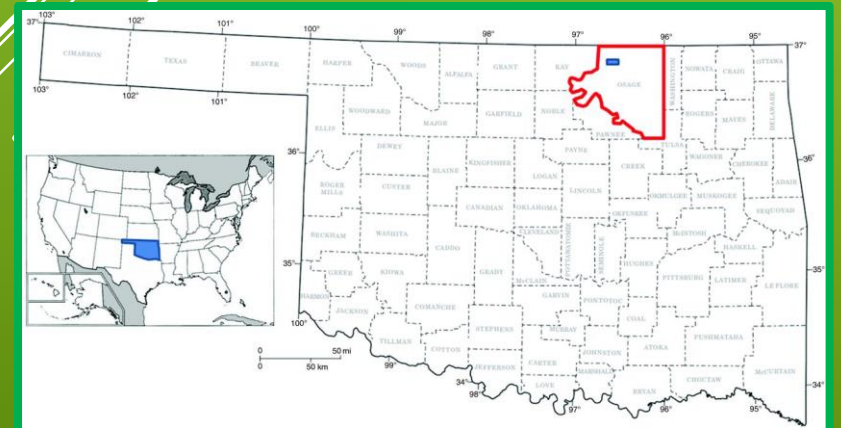


SITE SPECIFIC RISK ASSESSMENT OF SOIL SENSITIVITY TO BRINE RELEASE OSAGE COUNTY, OKLAHOMA

Blake Redden

J. Berton Fisher

IMMIX, LLX





OFFICE OF
INSPECTOR GENERAL
U.S. DEPARTMENT OF THE INTERIOR

- ▶ **“We found that the Agency's oil and gas management program is fundamentally flawed, thereby preventing the Agency from effectively managing the mineral estate.”**
- ▶ **“BIA can only reform the program through sweeping changes in how the Agency conducts oil and gas activities.”**



**“BIA NEEDS SWEEPING CHANGES TO MANAGE
THE OSAGE NATION'S ENERGY RESOURCES”**



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U.S. DEPARTMENT OF THE INTERIOR

- ▶ **“Separate legislation specifically excludes the Osage Nation from other Indian oil and gas regulations.”**
- ▶ **“... the Council has”:**
 - ▶ **Historically resisted assistance from BLM, BIA, & ONRR, and continues to do so.**
 - ▶ **Gone beyond what it considers to be its unique status to avoid oversight**
 - ▶ **Maintains the status quo with no incentive to opt into a more rigorous system of accountability.**



**“BIA NEEDS SWEEPING CHANGES TO MANAGE
THE OSAGE NATION'S ENERGY RESOURCES”**



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Regarding NEPA

- ▶ Agency currently relies on a single environmental assessment from 1979 for its Osage mineral leasing NEPA compliance.
- ▶ Agency has not conducted any further NEPA review of these activities since its 1979 environmental assessment has exposed it to litigation risk under the NEPA.
- ▶ We have noted this litigation risk throughout the course of our evaluation, and now such lawsuits have been filed.



“BIA NEEDS SWEEPING CHANGES TO MANAGE
THE OSAGE NATION'S ENERGY RESOURCES”



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U.S. DEPARTMENT OF THE INTERIOR

Regarding NEPA

- ▶ **Agency Environmental Policy and Practice Has Exposed it to Litigation Risk**
- ▶ **OIG/DOI Recommends that:**
 - ▶ **BIA Develop and implement oversight procedures to ensure compliance with the NEPA for all Osage Nation oil and gas activities.**
 - ▶ **Ensure that the (Osage) Agency has permanent environmental staff to address the NEPA requirements.**



“BIA NEEDS SWEEPING CHANGES TO MANAGE THE OSAGE NATION'S ENERGY RESOURCES”

- ▶ Plaintiff challenged DOI/BIA lease sale and issuance of drilling permit to Chaparral Energy, LLC in Osage Country, OK on basis of failure to comply with the National Environmental Policy Act.
- ▶ December 2015 - Judge Gregory Frizzell invalidated Chaparral Energy's 2013 oil and gas lease with the Osage Nation – ruled DOI and BIA failed to comply with NEPA – declared lease void *ab initio*.
- ▶ During pendency of appeal, BIA retroactively approved the leases and their assignment to a different company based on a new NEPA analysis.
- ▶ 10th Circuit mooted appeal, vacated judgement and remanded with directions to dismiss.



Judge Frizzell

HAYES V. CHAPARRAL ENERGY, LLC

14-CV-495-GKF-PJC

- ▶ **Plaintiffs challenged lease sales and issuance of drilling permits to 29 named Defendants in Osage Country, OK on basis of failure to comply with the National Environmental Policy Act.**
- ▶ **Plaintiffs sought declaratory judgment invalidating approval by BIA of leases, assignments, concession agreements, and drilling permits granted to the Defendants without satisfying NEPA's requirements.**
- ▶ **March 2016: Case dismissed on grounds that plaintiffs challenged an entire program of leasing and permitting and did not challenge a specific lease(s) or permit(s)**



Judge Payne

DONELSON & FRIEND V. US
14-CV-316-JHP-FHM

- ▶ BIA upgraded NEPA compliance measures.
- ▶ Responsibility of the applicant (Lessees, including his or her contractor) to conduct and complete all environmental reviews for proposed actions requiring federal approval.
- ▶ Environmental reviews must be written in accordance with:
 - ▶ 43 CFR Part 46 - IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
 - ▶ INDIAN AFFAIRS NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) GUIDEBOOK 59 IAM 3-H

- ▶ The environmental review document is a mandatory component of the permit application package for

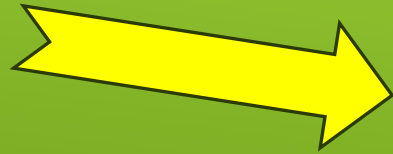
- ▶ Drilling
- ▶ Plugging
- ▶ Deepening
- ▶ Plugging back
- ▶ Conversion
- ▶ Casing alteration
- ▶ Formation treatment



OUTCOMES



- ▶ **(g) An environmental assessment must contain objective analyses that support conclusions concerning environmental impacts.**



Site Specific Data

43 CFR 46.310 - CONTENTS OF AN ENVIRONMENTAL ASSESSMENT.

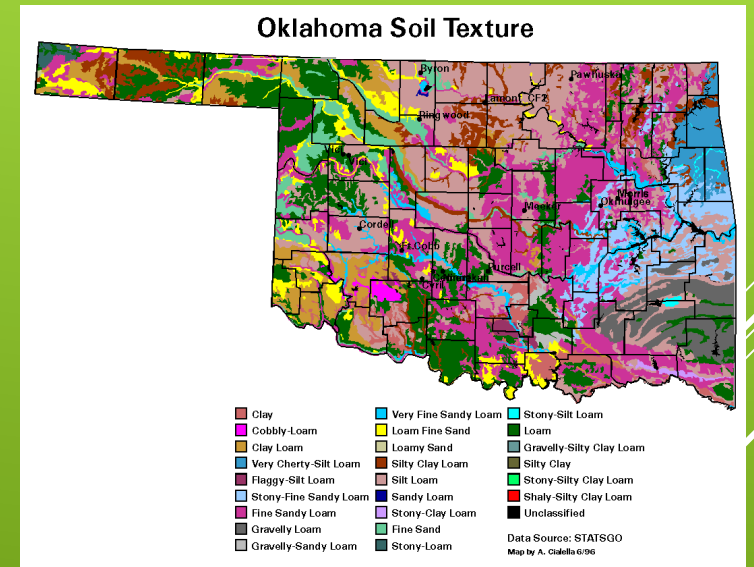


Web Soil Survey

- ▶ Public record
- ▶ Readily useable
- ▶ Massive amount of measured and derived physical data
- ▶ Direct interest at oil and gas sites



- Salt scaring
- Infiltration / runoff
- Physical damage
- Trafficability
- Corrosivity



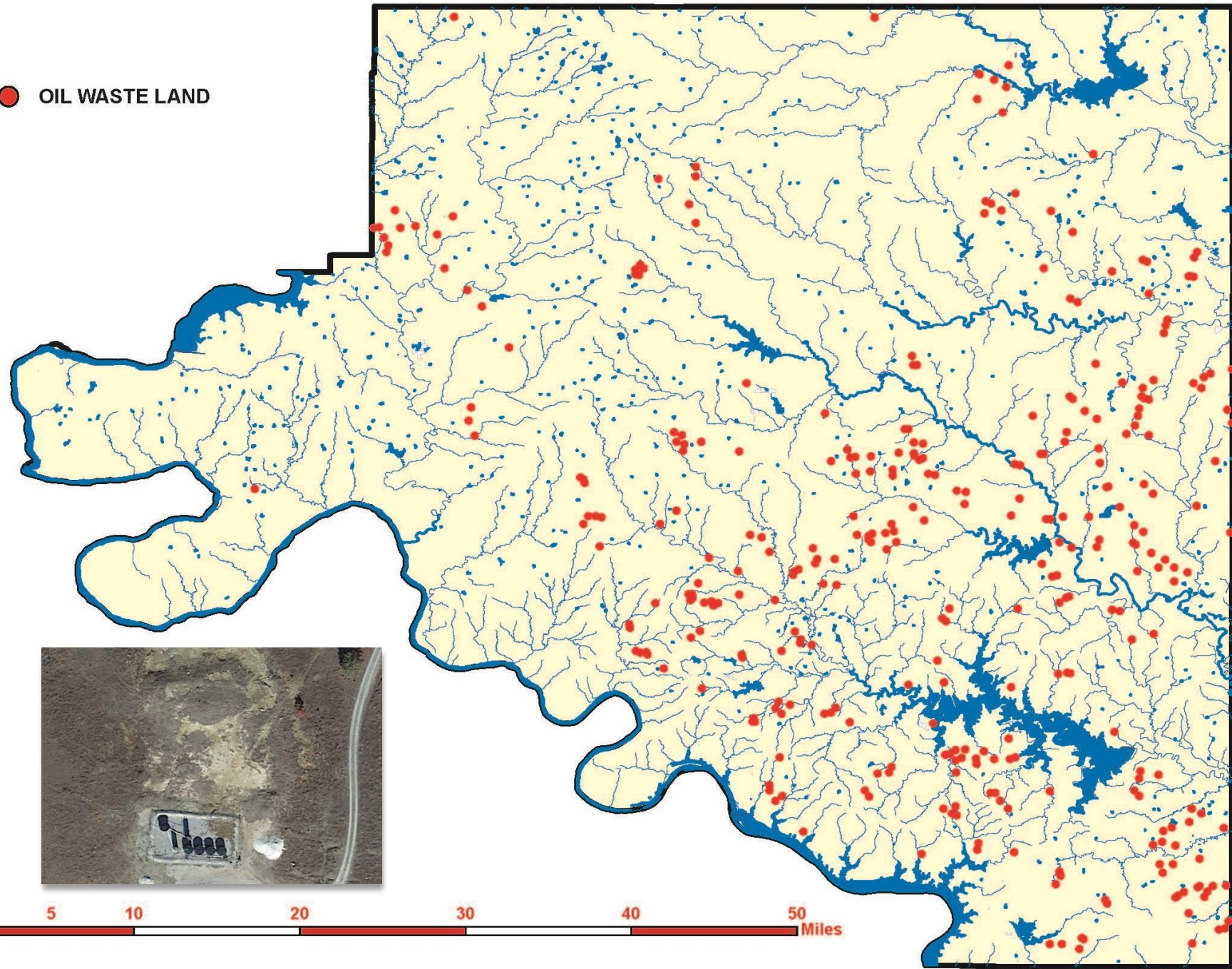
See: <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>



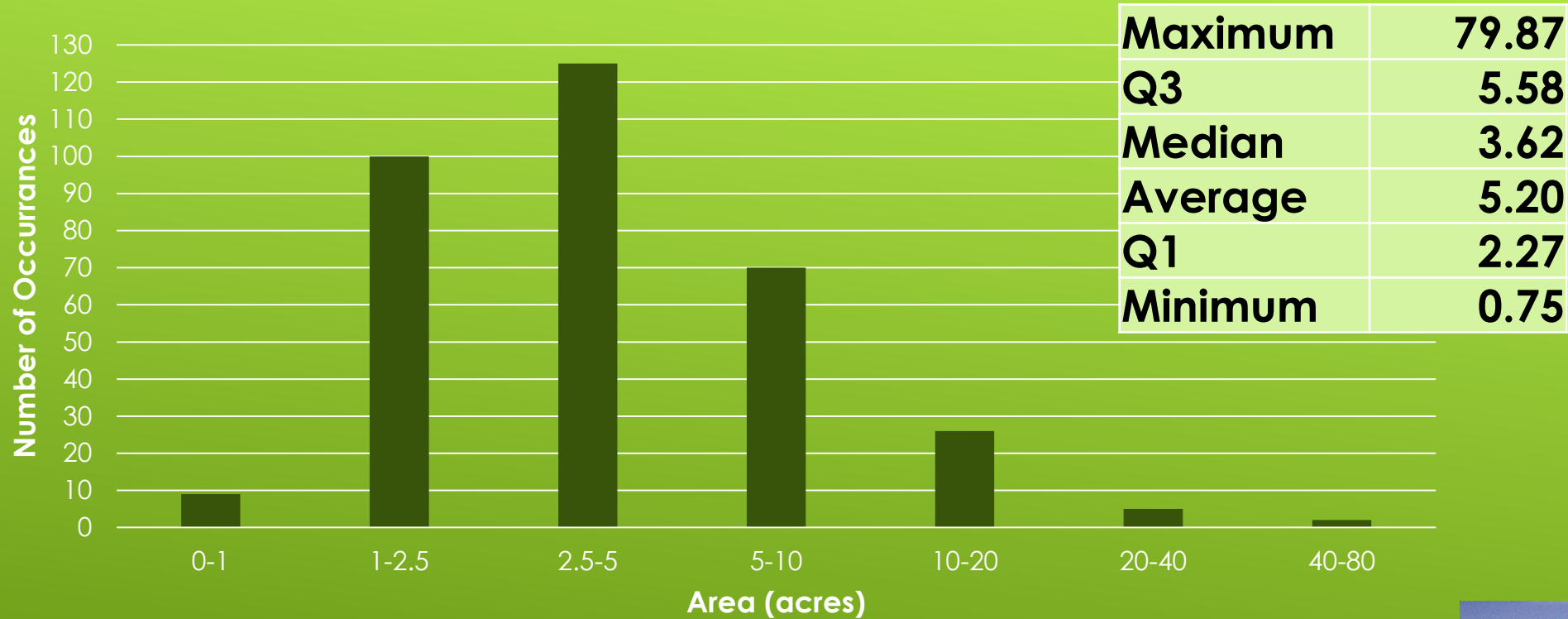
OILFIELD WASTELAND

Web Soil Survey

● OIL WASTE LAND



0 5 10 20 30 40 50 Miles

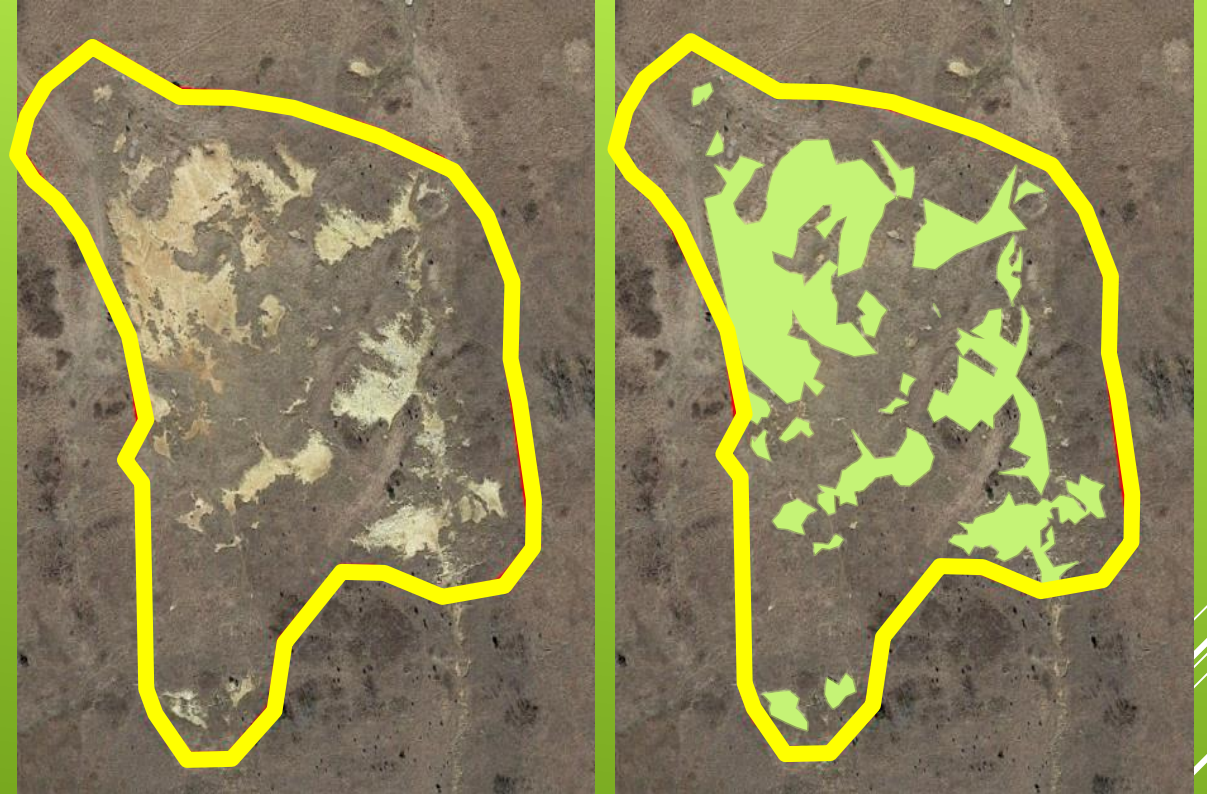


NRCS OILFIELD WASTELAND AREAS OSAGE COUNTY, OKLAHOMA



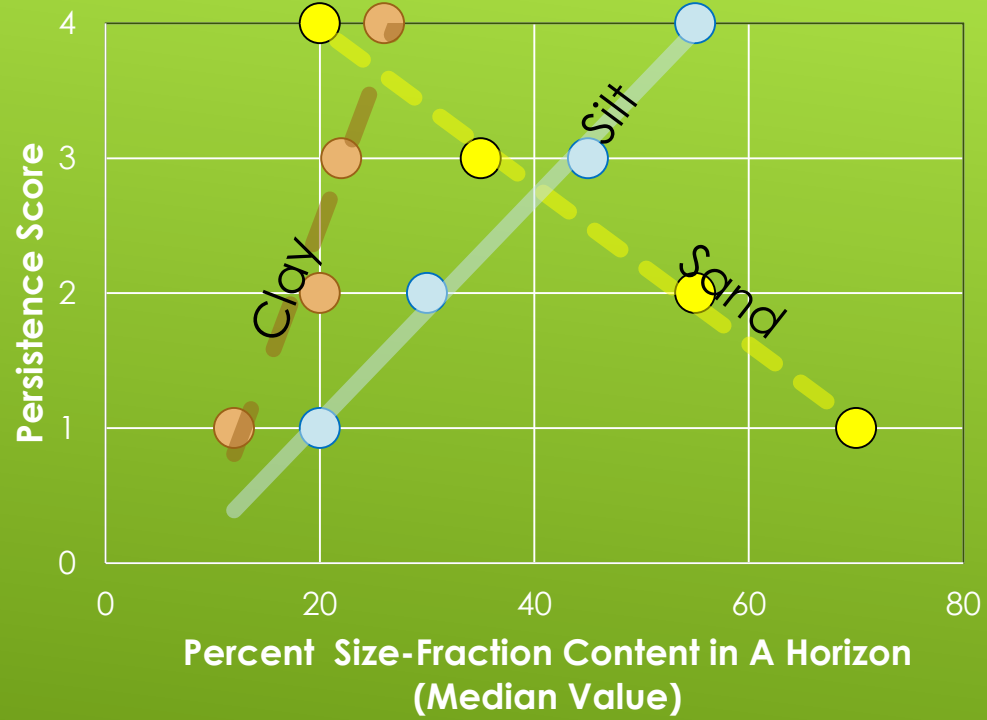
231 Mapped Locations; 1,752.8 Acres

- ▶ Extract Oilfield Waste Land Polygons from USDA-NRCS Database
- ▶ Overlay Polygons on air photo coverages (1994-2016)
- ▶ Score brine spill scars based on persistence
- ▶ Examine statistical relationship between quantitative soil properties and persistence scores

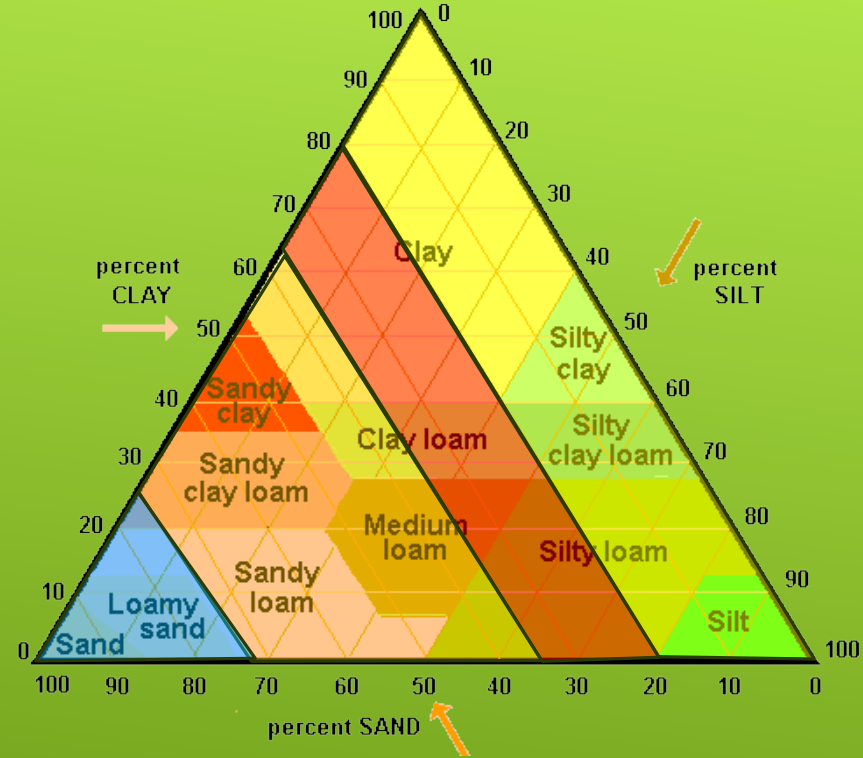
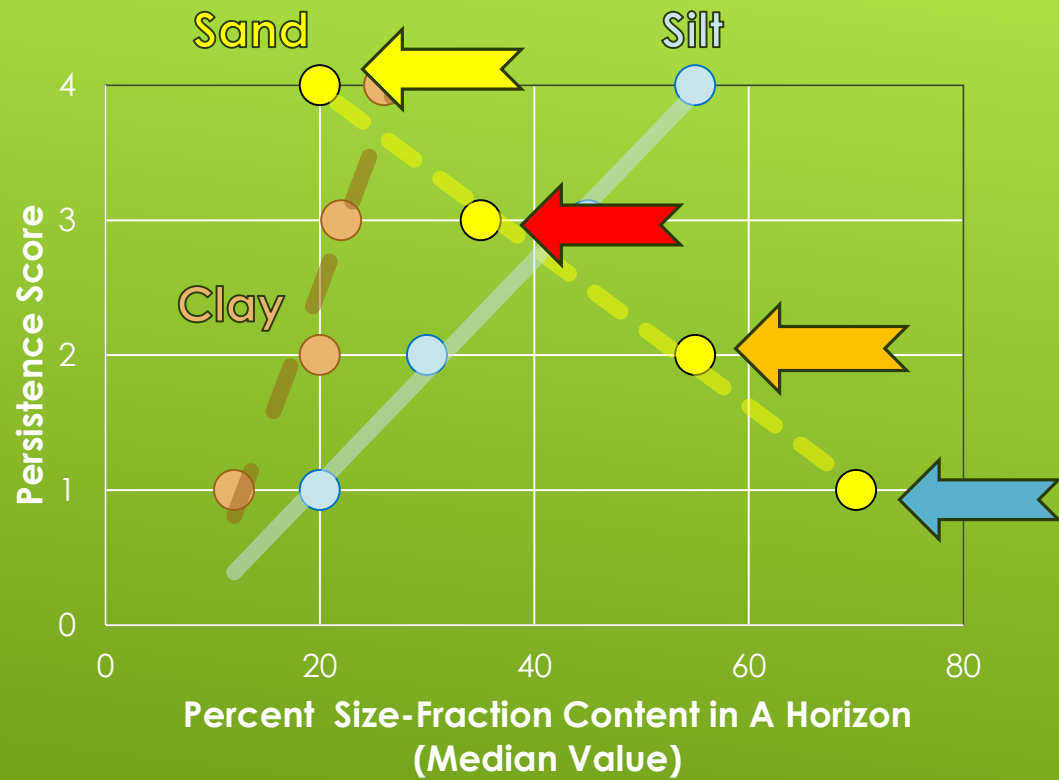


PROCESS

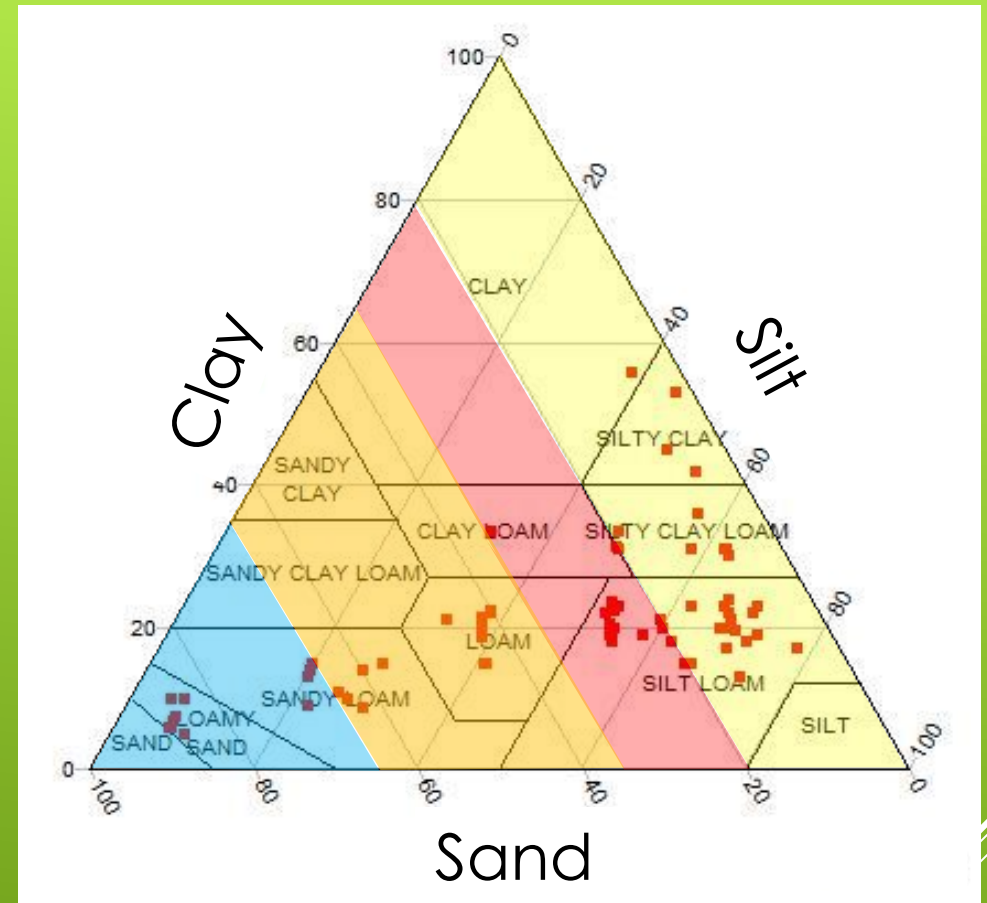
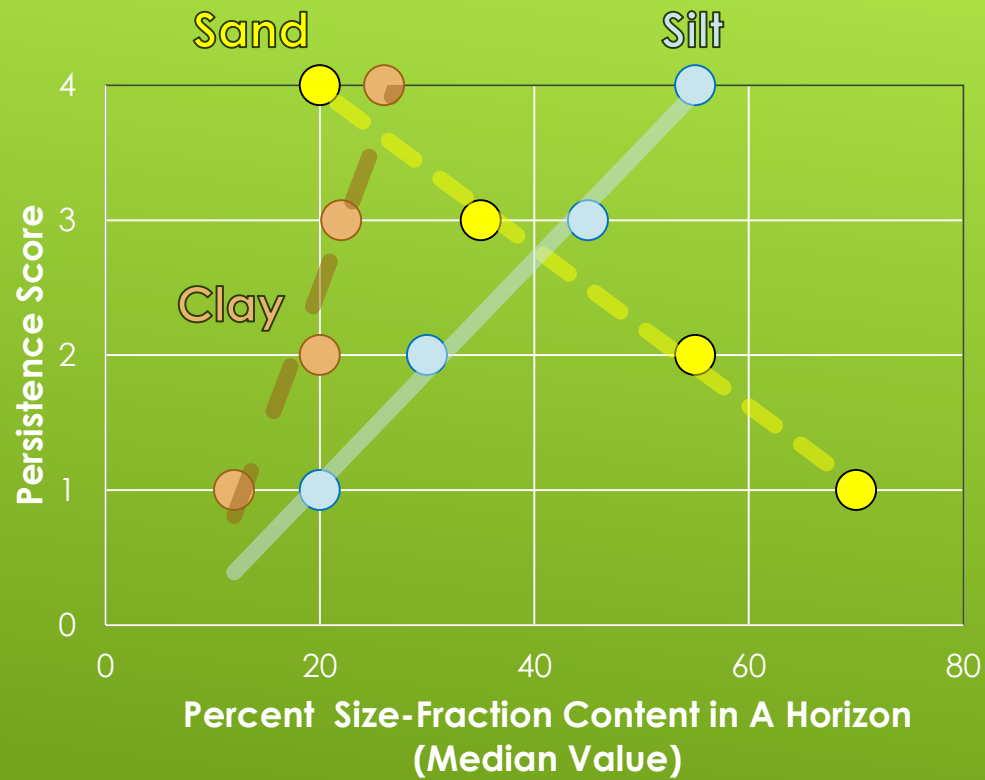
Rating	Qualitative Interpretation	Quantitative Interpretation
1	Scar Almost or Entirely Absent	0-25% of Scar Remaining
2	Majority of Scar Absent	25%-50% of Scar Remaining
3	Majority of Scar Present	50%-75% of Scar Remaining
4	Little to No Change Over Time	75%-100% of Scar Remaining



SOIL PROPERTIES AND SALT SCAR PERSISTENCE

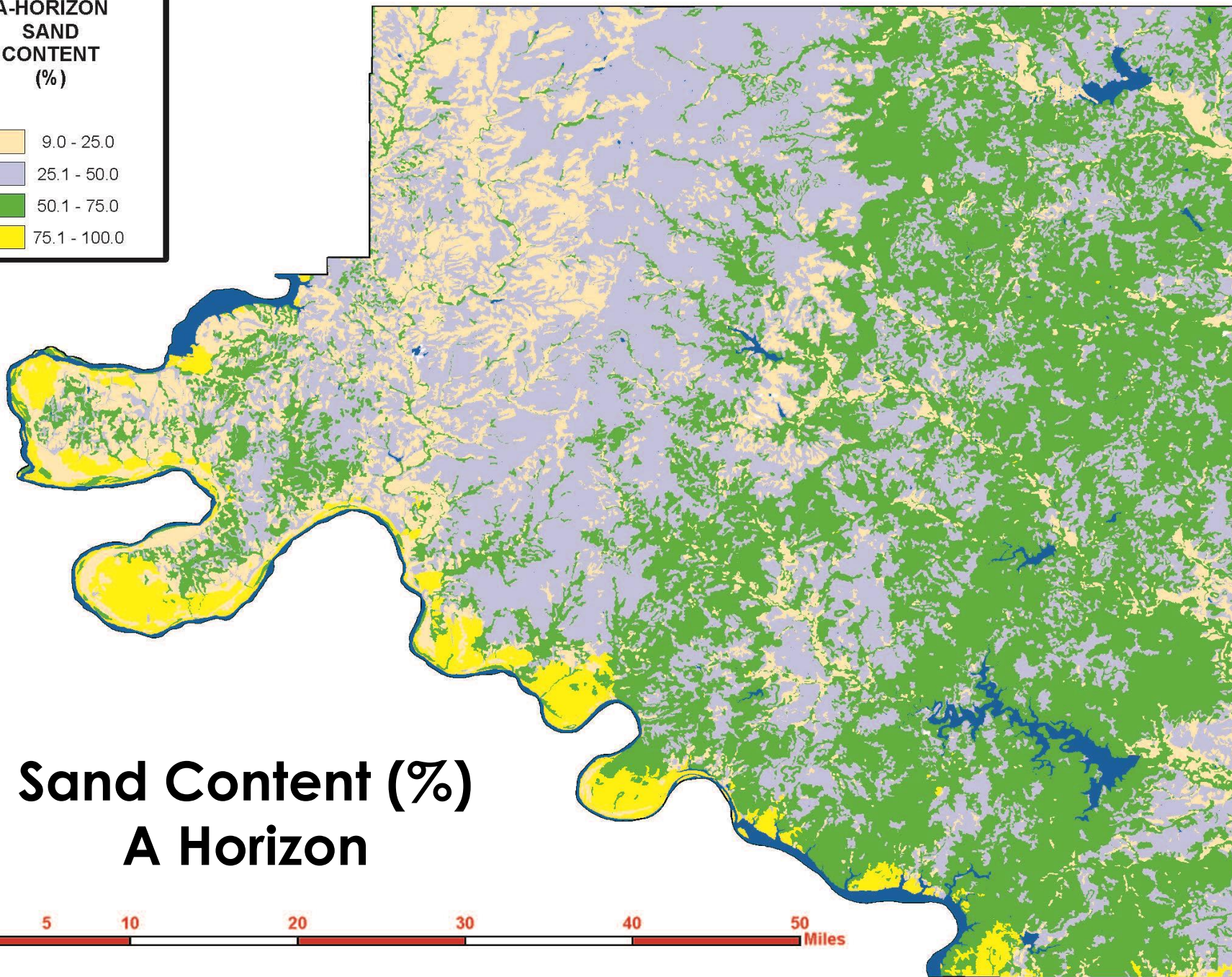
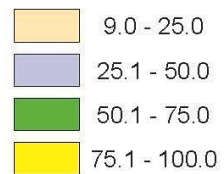


SOIL TEXTURE AND SALT SCAR RISK



SOIL TEXTURE AND SALT SCAR RISK ACTUAL OSAGE SOILS

**A-HORIZON
SAND
CONTENT
(%)**

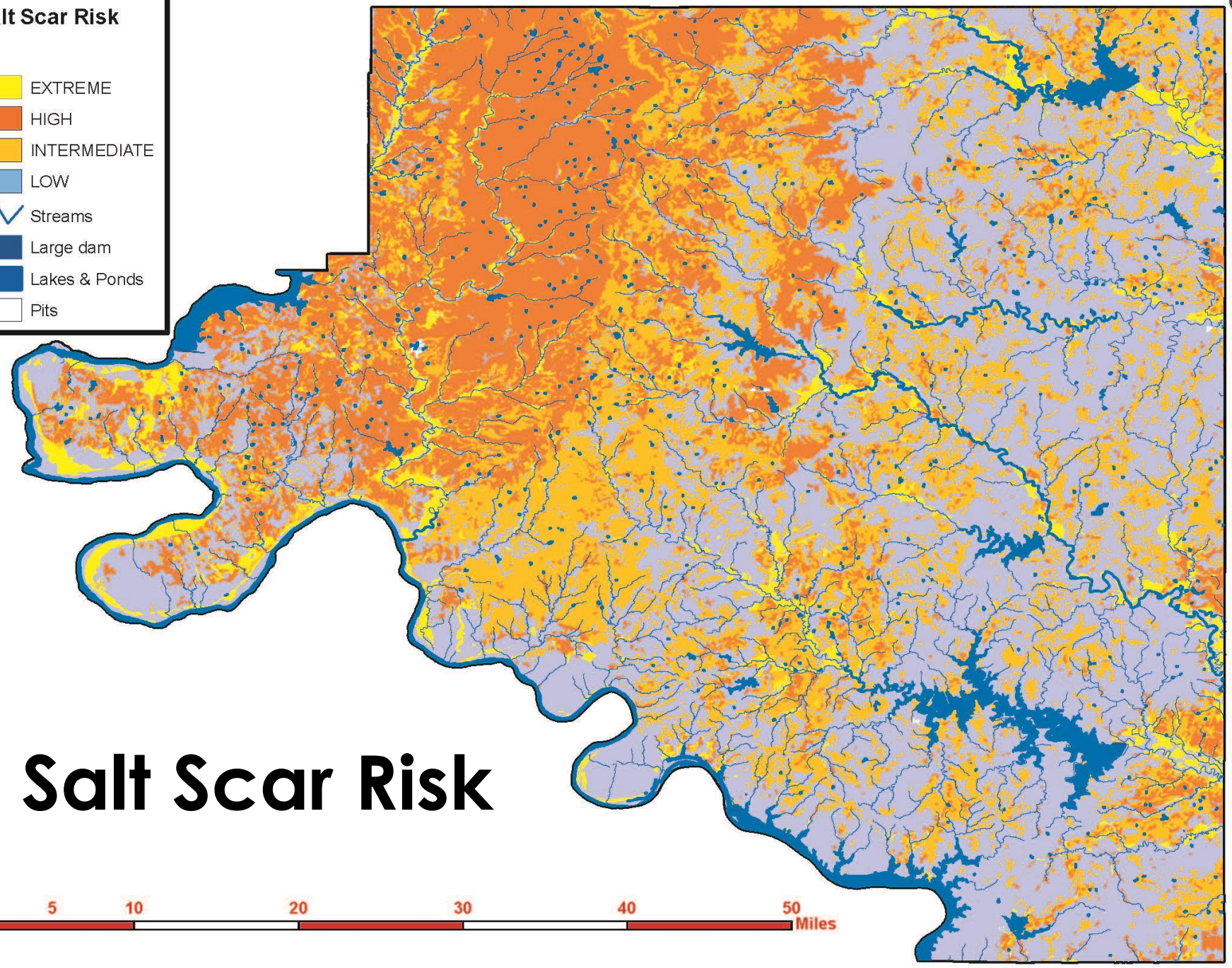


**Sand Content (%)
A Horizon**



Salt Scar Risk

- EXTREME
- HIGH
- INTERMEDIATE
- LOW
- Streams
- Large dam
- Lakes & Ponds
- Pits



Salt Scar Risk



- ▶ **The Web Soil Survey is a rich source of numerical and categorical data**
- ▶ **Areas mapped as oil field wasteland can be correlated to probable original soil types**
- ▶ **Textural class of soil is predictive of the persistence of salt scars**
- ▶ **Overall, the best single predictor of salt scar persistence was sand content**
- ▶ **Salt scar persistence varies inversely with soil sand content and directly with silt and clay content**

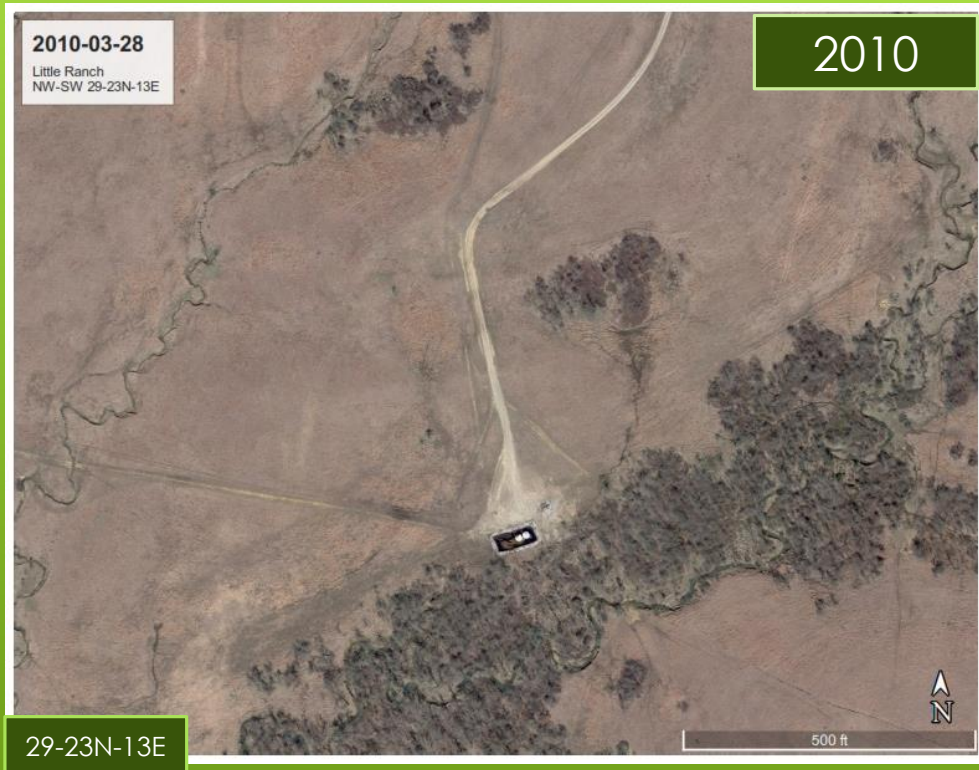
CONCLUSIONS



2005 TO 2006



2006 TO 2010



2010 TO 2011



2011 TO 2012



2012 TO 2015



2015 TO 2016



2011 TO 2016