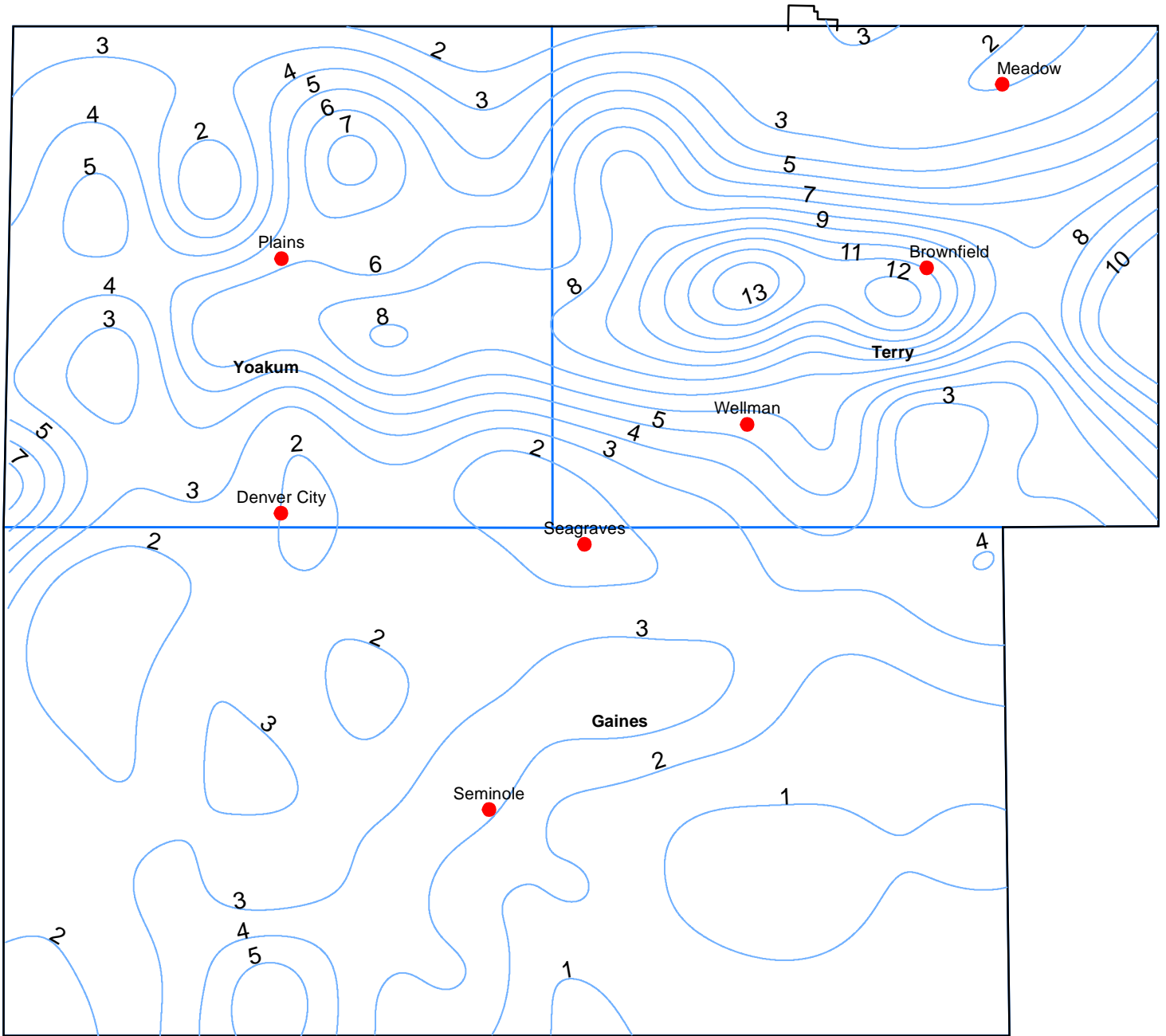


Harvested cotton, in modules.

End of 2005 Season Pictures

Southern Ogallala Rainfall Enhancement Program

May 2005 Rainfall



Contour Interval = 1 in

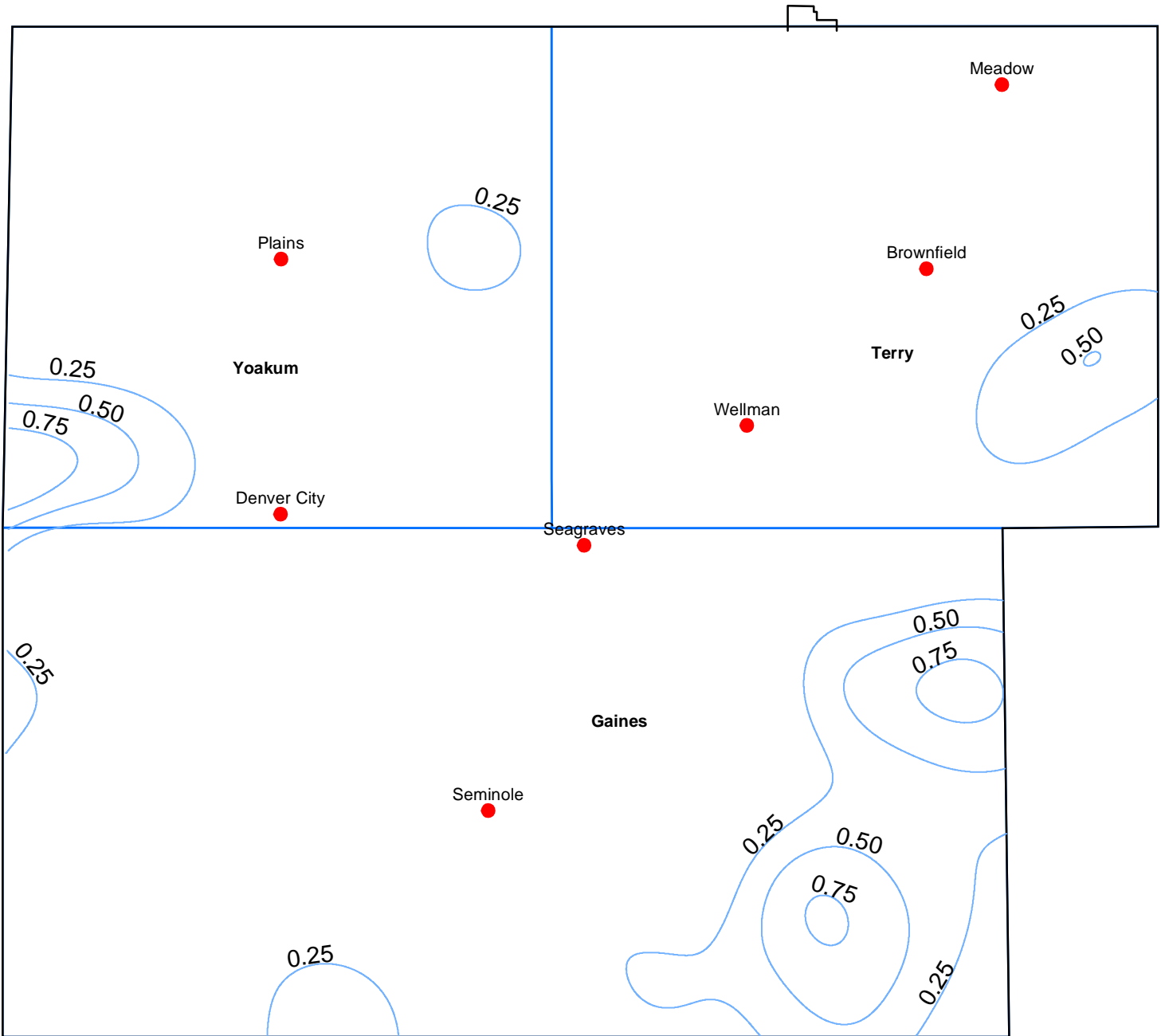
Legend

- Towns
- District Boundary
- Texas Target Area
- County Boundaries
- May 2005 Rainfall

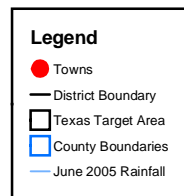


Southern Ogallala Rainfall Enhancement Program

June 2005 Rainfall

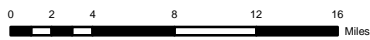
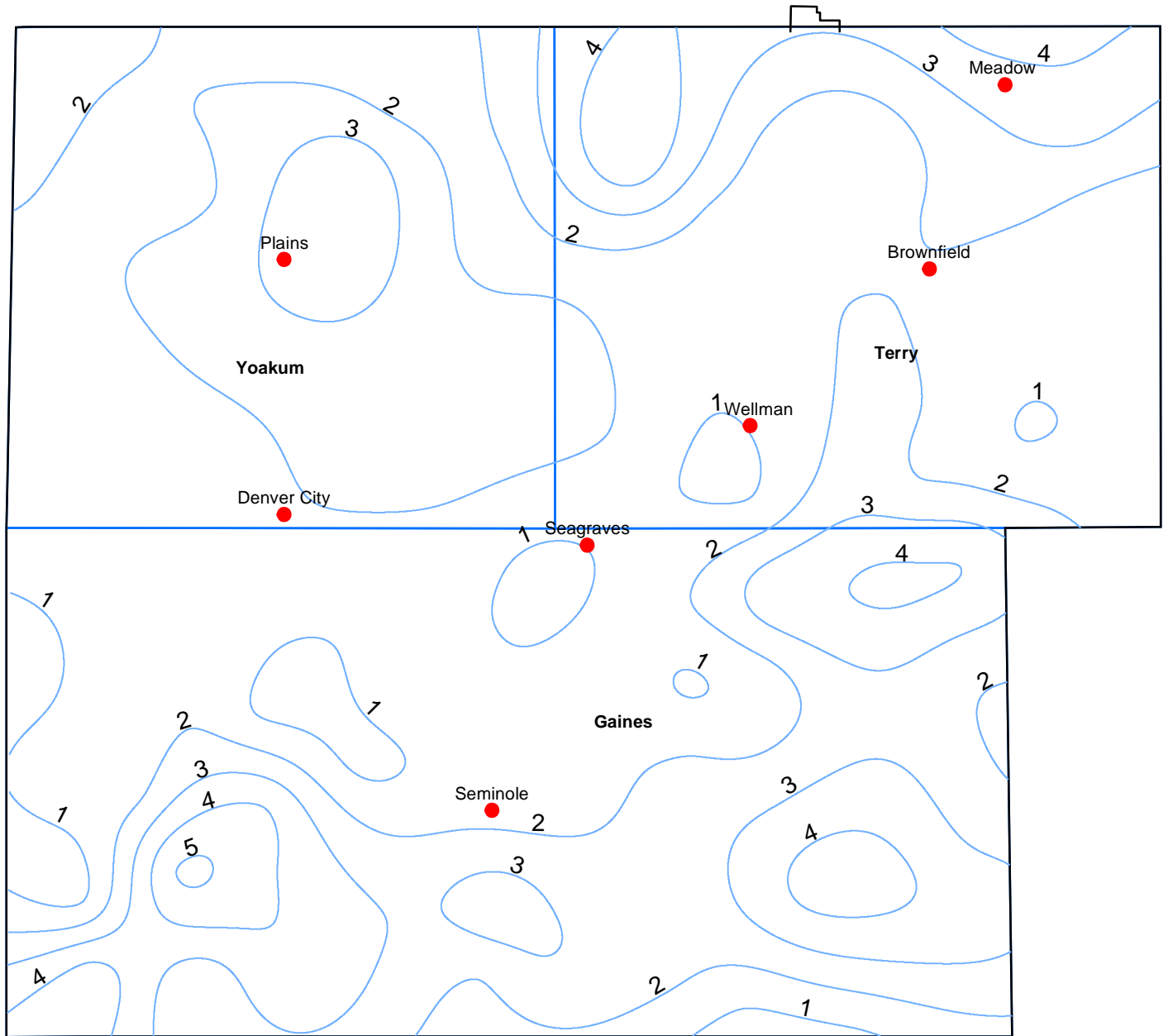


Contour Interval = 0.25 in



Southern Ogallala Rainfall Enhancement Program

July 2005 Rainfall



Contour Interval = 1 in

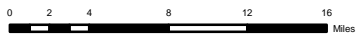
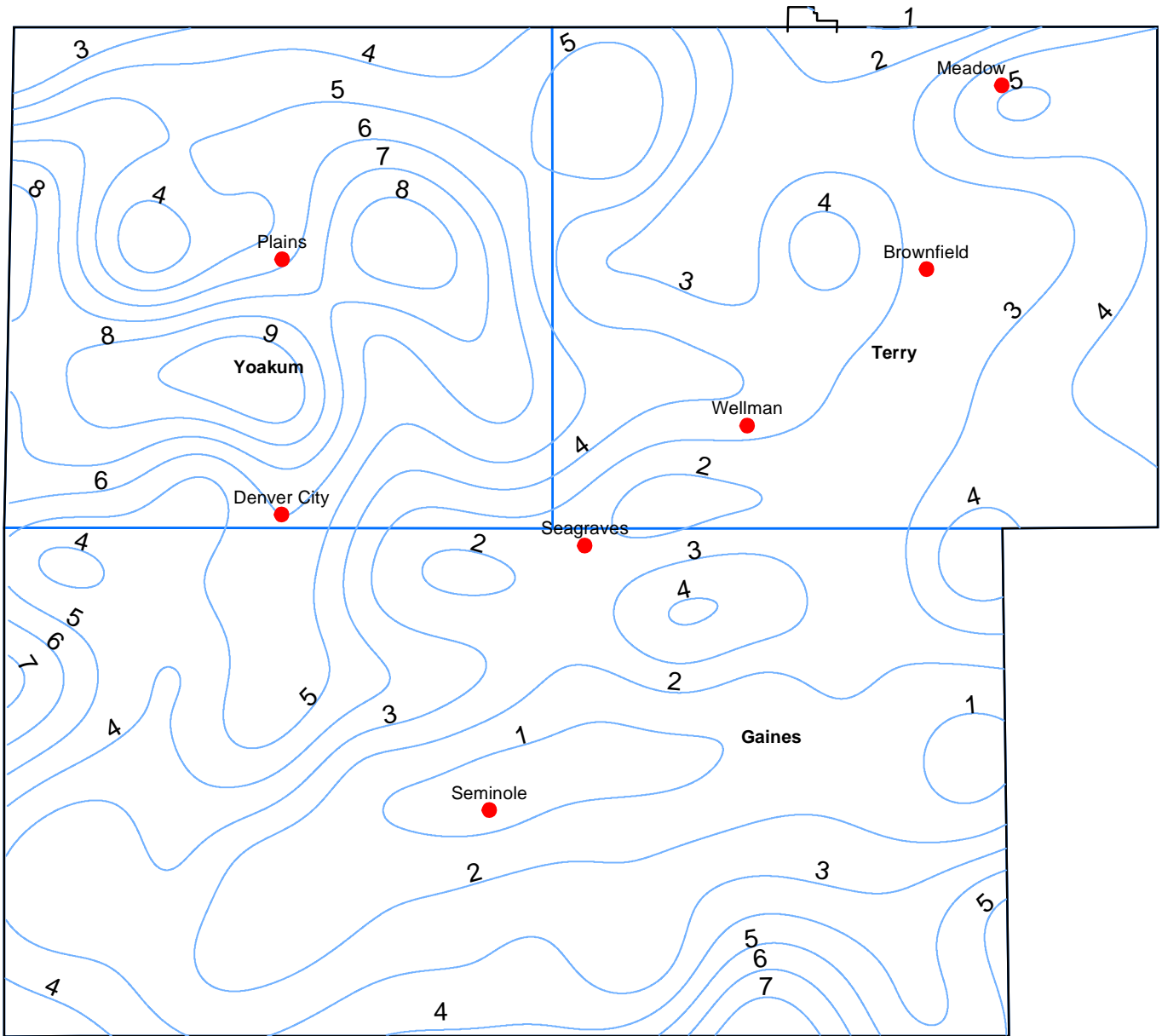
Legend

- Towns
- District Boundary
- Texas Target Area
- County Boundaries
- July 2005 Rainfall



Southern Ogallala Rainfall Enhancement Program

August 2005 Rainfall



Contour Interval = 1 in

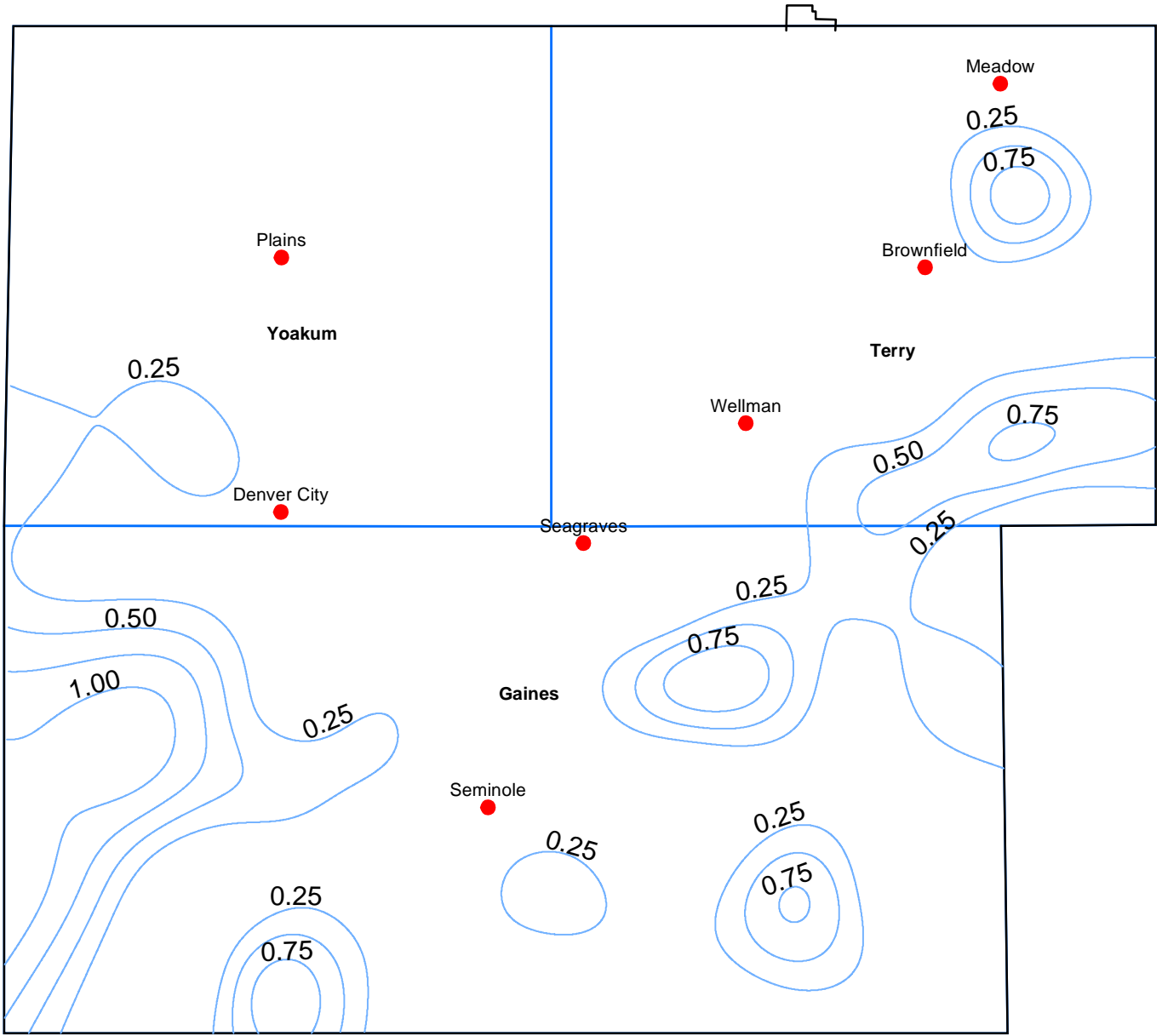
Legend

- Towns
- District Boundary
- Texas Target Area
- County Boundaries
- August 2005 Rainfall

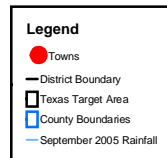


Southern Ogallala Rainfall Enhancement Program

September 2005 Rainfall



Contour Interval = 0.25 in



**SANDY LAND UWCD
RAINFALL MEASUREMENTS
YOAKUM COUNTY, TEXAS
2005**

SECTION #	1/31/2005	2/28/2005	3/31/2005	4/30/2005	5/31/2005	6/30/2005	7/31/2005	8/31/2005	9/30/2005	10/31/2005	11/30/2005	12/31/2005	TOTALS
575	0.70	0.60	0.10	0.20	6.60	0.00	2.40	9.10	0.10	2.25	0.00	0.00	22.05
579	0.00	0.00	0.05	0.10	3.00	0.00	1.80	8.05	0.15	1.15	0.00	0.00	14.30
535	0.25	0.10	0.00	0.25	4.20	0.00	broken	7.80	0.10	1.15	0.00	0.00	13.85
852	0.80	1.55	0.25	0.10	7.00	0.90	1.30	6.35	0.35	1.00	0.00	0.00	19.60
793	0.60	1.50	0.20	0.10	3.30	0.60	1.20	6.70	0.20	0.90	0.00	0.00	15.30
832	0.80	1.55	0.10	0.10	3.40	0.20	1.40	5.20	0.30	0.95	0.00	0.00	14.00
759	1.00	1.10	0.20	0.20	3.20	0.00	2.50	4.95	0.00	1.20	0.00	0.00	14.35
753	1.20	1.50	0.20	0.10	2.00	0.00	2.30	5.30	0.00	0.90	0.00	0.00	13.50
563	0.95	1.15	0.10	0.25	7.40	0.00	2.40	7.05	0.00	3.20	0.00	0.00	22.50
568	0.60	1.35	0.05	0.20	8.00	0.00	2.80	6.00	0.00	1.55	0.00	0.00	20.55
432	1.00	0.60	0.10	0.10	5.30	0.00	3.30	8.60	0.00	2.60	0.00	0.00	21.60
1	1.10	1.60	0.20	0.15	6.60	0.40	1.80	7.50	0.00	2.65	0.00	0.00	22.00
265	1.00	1.20	0.15	0.10	4.20	0.00	1.80	5.25	0.00	1.85	0.00	0.00	15.55
255	1.00	0.85	0.20	0.10	7.40	0.10	3.50	6.60	0.00	1.40	0.00	0.00	21.15
308	0.00	0.00	0.00	0.20	1.20	0.00	2.00	4.90	0.00	1.65	0.00	0.00	9.95
187	1.75	1.50	0.20	0.20	2.70	0.00	2.00	4.80	0.00	1.20	0.00	0.00	14.35
163	2.30	1.20	0.25	0.20	3.80	0.20	1.90	5.35	0.00	1.40	0.00	0.00	16.60
167	1.65	0.70	0.15	0.20	3.20	0.00	2.60	3.55	0.00	0.30	0.00	0.00	12.35
298	2.20	1.25	0.15	0.10	4.00	0.20	2.00	8.10	0.00	1.90	0.00	0.00	19.90
342	1.30	1.60	0.10	0.10	5.10	0.00	1.60	4.35	0.00	1.00	0.00	0.00	15.15
34	1.30	0.60	0.1	0.10	2.80	0.00	1.60	3.95	0.00	0.95	0.00	0.00	11.40
148	1.00	1.00	0.05	0.15	4.50	0.00	1.60	4.65	0.00	0.75	0.00	0.00	13.70
371	----	1.25	0.1	0.15	4.60	0.12	3.20	5.00	0.00	1.95	0.00	0.00	16.37
420	1.80	0.80	0.1	0.10	4.60	0.00	2.20	3.80	0.00	1.20	0.00	0.00	14.60
673	0.25	1.35	0.1	0.25	3.20	0.00	2.30	9.40	0.00	0.70	0.00	0.00	17.55
714	1.10	1.60	0.15	0.30	4.40	0.50	1.00	6.90	0.30	0.55	0.00	0.00	16.80

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2006 Season

Sandy Land Underground Water Conservation District Agricultural Water Conservation Project Drip Irrigation Project ~ Cotton



Drip irrigated land prior to planting the 2006 crop. Notice the bare cotton stalks from the 2005 crop.



Notice the drip lines emerging from the ground at the end of the rows.



Healthy cotton plants soon after emergence.



Young cotton plants.



The filter system (left) and a tank beside the center pivot system.



The "lay flat" lines are connected to the filter system. Individual rows of underground drip line are then connected to the "lay flat."

Sandy Land Underground Water Conservation District Agricultural Water Conservation Project Drip Irrigation Project ~ Cotton



Notice the line coming out of the ground at the ends of the row. This drip line is connected to the "lay flat."



Lay flat and drip line connected.

This picture shows the cotton field utilizing the drip irrigation system. In the distance, you can see the filter system.



You can also see the deflated "lay flat" line and how it is connected to the drip lines going underground.



Maturing cotton plants.



Cotton plants as they appeared toward the end of May.

Sandy Land Underground Water Conservation District

Drip Irrigation Project ~ Cotton



This picture was taken in late June and shows the lay flat lines laying perpendicular to the cotton rows. Also in this photograph, you can see the hose connecting the lay flat to the underground line.

Also of note, when using drip irrigation, the road is not watered and therefore stays in better condition and is also free of weeds.



Another photograph that shows the lay flat line and one of the hoses that connect the lay flat to the underground line.



As evidenced in this photograph, there are very few weeds in the furrows between the cotton plants. When using drip irrigation, the water is applied underground, so the weed seed near the top of the ground never germinates (until it rains), thus keeping the field free of weeds.

Sandy Land Underground Water Conservation District

Drip Irrigation Project ~ Cotton



The photograph at left shows the drip irrigated cotton as it matures.



Pink and white blooms in the cotton attest to the maturation process. Each bloom has the capability of producing a boll of cotton. This cotton has many squares and blooms heightening the potential for a profitable yield.



Notice in this photograph how "even" the cotton crop looks. With drip irrigation, no moisture is lost to the wind and evaporation as in conventional watering methods, so the cotton plants grow more uniformly. This, in turn, makes the cotton easier to harvest.

Sandy Land Underground Water Conservation District

Drip Irrigation Project ~ Cotton



The photograph at left shows the cotton at "green boll stage". As the season progresses, the cotton boll will open and expose the cotton fibers. The cotton stalks at this stage are very dense and woody.



This photograph very graphically shows the benefit of drip irrigation. The cotton on the left side of the photo is watered with conventional watering methods and the cotton on the right is watered with drip irrigation. As you can see, the drip cotton is definitely larger and more lush. The efficiency of drip irrigation in supplying the water to the root system where it is most needed can clearly be noted here.



This picture was taken in August and you can see how the cotton has nearly lapped together. This cotton has not been "stressed" as conventionally watered cotton might be. During the late spring and early summer, we frequently have high winds in this area. Many farmers will have to stop watering with center pivot systems during a wind storm because much of the water will be lost to evaporation or literally blown away, causing uneven distribution of moisture. This is not a problem with drip irrigation.

Sandy Land Underground Water Conservation District

Drip Irrigation Project ~ Cotton



This photograph was taken around the first week in September. The cotton is still very green, but you can see that the cotton is beginning to open. Also visible is the lay flat line and feeder lines that go underground.



This photograph shows the lay flat line and feeder lines more closely. You can actually see the feeder lines going underground.



This picture was taken in early October. The cotton has had some chemicals applied that aid in harvesting. First, a chemical is used that helps to open the bolls. This helps have a more uniformly mature crop. It also helps open late bolls that might not mature if it was not applied. A defoliant is also used to strip the cotton of its leaves so that it may be harvested earlier. This helps the yield of the crop.

Sandy Land Underground Water Conservation District Drip Irrigation Project ~ Cotton



This photograph shows the drip cotton acreages prior to harvest.



This photograph clearly shows the benefit of drip irrigation. The cotton rows on the right side of the frame are cotton that is drip irrigated, with the cotton on the left being watered with conventional irrigation.



This photograph at left is another shot showing the difference between drip irrigation versus conventional irrigation. Again, the cotton on the top and right side of the picture is drip irrigated.

Sandy Land Underground Water Conservation District Drip Irrigation Project ~ Cotton



The photograph at left shows the cotton being harvested. The High Plains is one of the few areas that harvest cotton with a "cotton stripper". Most areas of the country that grow cotton use a "cotton picker" for harvest. The cotton stripper literally "strips" the cotton and cotton burrs off the stalk. The cotton picker will "pick" the cotton out of the burr leaving the stalk almost totally intact. A cotton stripper is shown harvesting this cotton.



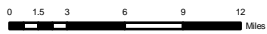
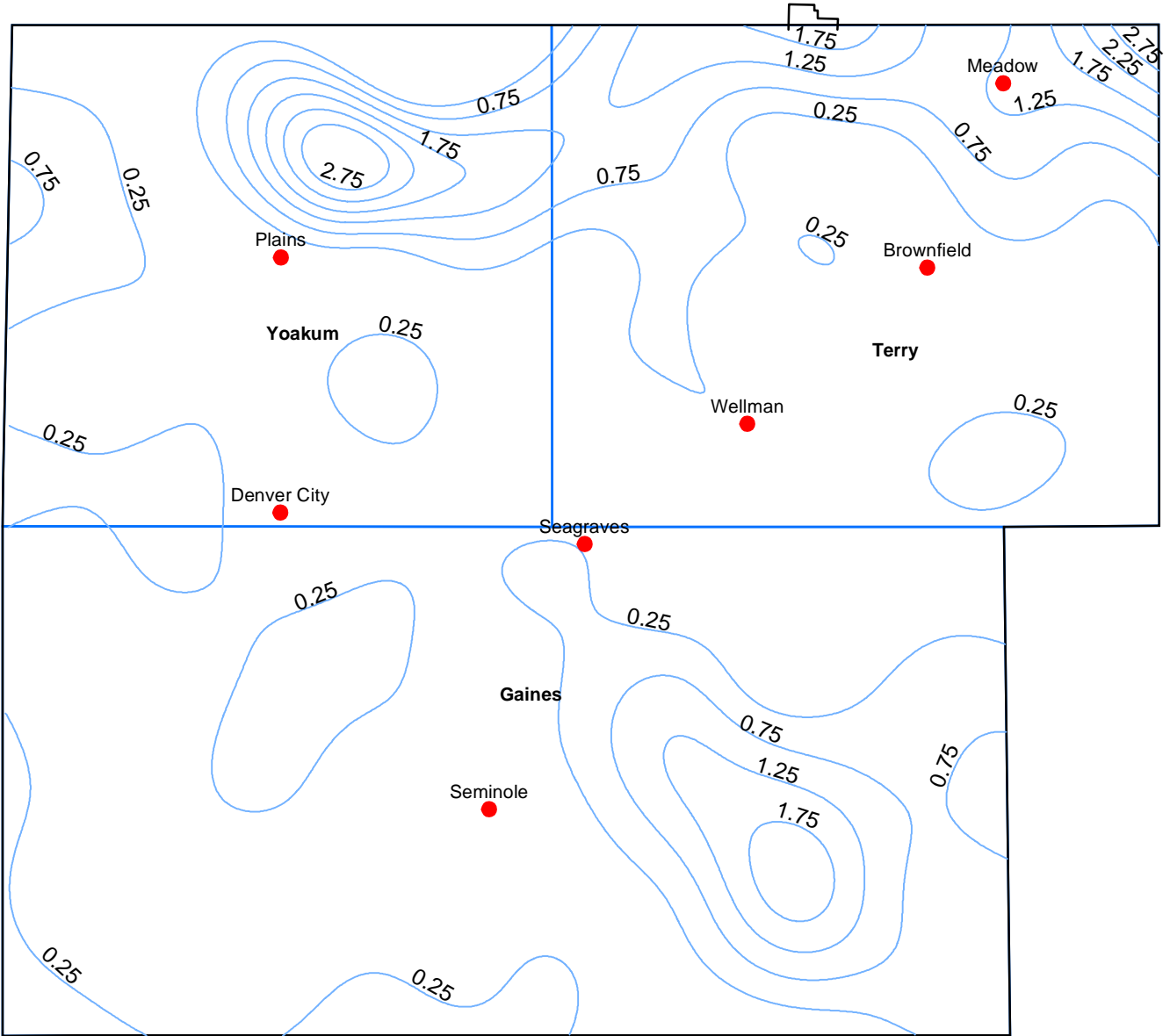
This photograph is a closer shot of the cotton being harvested through a cotton stripper.



The photograph at left shows the cotton in "modules". After stripping the cotton, it is dumped into a machine that compacts the cotton into these modules. They will stay in the field until the cotton gin is ready to gin the cotton.

Southern Ogallala Rainfall Enhancement Program

May 2006 Rainfall



Contour Interval = 0.5 in

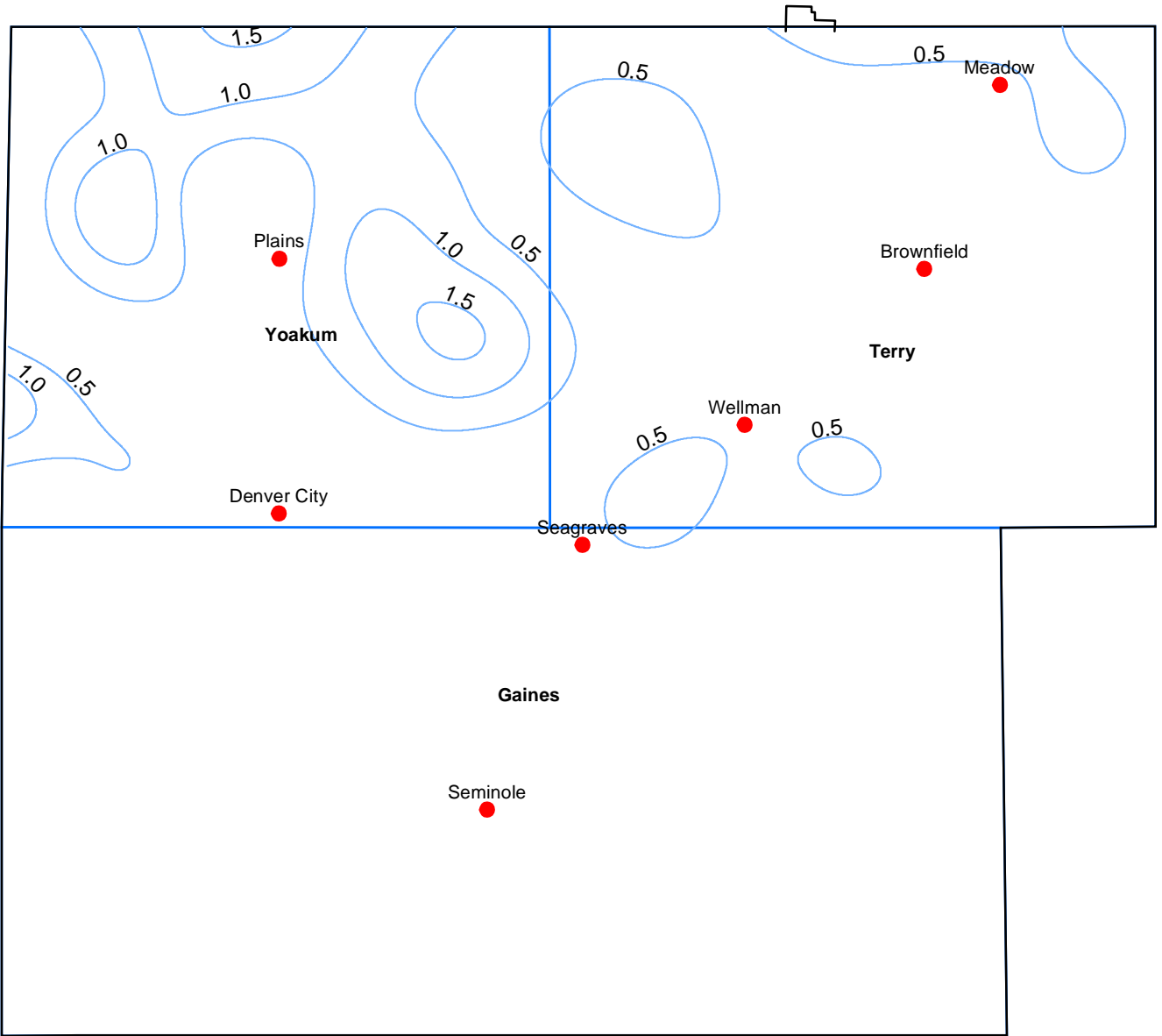
Legend

- Towns
- District Boundary
- Texas Target Area
- - - County Boundaries
- May 2006 Rainfall



Southern Ogallala Rainfall Enhancement Program

June 2006 Rainfall



Contour Interval = 0.5 in

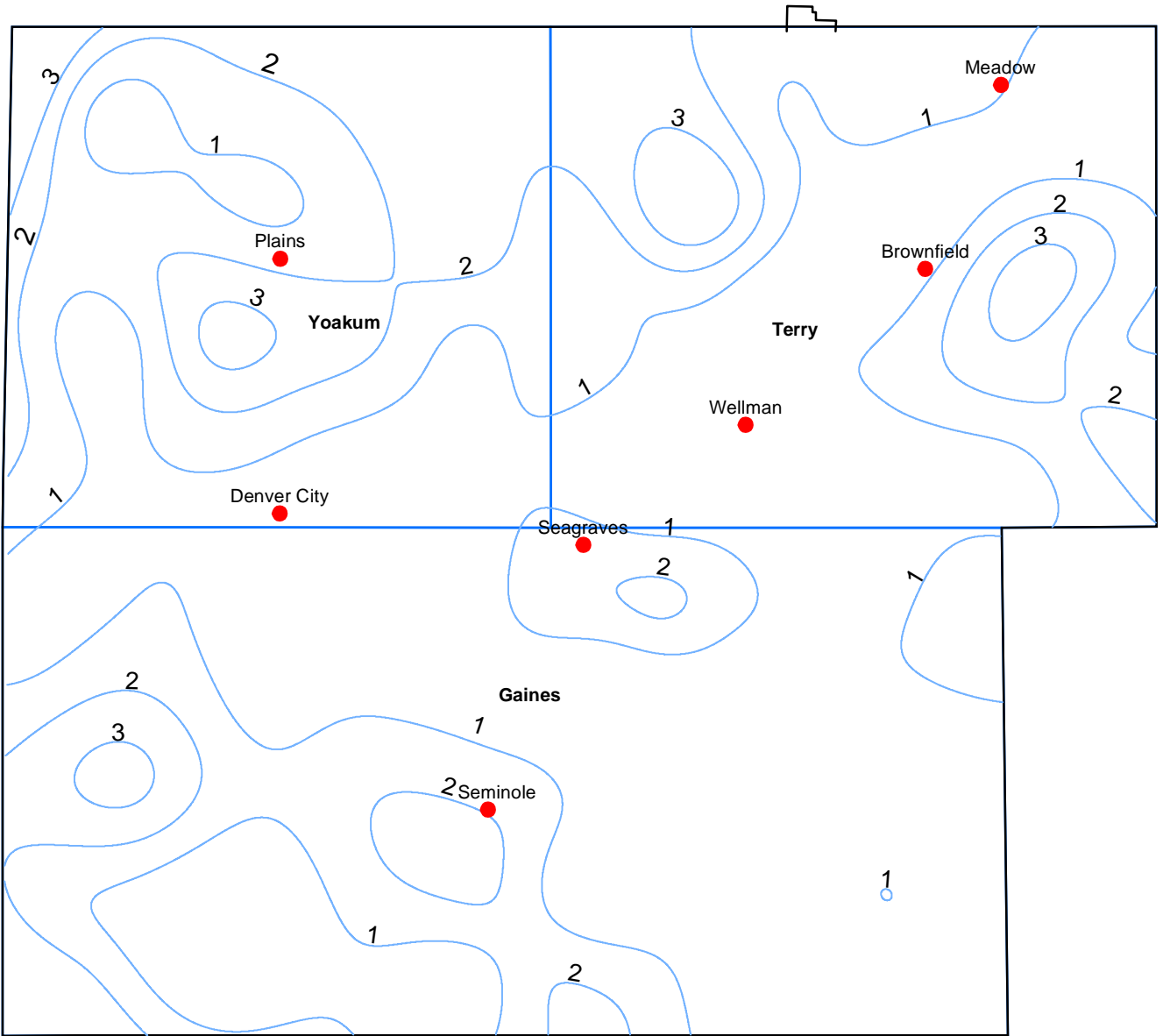
Legend

- Towns
- District Boundary
- Texas Target Area
- County Boundaries
- June 2006 Rainfall



Southern Ogallala Rainfall Enhancement Program

July 2006 Rainfall



Contour Interval = 1 in

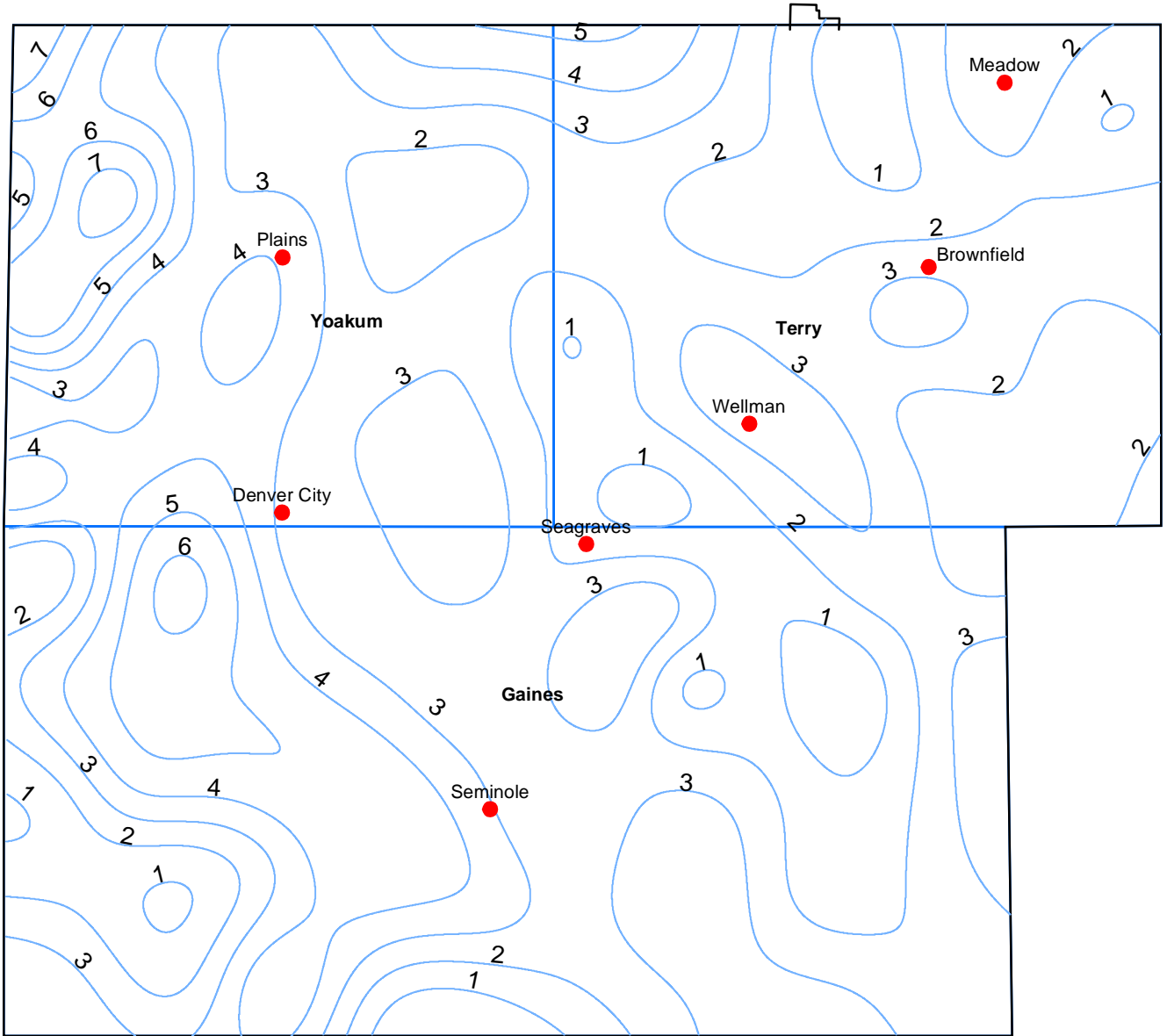
Legend

- Towns
- District Boundary
- Texas Target Area
- County Boundaries
- July 2006 Rainfall



Southern Ogallala Rainfall Enhancement Program

August 2006 Rainfall



Contour Interval = 1 in

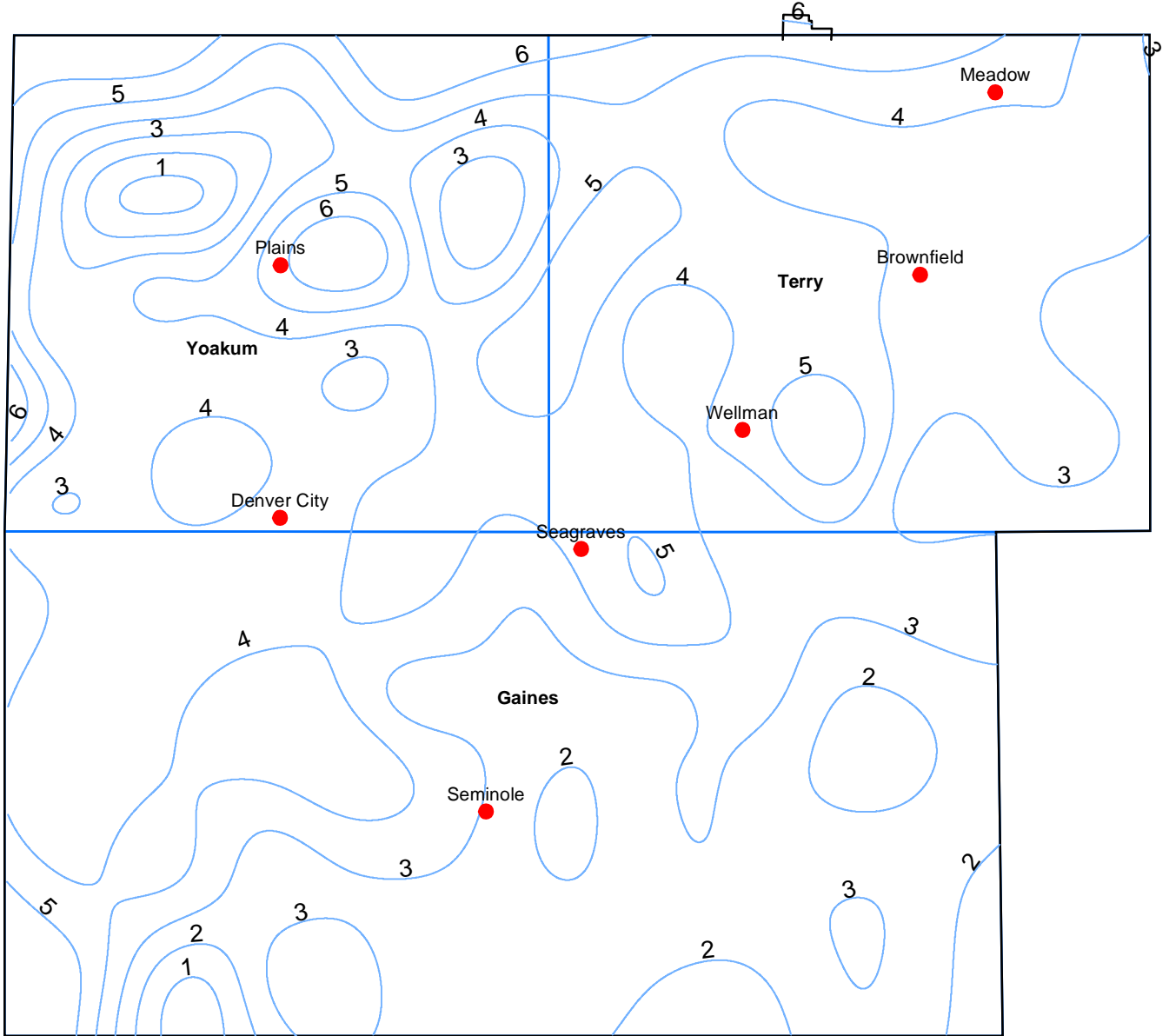
Legend

- Towns
- District Boundary
- Texas Target Area
- - - County Boundaries
- August 2006 Rainfall



Southern Ogallala Rainfall Enhancement Program

September 2006 Rainfall



Contour Interval = 1 in

Legend

- Towns
- District Boundary
- Texas Target Area
- County Boundaries
- September 2006 Rainfall



**SANDY LAND UWCD
RAINFALL MEASUREMENTS
YOAKUM COUNTY, TEXAS
2006**

SECTION #	1/31/2006	2/28/2006	3/31/2006	4/30/2006	5/31/2006	6/30/2006	7/31/2006	8/31/2006	9/30/2006	10/31/2006	11/30/2006	12/31/2006	TOTALS
575	0.00	0.00	1.65	0.50	0.10	0.20	3.20	4.10	3.60	0.90	0.00	1.40	15.65
579	0.00	0.00	1.20	0.45	0.00	0.10	0.80	3.20	3.50	0.85	0.00	1.00	11.10
535	0.00	0.00	2.05	0.05	0.15	0.20	1.70	5.80	4.50	1.15	0.00	1.40	17.00
852	0.00	0.00	0.80	0.95	0.40	0.10	1.60	4.30	3.70	0.80	0.00	1.50	14.15
793	0.00	0.00	0.90	0.30	0.30	0.50	0.90	3.50	3.40	1.10	0.00	1.40	12.30
832	0.00	0.00	1.65	0.60	0.30	0.30	1.00	4.10	4.60	1.15	0.00	1.40	15.10
759	0.00	0.00	0.90	0.15	0.20	0.10	0.50	3.20	3.70	4.80	0.00	1.40	14.95
753	0.00	0.00	0.60	0.55	0.00	0.20	0.80	3.00	4.40	0.40	0.00	0.80	10.75
563	0.00	0.00	0.70	0.90	0.00	1.60	0.85	2.60	4.70	1.05	0.00	1.20	13.60
568	0.00	0.00	0.70	0.95	0.20	1.00	2.20	2.40	3.50	1.25	0.00	1.20	13.40
432	0.00	0.00	1.10	1.05	0.30	1.20	1.80	1.80	6.35	0.60	0.00	1.50	15.70
1	0.00	0.00	1.30	0.85	0.60	0.75	2.45	2.00	2.80	1.05	0.00	1.40	13.20
265	0.00	0.00	0.90	0.65	1.60	0.40	2.30	1.80	2.60	0.40	0.00	2.20	12.85
255	0.00	0.00	2.10	1.60	3.20	0.75	1.80	2.00	4.50	1.00	0.00	1.70	18.65
308	0.00	0.00	0.20	0.00	0.00	0.00	1.00	3.50	1.50	0.00	0.00	1.10	7.30
187	0.00	0.00	1.40	0.95	0.20	1.00	1.20	3.70	3.60	0.75	0.00	1.20	14.00
163	0.00	0.00	1.50	1.10	0.20	0.50	0.75	5.30	4.30	1.80	0.00	1.20	16.65
167	0.00	0.00	1.10	0.75	0.30	0.10	4.40	6.60	5.70	2.05	0.00	0.80	21.80
298	0.00	0.00	1.30	0.80	0.80	0.20	2.60	5.00	4.50	0.75	0.00	0.90	16.85
342	0.00	0.00	1.20	5.00	0.30	1.40	1.40	7.20	1.20	0.90	0.00	0.80	19.40
34	0.00	0.00	1.90	0.60	0.25	1.40	2.45	2.60	4.80	0.80	0.00	1.00	15.80
148	0.00	0.00	1.40	0.60	0.30	0.60	2.40	3.20	5.70	1.65	0.00	1.50	17.35
371	0.00	0.00	1.10	0.40	0.20		1.89	4.50	3.60	1.20	0.00	1.30	14.19
420	0.00	0.00	0.80	0.40	0.10	0.15	1.80	3.10	3.40	0.55	0.00	1.10	11.40
673	0.00	0.00	0.95	0.35	0.15	1.30	2.60	2.40	6.70	1.85	0.00	1.50	17.80
714	0.00	0.00	0.80	0.50	0.30	0.00	1.00	3.50	4.80	1.25	0.00	1.40	13.55

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Conclusions

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2005 Production Benefits

**Drip Irrigation 76,573 lbs.
Conventional Irrigation 79,769 lbs.**

Drip Benefit in Pounds -3,196

2005 Water Savings Comparison

Conventional Irrigation 41.45 acre feet

Drip Irrigation 20.46 acre feet

Savings 20.99 acre feet

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2006 Production Benefits

Drip Irrigation 67,665 lbs

Conventional Irrigation 59,899 lbs

Drip Benefit in Pounds 7,766 lbs.

2006 Water Savings Comparison

Conventional Irrigation 63.00 acre feet

Drip Irrigation 49.24 acre feet

Savings 13.76 acre feet

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Total Water Savings and Benefits

Total Water Savings Over Two Years 34.75 acre feet

Additional Production Benefit Over Two Years 4,570 lbs.