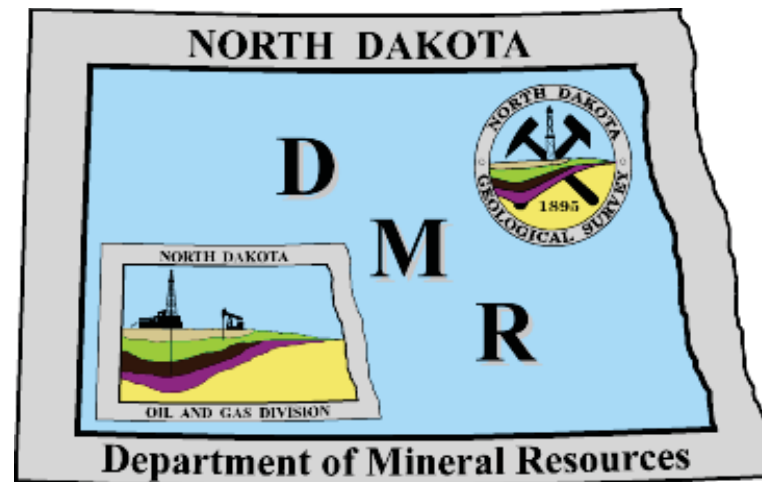


North Dakota's AWPSRF Program



<https://www.dmr.nd.gov/oilgas>
(701) 328-8020

Cody VanderBusch
Reclamation Specialist

Abandoned Well Plugging and Site Restoration Fund

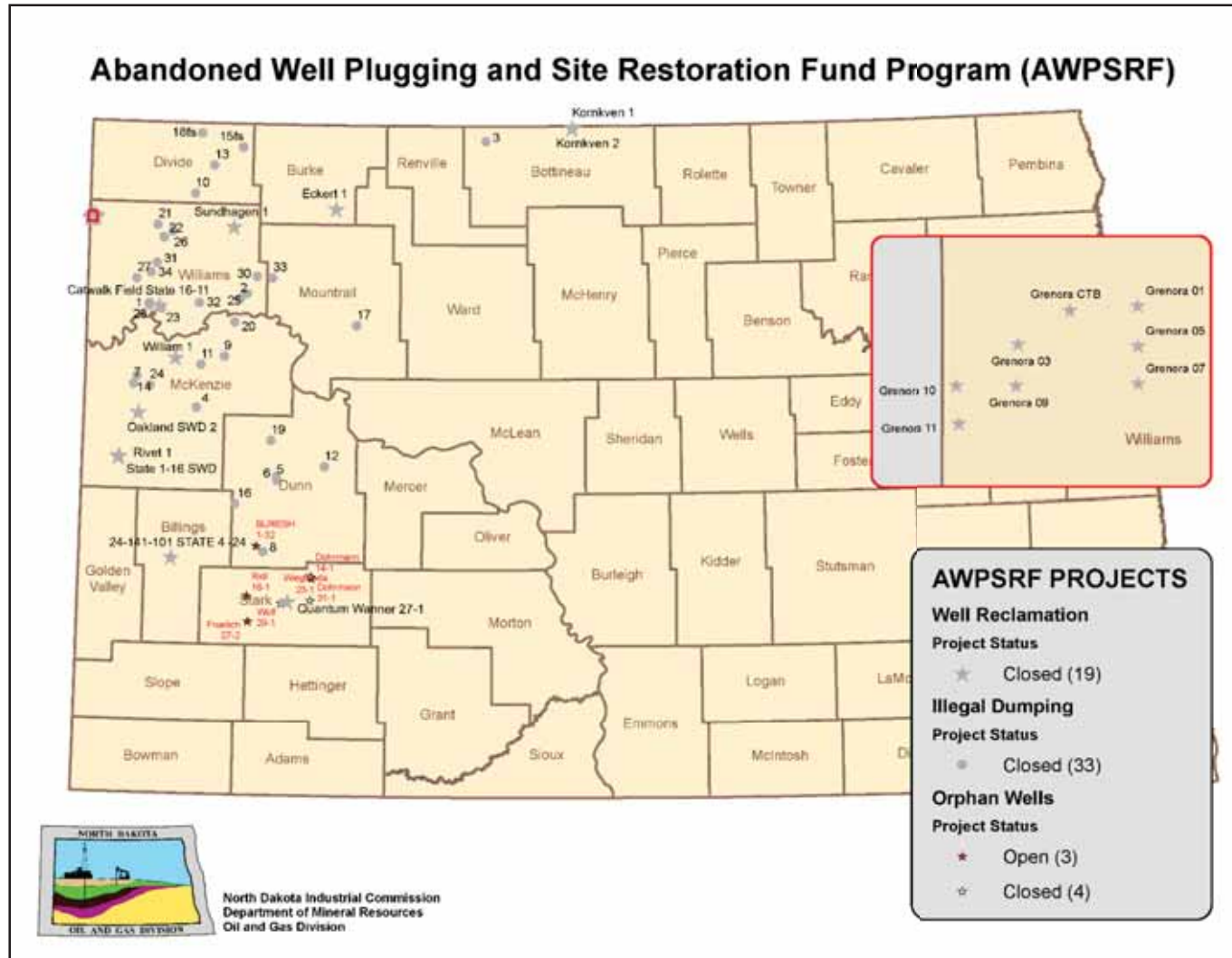
“AWPSRF”

- Established 1983
- Pay plugging and reclamation costs where no responsible party exists
- Originally funded by:
 - Fees paid to the Oil and Gas Division
 - Confiscated bonds
- Amended 2013 the fund is currently supported through a combination of:
 - A portion of the gross production tax (\$7.5 million per fiscal year)
 - Fees paid to the Oil and Gas Division
 - Confiscated bonds
 - Collected civil penalties
- The AWPSRF currently has approximately \$14.6 million dollars
 - Fund capped at \$100 million
 - General Program
 - Legacy Program limited to \$1.5 million per biennium

AWPSRF – General Program

- General Program
 - Plugging and reclamation of sites (1983-present)
 - Where a company has defaulted on their responsibilities and the state seized the bond, equipment, and salable oil
 - The commission shall seek reimbursement for all reasonable expenses incurred in plugging any well or reclaiming any well site through an action instituted by the Attorney General
 - Illegal dumping of oil-field waste
 - Examples include:
 - Production Water
 - Filter Socks
 - Frac fluid and proppant
 - Production equipment

AWPSRF – General Program



State 4-24: Re-plugging Billings County, ND; Spring 2016



Well PA 1984 – 2 historical operators – no longer exist

State 4-24: Re-plugging Billings County, ND; Spring 2016



State 4-24: Re-plugging Billings County, ND; Spring 2016



\$180,000 – re-plugged and reclaimed

AWPSRF #9: Illegal Dumping

McKenzie County, ND; Winter 2014-Spring 2016



Salt water dumped off county road onto private pasture
Affected ½ mile of drainage and two stock ponds
No responsible party identified

AWPSRF #9: Illegal Dumping McKenzie County, ND; Winter 2014-Spring 2016



AWPSRF #9: Illegal Dumping McKenzie County, ND; Winter 2014-Spring 2016



\$456,000 - remediation, reclamation, revegetation

AWPSRF - Legacy Program

- 2015 State Legislature expanded the scope of the AWPSRF to include the legacy program
- Allocated additional \$1.5 million dollars per biennium
 - Dedicated to “legacy” pre-1983 oil field issues
 - No continuing reclamation responsibility covered under state law
 - Situations originated prior to state laws requiring reclamation
 - Allowed AWPSRF to cover reclamation of eligible pre-1983 oil filed issues
 - Examples include:
 - Reclaiming old reserve pits
 - Properly abandoning old flowlines
 - Plugging seismic “shot holes”

House Bill 1358 Legacy Sites



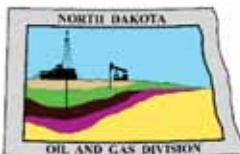
Legacy Sites Project Status



Closed (4)



Open (7)



North Dakota Industrial Commission
Department of Mineral Resources
Oil and Gas Division

1358-1: Historical Reserve Pit

Billings County, ND; Fall 2015-Spring 2016



Dry hole plugged and released from bond in 1966
Met all reclamation requirements at the time
Reserve pit eroding into Little Missouri River

1358-1: Historical Reserve Pit

Billings County, ND; Fall 2015-Spring 2016



1358-1: Historical Reserve Pit Billings County, ND; Fall 2015-Spring 2016



\$569,000 – excavated and reclaimed

1358-5: Flow line Bottineau County, ND; Fall 2015



Wells plugged in 1968 and 2001
No flow line abandonment rules at that time
Flow line to central tank battery

1358-5: Flow line Bottineau County, ND; Fall 2015



1358-5: Flow line Bottineau County, ND; Fall 2015



\$102,000 – excavated, reclaimed, and reseeded

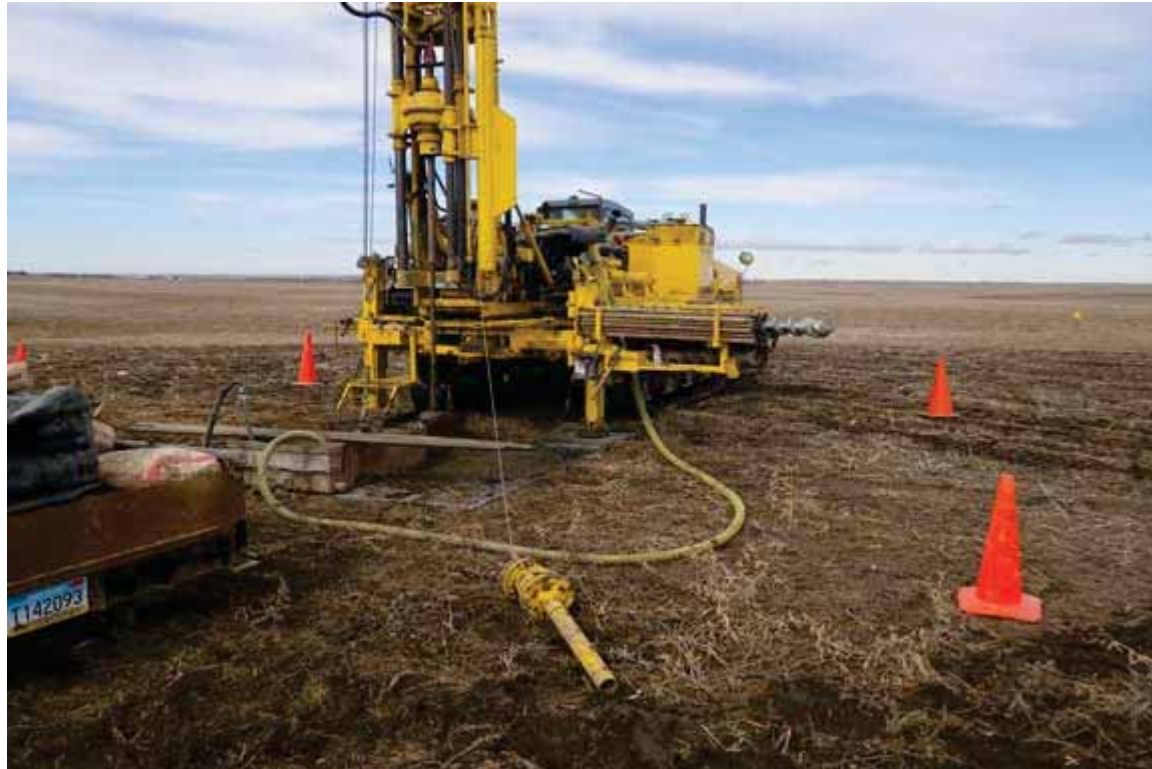
1358-6/7: Plugged Shot Holes

Williams County, ND; Fall 2015-Spring 2016



Artesian flow from 11 seismic shot holes improperly plugged in the 1970s
Approximately 30 acres too wet to farm

1358-6/7: Plugged Shot Holes Williams County, ND; Fall 2015-Spring 2016



1358-6/7: Plugged Shot Holes Williams County, ND; Fall 2015-Spring 2016



\$115,000 – plugged and ready to farm next spring

HB 1032: AWPSRF Balance Sheet

Fiscal Year 2015- Dec. 31, 2016

- July 1, 2015 beginning balance \$11.5 Million
-

- Revenue \$8.1 M
 - Gross Production Tax \$7.3 M
 - Conf. Bonds/Civil Penalties \$0.3 M
 - OGD Fees \$0.5 M

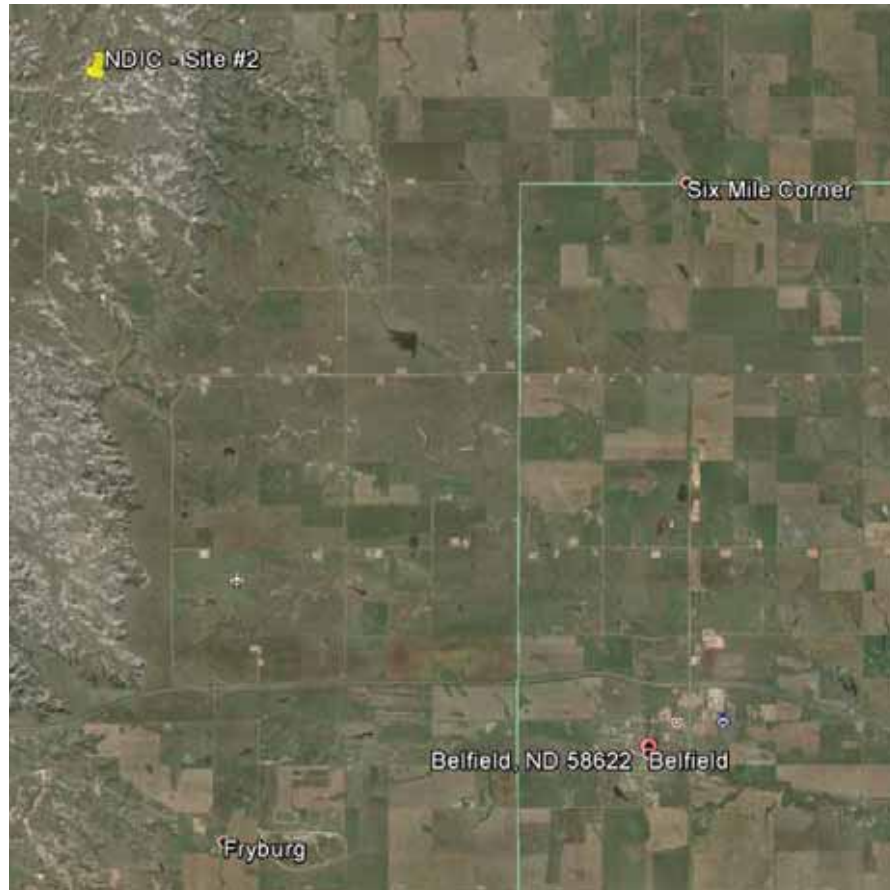
- General Program \$1.8 M
 - Plugging and Reclaim \$1.7 M
 - Illegal Dumping \$0.1M

- Legacy Program \$1.2 M
 - Site Reclaim \$0.9 M
 - Study \$0.3 M

- Legislative Transfers \$2.1 M
-

- **AWPSRF** **\$14.5 Million**

Future Site – Pit Washing into Pasture Land, NW of Fryburg / Belfield, ND



Approximately 9 miles north of Fryburg, ND



10 foot gully cutting through pit – depositing NE

Panoramic view or Pit, Gully cutting through Pit, & Outwash Area



Gully cutting through Pit



Outwash Area

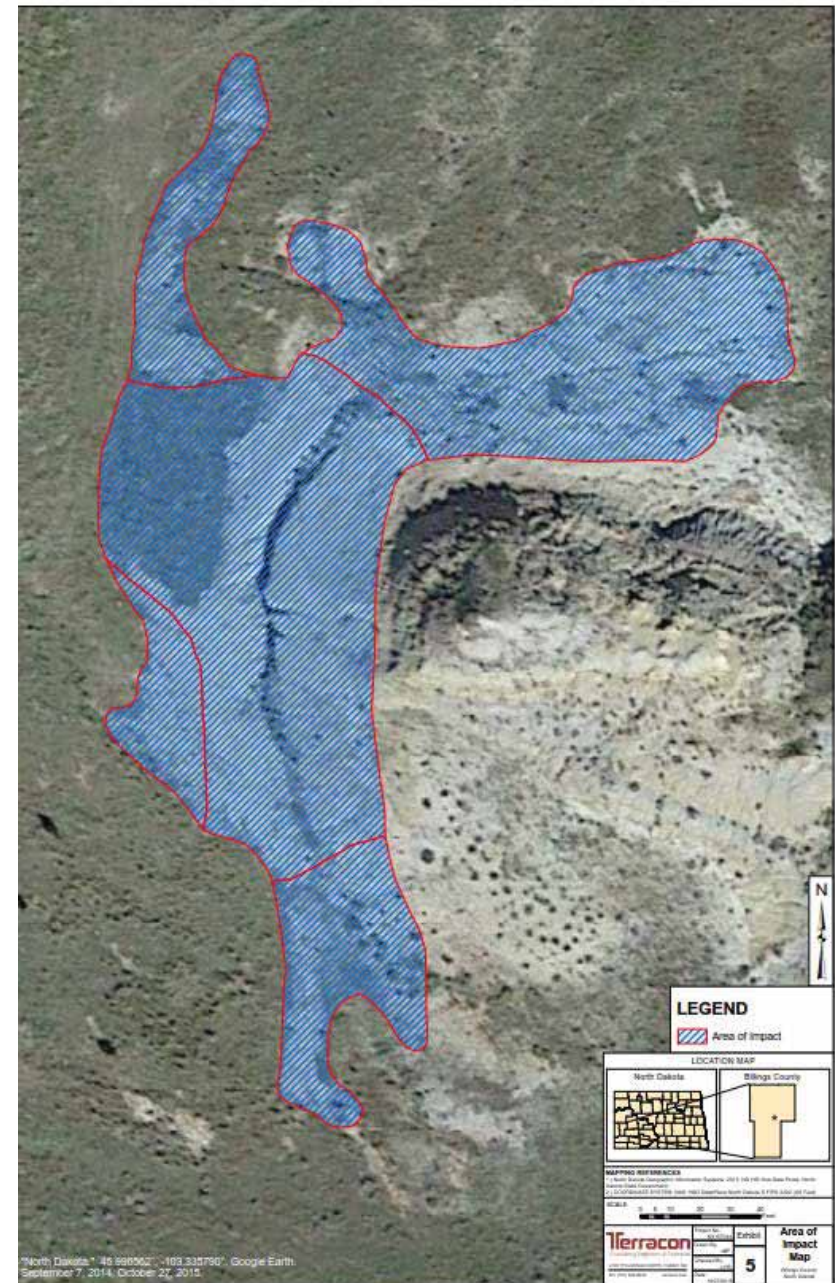


Trench and Pit Contained Debris
as well as Brine and Hydrocarbons



Outwash – High EC, Chlorides,
& Hydrocarbon Residue.



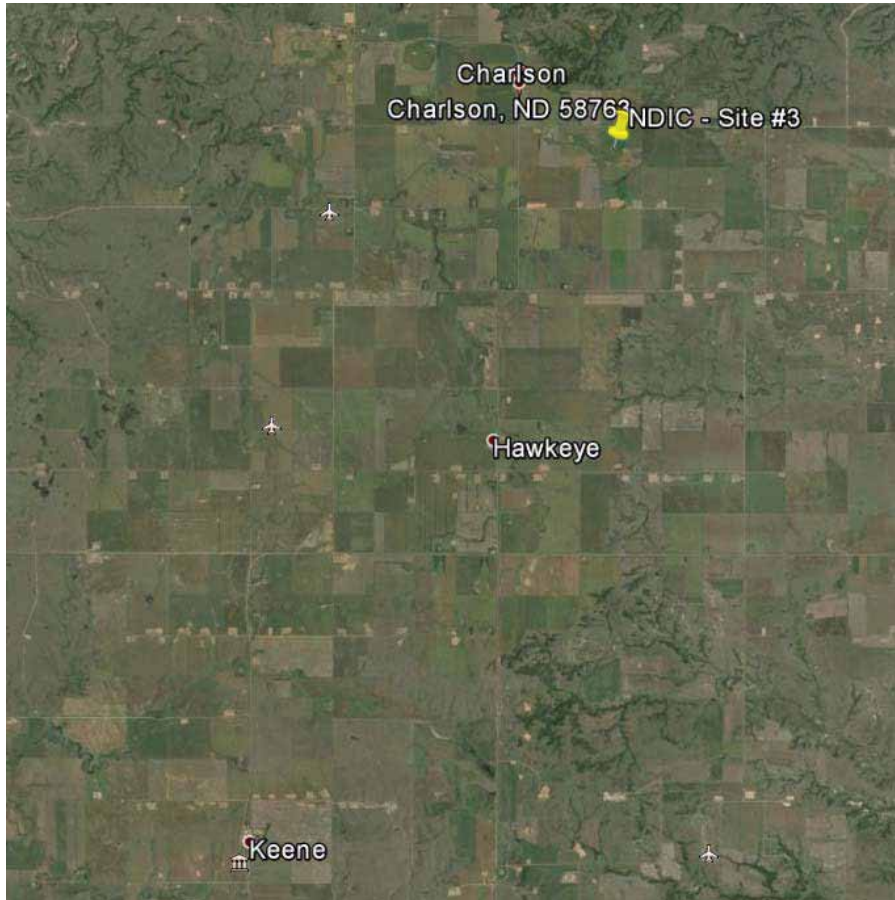


Proposed Costs for Removal

- Subcontractor Cost - \$616,000 (SM)
- Terracon - \$ 62,000
- Total Cost - Removal \$678,000

- Subcontractor Bids – 6 Companies
 - Mobilization, Excavation, Truck Hauling & Removal, Disposal, Backfilling General Fill and Topsoil, Finish Grading, and Seeding.
 - 22 Days to Complete
 - Bids Ranged from \$616,000 – \$817,000

Future Site – Pit Washing into Little Antelope Creek SE of Charlson, NE of Keene, ND



Approximately 12 miles Northeast of Keene, ND



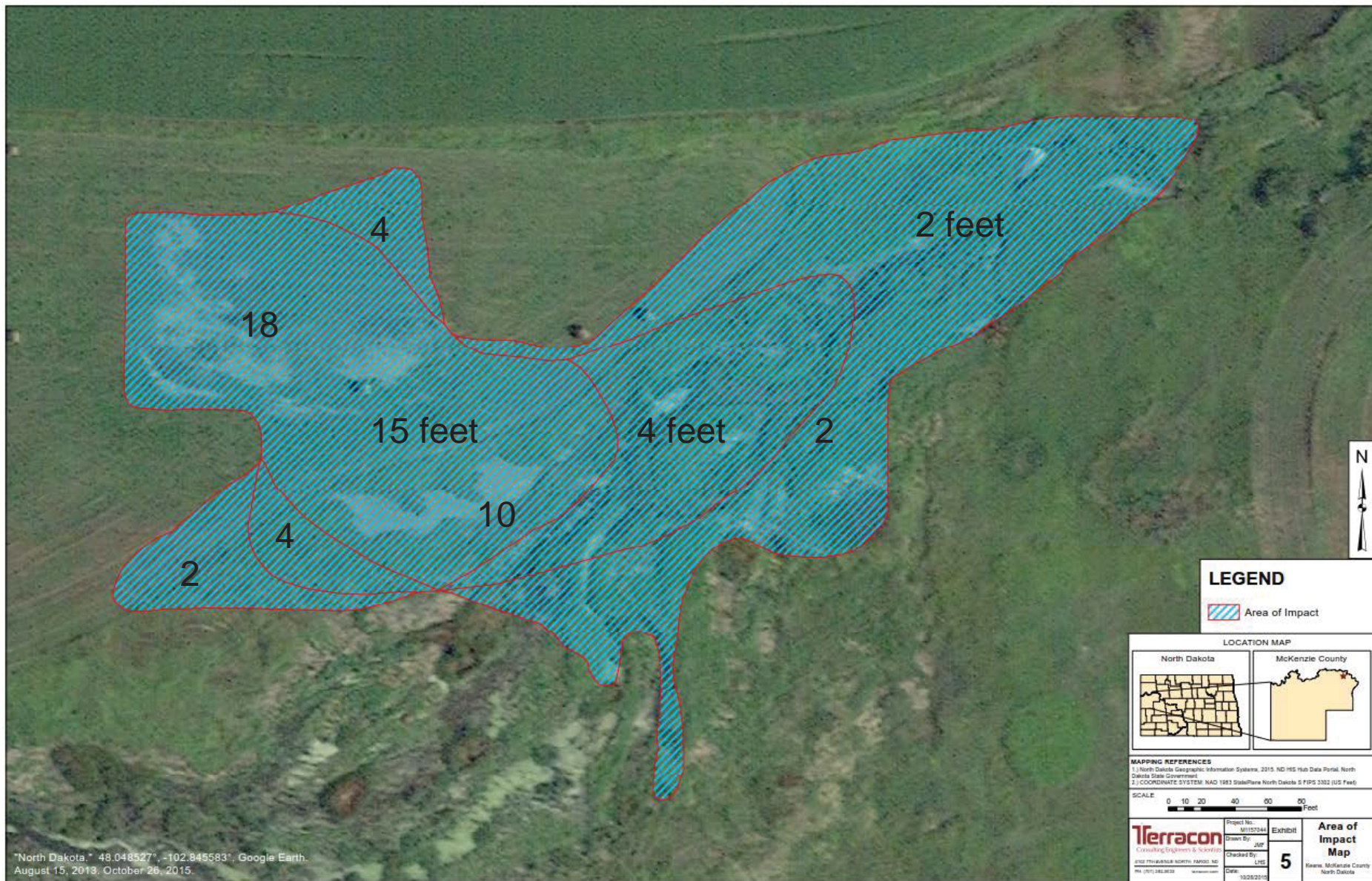
Pit washing into coulee.



Air Photos from 2003 and 1995

The pit has been exposed for more than 20 years (probably more than 30 years). The contaminated plume has grown in size and into Little Antelope Creek to the south.





Proposed Costs for Removal - #3

- Subcontractor Cost - \$2,600,000 (ABS)
- Terracon - \$ 111,400
- Total Cost - Removal \$2,711,400

- Subcontractor Bids – 7 Companies
 - Mobilization, Excavation, Truck Hauling & Removal, Disposal, Backfilling General Fill and Topsoil, Finish Grading, and Seeding.
 - 40 Days to Complete
 - Bids Ranged from \$2,600,000 - \$3,750,000

Short-Term Budget

Estimated Costs

	<u>Description</u>	<u>Status</u>	<u>Cost estimate</u>	<u>Project Cost to Date</u>
Site #1	Pit	Done		\$568,853
Site #2	Pit		\$678,000	\$33,997
Site #3	Pit		\$2,742,400	\$45,861
Site #4	Doesn't Qualify			
Site #5	Leaking Pipeline	Done		\$102,200
Site #6	Seismic Shot Holes	Done		\$68,340
Site #7	Seismic Shot Holes	Done		\$56,494
Site #8	Possible Leaking well		\$190,000	
Site #9	Seismic Shot Holes	Done		\$28,000
Site #10	Seismic Shot Holes	Done		\$20,000
<u>Site #11</u>	<u>Seismic Shot Holes</u>		<u>\$50 to 70K</u>	
Total			\$3.7 million	\$923,745

**Reclamation Options for Soils Surrounding Legacy
Brine Waste Pits in Northcentral North Dakota**



Ryan Limb¹, Aaron Daigh², Kevin Sedivec¹, Thomas DeSutter²,
Amit Chatterjee², Frank Casey², Shawn DeKeyser¹

¹Range Program, ²Department of Soil Science - School of Natural Resource Sciences
North Dakota State University

\$309, 508 - "Reclamation Options for Soils Surrounding Legacy Brine Waste Pits in Northcentral North Dakota"

PROPOSED ACTION 1 - Create a Pilot Program on soils surrounding Legacy Brine Waste Pits

We've completed site establishment, pre- and post-amendment soil sampling, applying the amendments, and planting for our field study. The last step will be assessing plant (plug) survival and seeding the plots in early September.

PROPOSED ACTION 2 - Greenhouse Studies at North Dakota State University

Preparations are underway to begin the greenhouse experiments fall 2016

PROPOSED ACTION 3 - Laboratory Studies at North Dakota State University

We have completed run #1 of the laboratory column experiment and are preparing to analyze the soil and leachate samples.

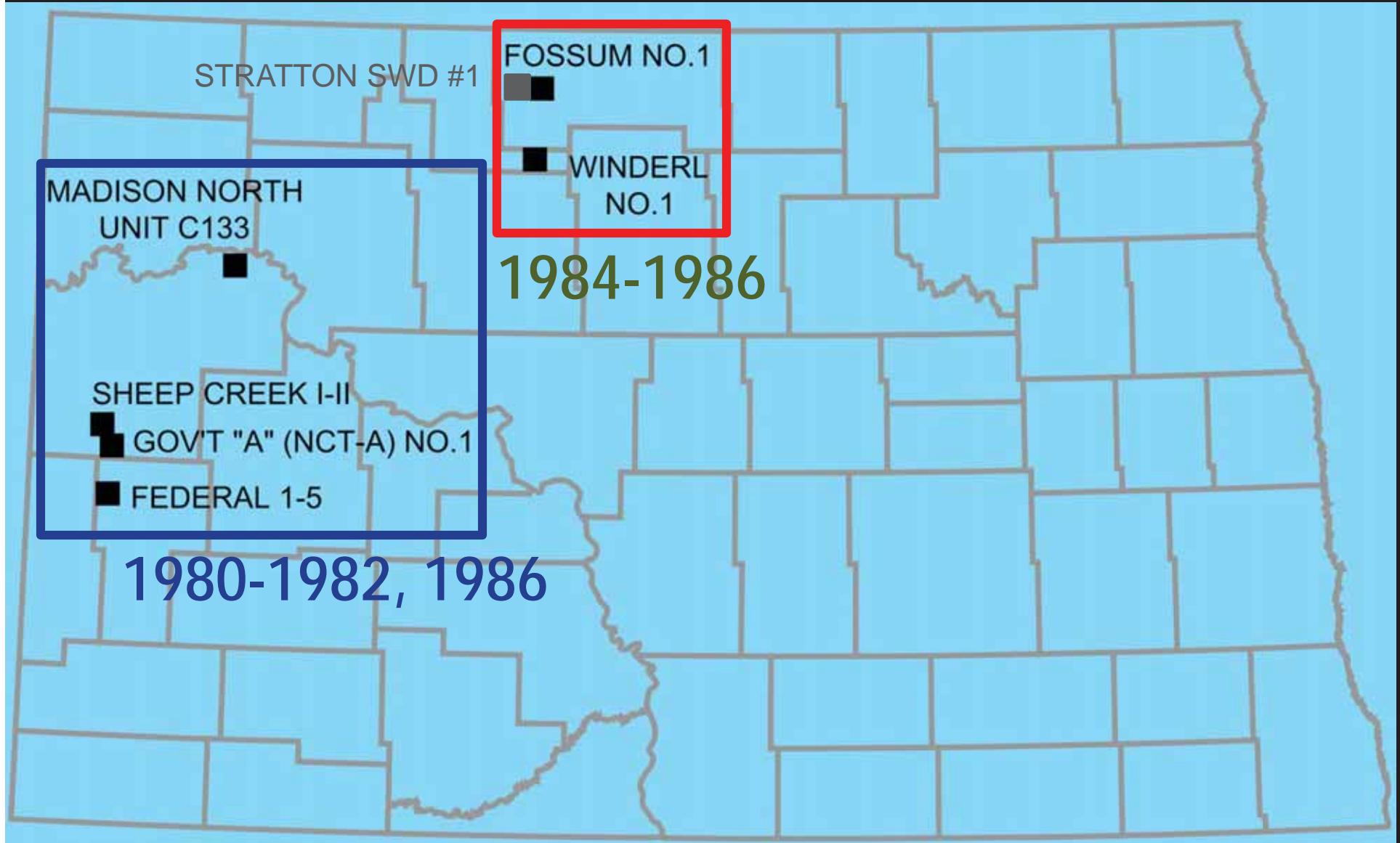
Run #2 is being prepared and will be initiated August 22, 2016.

The objective of the laboratory column experiments is to evaluate brine-remediation-products potential to leach salts away from the soil surface

NORTH DAKOTA GEOLOGICAL SURVEY

- **1980 - 1982** Studied four buried reserve pits in western North Dakota (one report, one paper, numerous presentations).
1986 Resampled Apache site (one report, one presentation).
- **1984 - 1986** Studied two buried reserve pits in north-central North Dakota (one report, several presentations).
- **1984 - 1985** Studied an abandoned brine holding pond in north-central North Dakota (two reports).

RESERVE PIT & BRINE POND STUDIES



BRINE HOLDING PONDS

Operated in North Dakota from 1951-1982.

NDGS personnel began field investigating and condemning brine holding ponds in the 1960s.

The exact number of brine ponds that existed from 1951-1982 is unknown (*est. 2,000 – 3,000*).

NDSU SOILS DEPT 1984 STUDY

Identified 121 old brine pond sites in Bottineau and Renville Counties.

Estimated the area contaminated by old brine ponds at 1,450 acres (average of 12 acres per site).

Interpreted aerial photographs from various years and scales.

NDSU SOILS DEPT 1984 STUDY

Wylie Field

Studied an area of 15 square miles in Wylie Field and identified 60 old brine pond locations.

Interpreted aerial photographs from various years and scales.

NDSU SOILS DEPT 1984 STUDY

Wylie Field

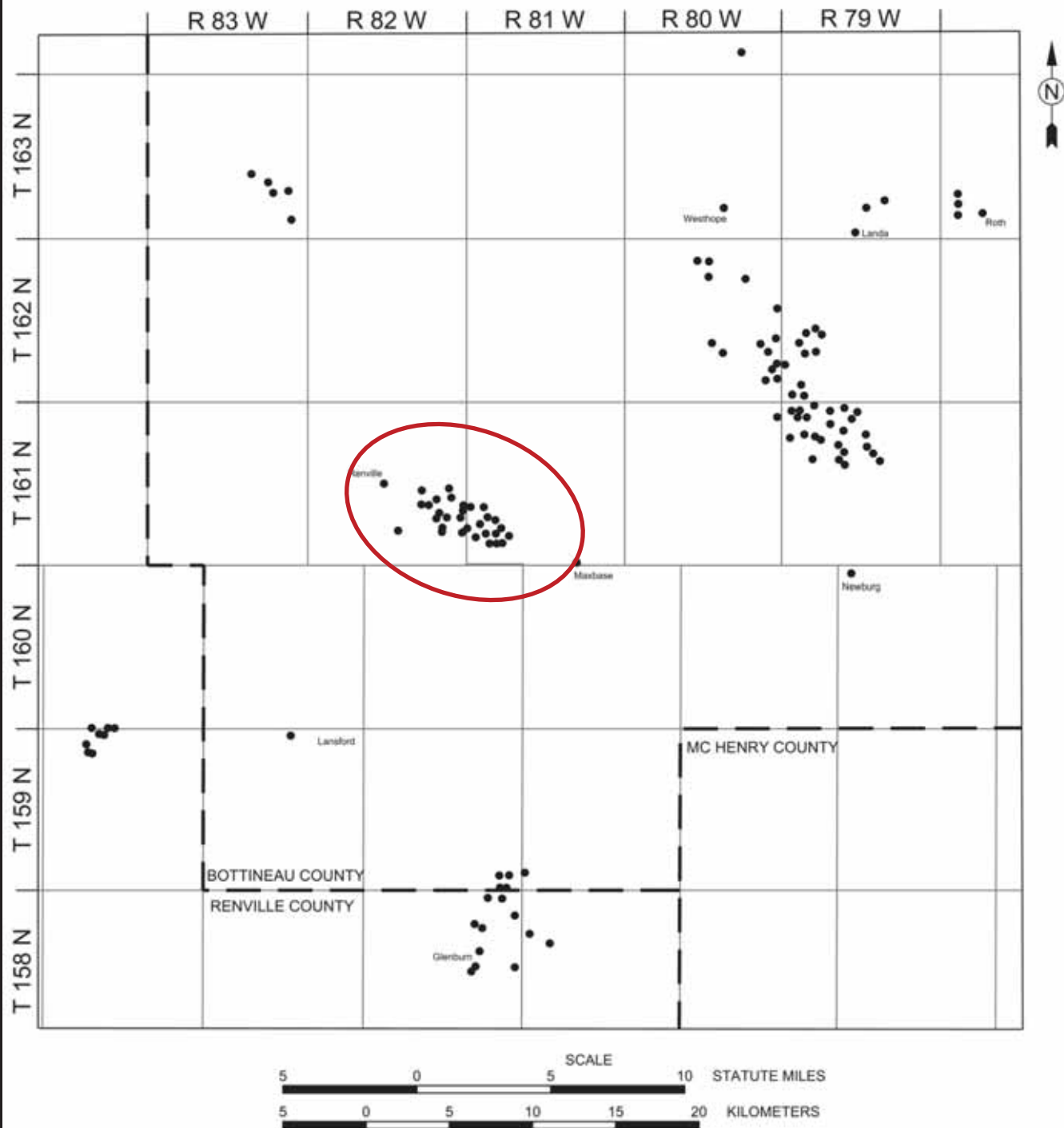
Mapped 23 of the 60 sites.

Salt-impacted area ranged from 0 to 42 acres at each site.

Average impact of 11.5 acres per site.

Total impact of 266 acres.

Electromagnetic soil conductivity meter (EM-38).



BRINE HOLDING PONDS

Dimensions:

45 x 60 ft up to 90 x 180 ft

4 to 9 feet deep

1) Unlined

2) Clay liner

3) Polyethylene liner

BRINE HOLDING PONDS



2006-2010 Wylie Field Study Sites

Bull

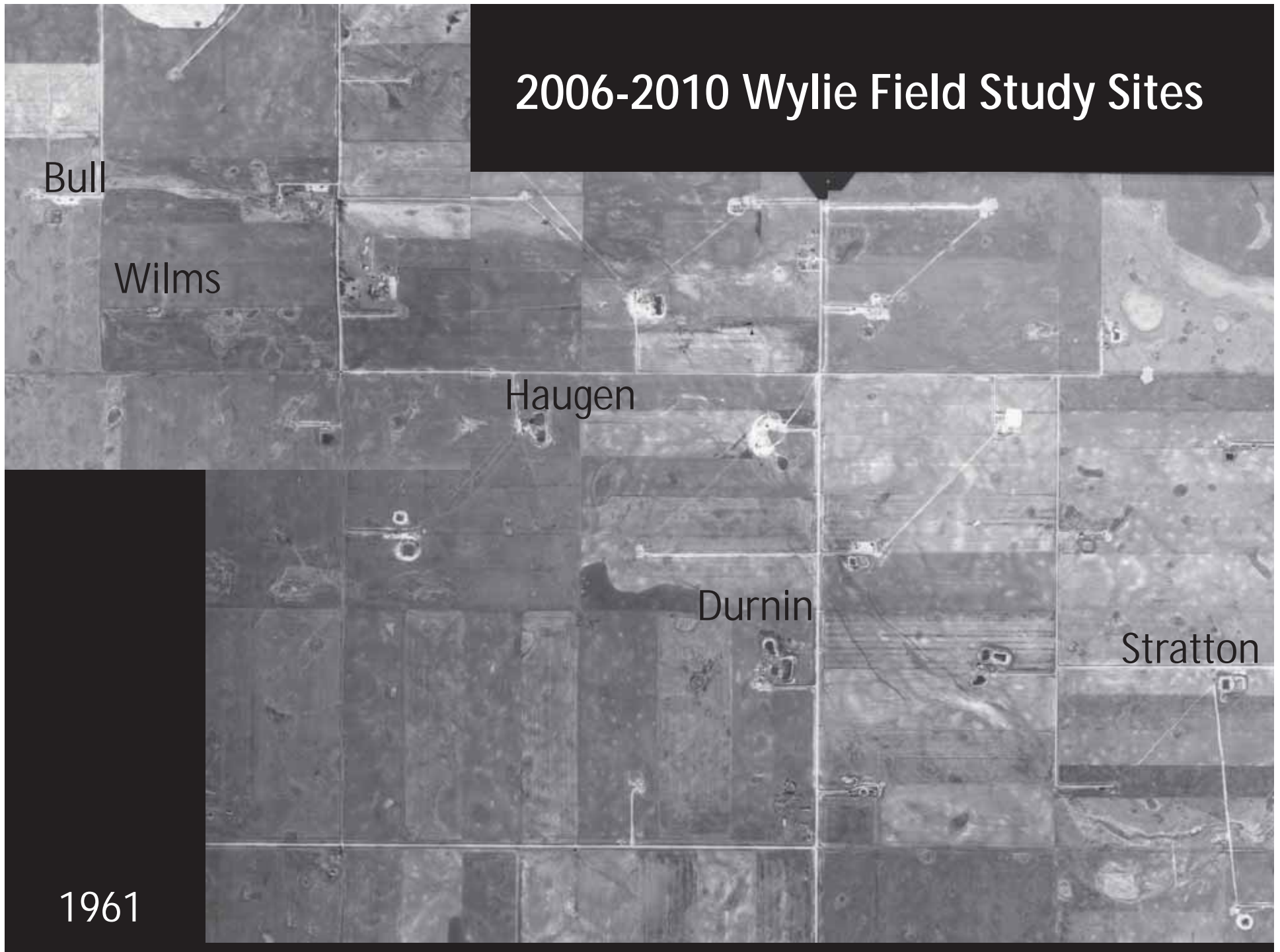
Wilms

Haugen

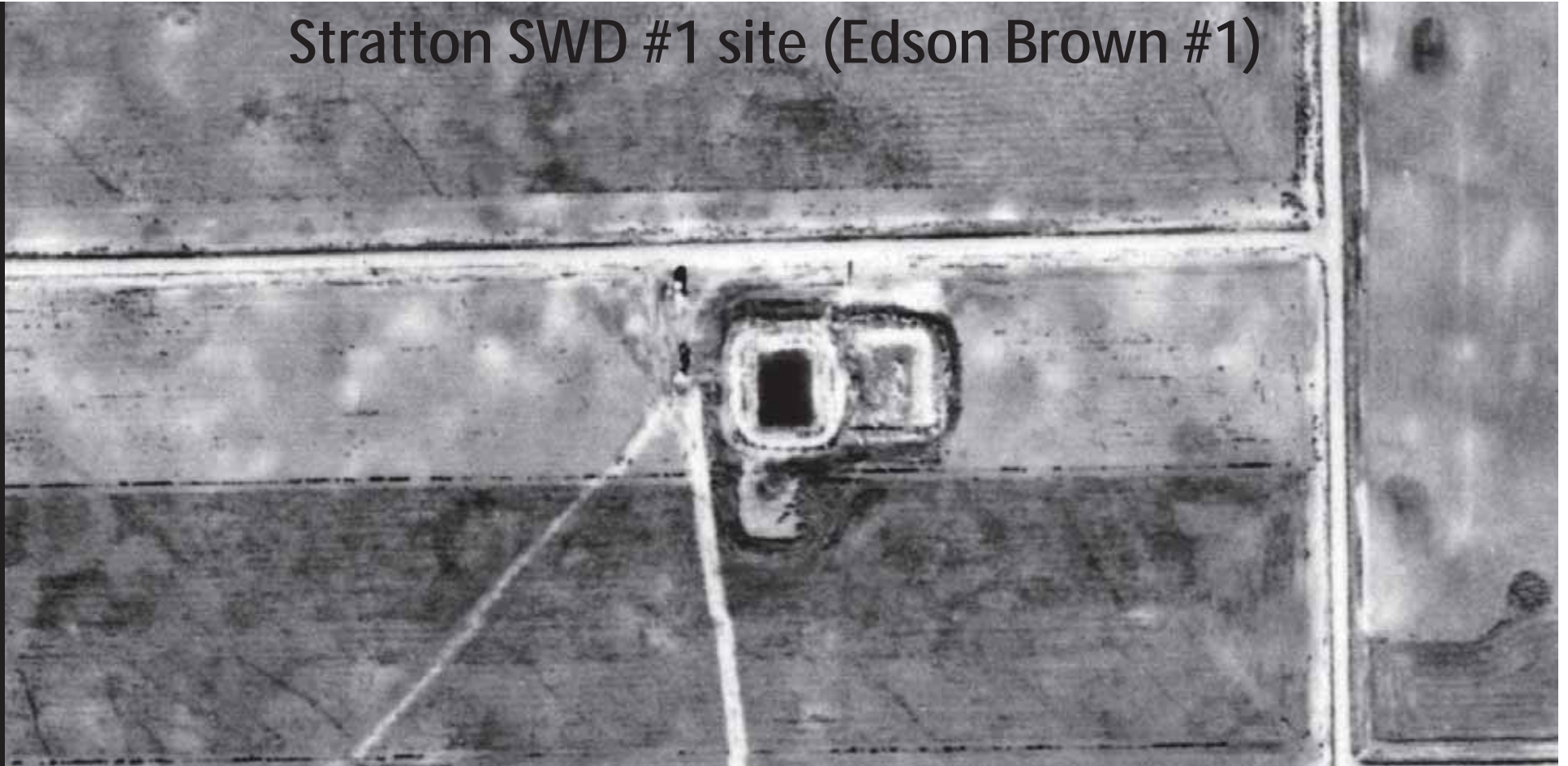
Durnin

Stratton

1961

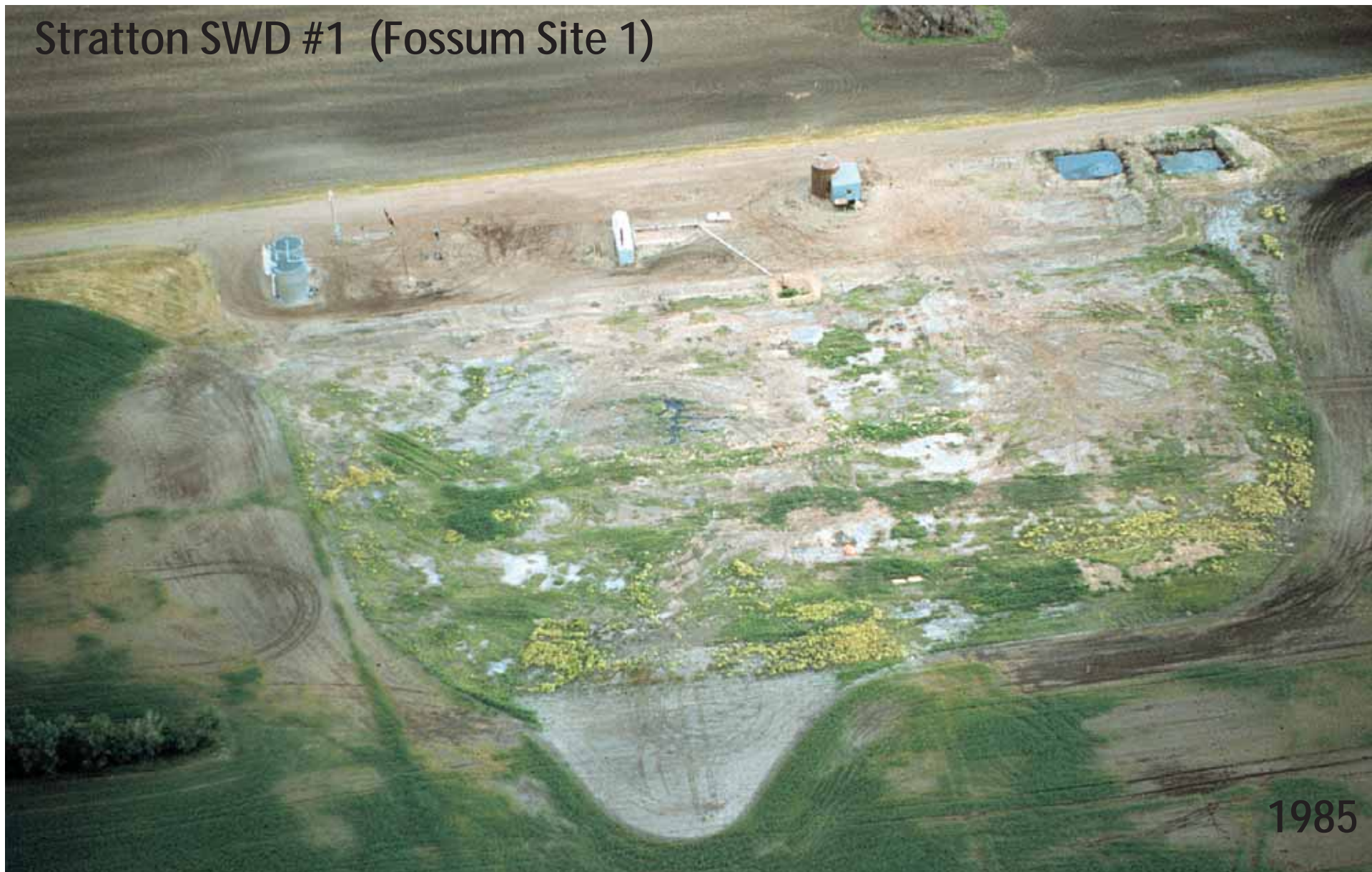


Stratton SWD #1 site (Edson Brown #1)



Drilled in 1959 by Cardinal Petroleum (Edson Brown #1). Produced oil from 1959-1970. Converted to a saltwater disposal well by Phillips Petroleum in 1978 (Stratton SWD #1). The site contained two brine holding ponds from 1959 to at least 1970 (with dimensions of 100 x 90 ft and 60 x 100 ft and 5 feet deep). Produced 178,000 barrels of saltwater.

Stratton SWD #1 (Fossum Site 1)



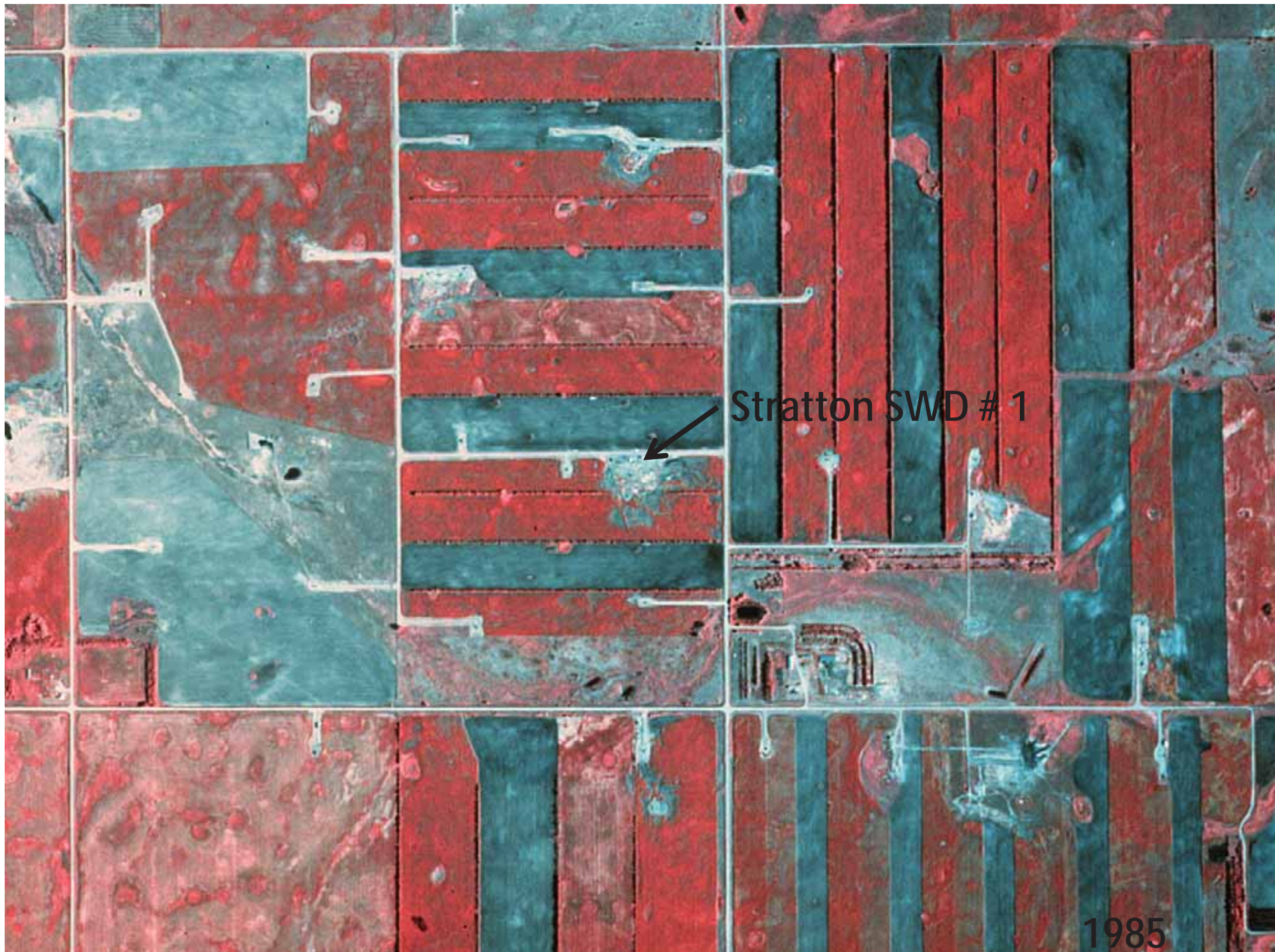
1985

In 1984-1985 NDSU estimated 500 tons of NaCl in the top 10 feet of the Stratton Site. This works out to 22 tons per acre for this site.

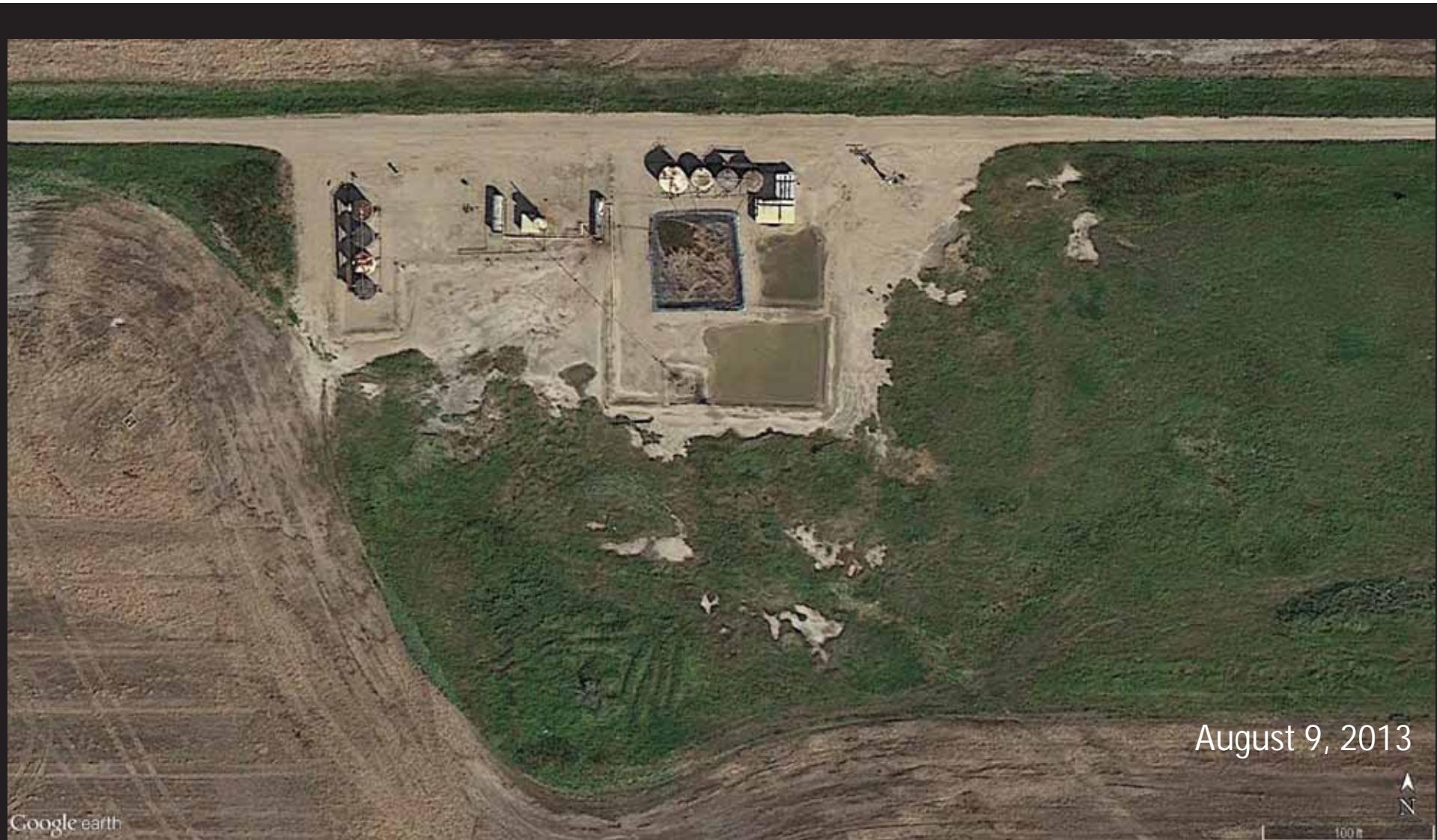
Stratton SWD # 1



1985



1985



Google earth

August 9, 2013

100 ft

STRATTON SWD #1

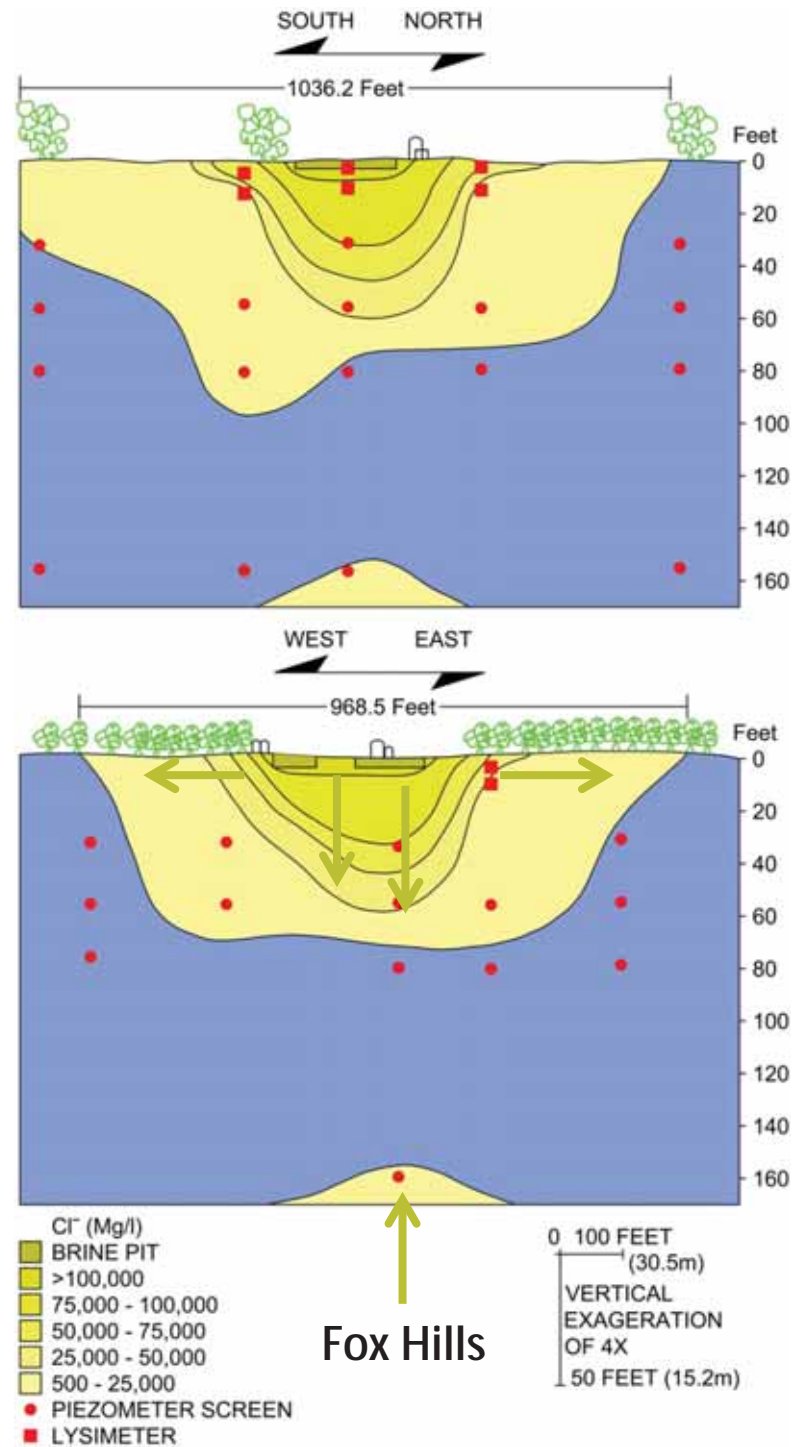
A high salt plume extends laterally around the site over an area of 250,000 ft² (about 6 acres).

This plume extends to a depth of more than 80 feet (highest concentrations in top 40 feet).

Brine plume restricted to till and not impacting any useable water supply (ND Health Dept. concurred in 2006).

Chloride levels at 160 feet (500 - 750 mg/l) appear to be coming from the underlying Fox Hills Formation (hydraulic heads).

Stratton SWD #1



ATTEMPTS TO CLEAN UP OLD BRINE PONDS IN THE WYLIE FIELD 2006 – 2010

Well Sites

Stratton D01 (Stratton SWD #1)

Bull B1R

Wilms A D01

Haugen B1

Durnin A & D01

ATTEMPTS TO CLEAN UP OLD BRINE PONDS IN THE WYLIE FIELD

2006 – 2010

Soil Parameter Monitoring

Sediment samples from 0-1 feet and 1-2 feet.

Groundwater Monitoring

Durnin Site

Three, 15 ft deep monitoring well.

Stratton Site

Three, 15 ft deep monitoring well.

Soil Amendment Application

Gypsum, fertilizer, manure, straw application-- lightly tilled.

Water Application

Three times per week at each site due to drought conditions.

Geophysical Survey

Conductivity and resistivity surveys at the Durnin site.

ATTEMPTS TO CLEAN UP OLD BRINE PONDS IN THE WYLIE FIELD

2006 – 2010 *(50 – 80% reduction)*

Stratton SWD #1 Site

Chloride levels exhibited a decreasing trend in soils.

Chloride levels did not decrease in groundwater.

Area of surface scarring reduced from 14 acres to 3 acres.

Bull Site

Chloride levels exhibited a decreasing trend in soils.

Area of surface scarring reduced from 3.5 acres to 1 acre.

Wilms Site

Chloride levels exhibited a decreasing trend in soils.

Area of surface scarring reduced from 1.5 acres to 0.5 acres.

Haugen Site

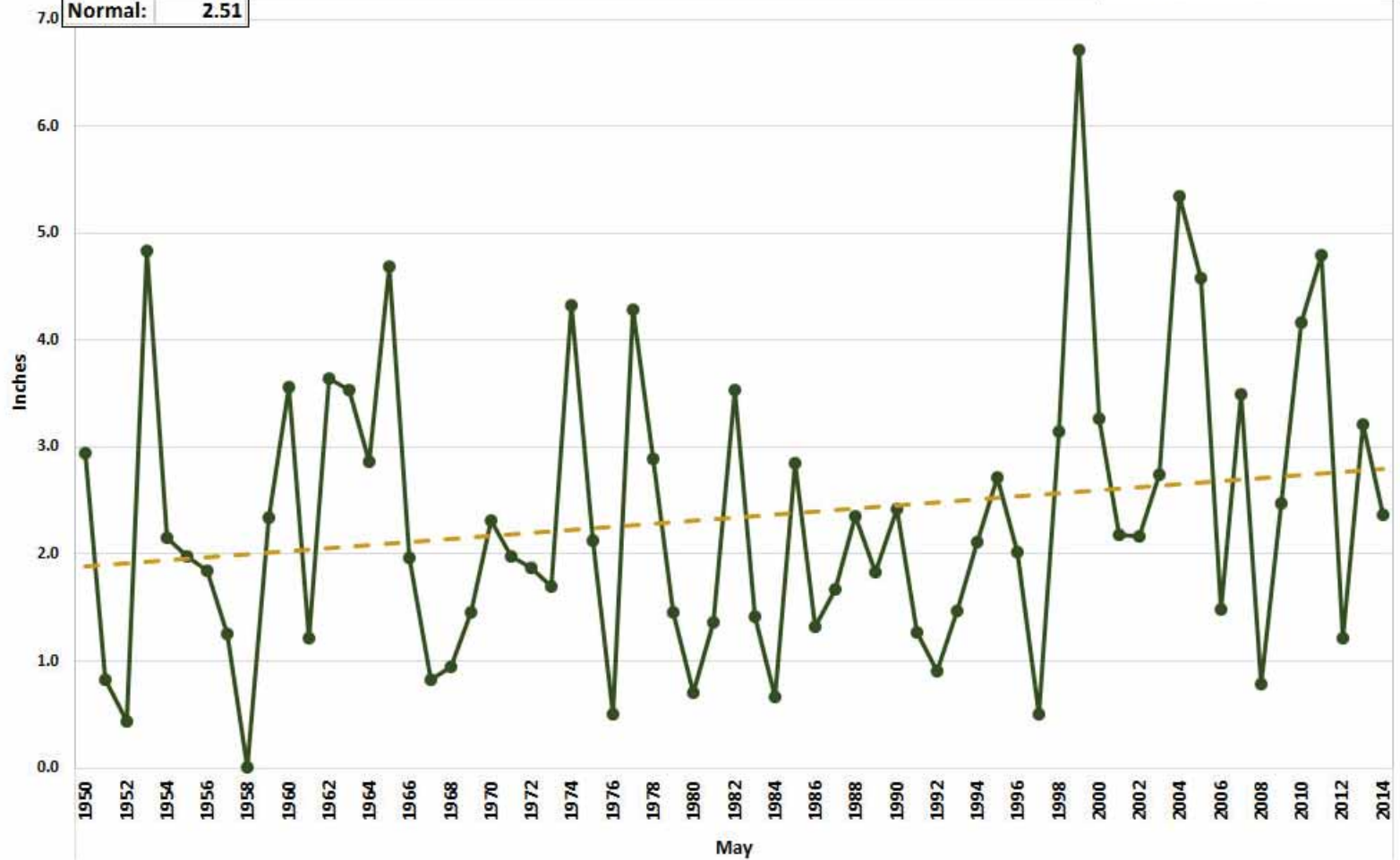
Chloride levels exhibited a decreasing trend in soils.

Area of surface scarring reduced from 3.5 acres to 1.75 acres.

MONTHLY PRECIPITATION TIME SERIES (1950-2014)
BOTTINEAU COUNTY, ND

Max:	6.72
Min:	0.01
Normal:	2.51

Trend (in/Decade): 0.141



Questions?