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Gullies and Their Treatment

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Natural Resources Conservation Service

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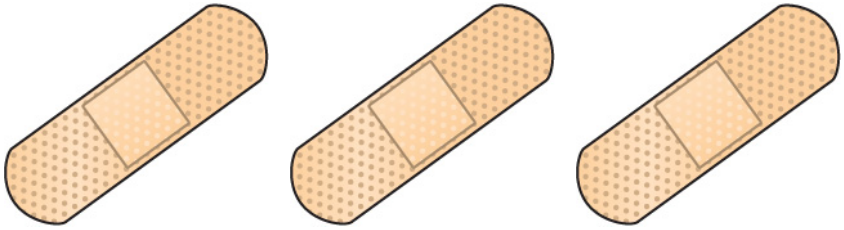
Types of Gullies

Ephemerals

- Small-to-medium sized gullies that recur in the same area
- Can be farmed-across…



Types of Gullies

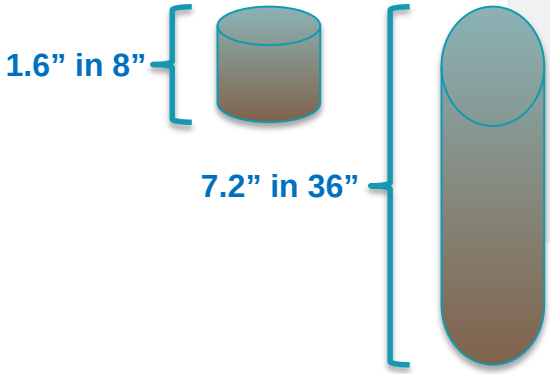
Classic Gullies

- Larger in scale and cannot be farmed across typically
- Are more permanent, and will require more intensive or special measures to address

Infiltration Affects Gully Formation

Infiltration – the function of a soil to take in water

- Water will go somewhere; if not in, then across
- Linked closely to near-surface conditions
- MANAGEMENT affects infiltration
  - Live plants and/or residue
  - No-till
  - Contouring



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	A	B	C	D	E	F	G
1	**Infiltration**						
2	Rep. No.	1st Inch of Water (Enter either start/end time, or minutes/seconds. Format start/end time as: 13:10:47)				**1st Infil.**	
3		Start Time	End Time	Minutes	Seconds	**(in/hr)**	
4	1	16:42:15	17:38:57	63	53	**0.9**	**High Traffic**
5	2	17:14:15	17:17:10	2	55	**20.6**	**Pit Ring**
6	3	16:58:15	18:24:32	86	17	**0.7**	**Wheel Track**
7	4	16:58:00	17:00:34	2	34	**23.4**	**No Wheel Track**
8	5					**calculation**	
9		2nd Inch of Water				**2nd Infil.**	
10		Start Time	End Time	Minutes	Seconds	**(in/hr)**	
11	1					**calculation**	**High Traffic**
12	2	17:23:45	17:38:57	15	12	**3.9**	**Pit Ring**
13	3						**Wheel Track**
14	4	17:10:30	17:35:25	24	55	**2.4**	**No Wheel Track**
15	5					**calculation**	
16							

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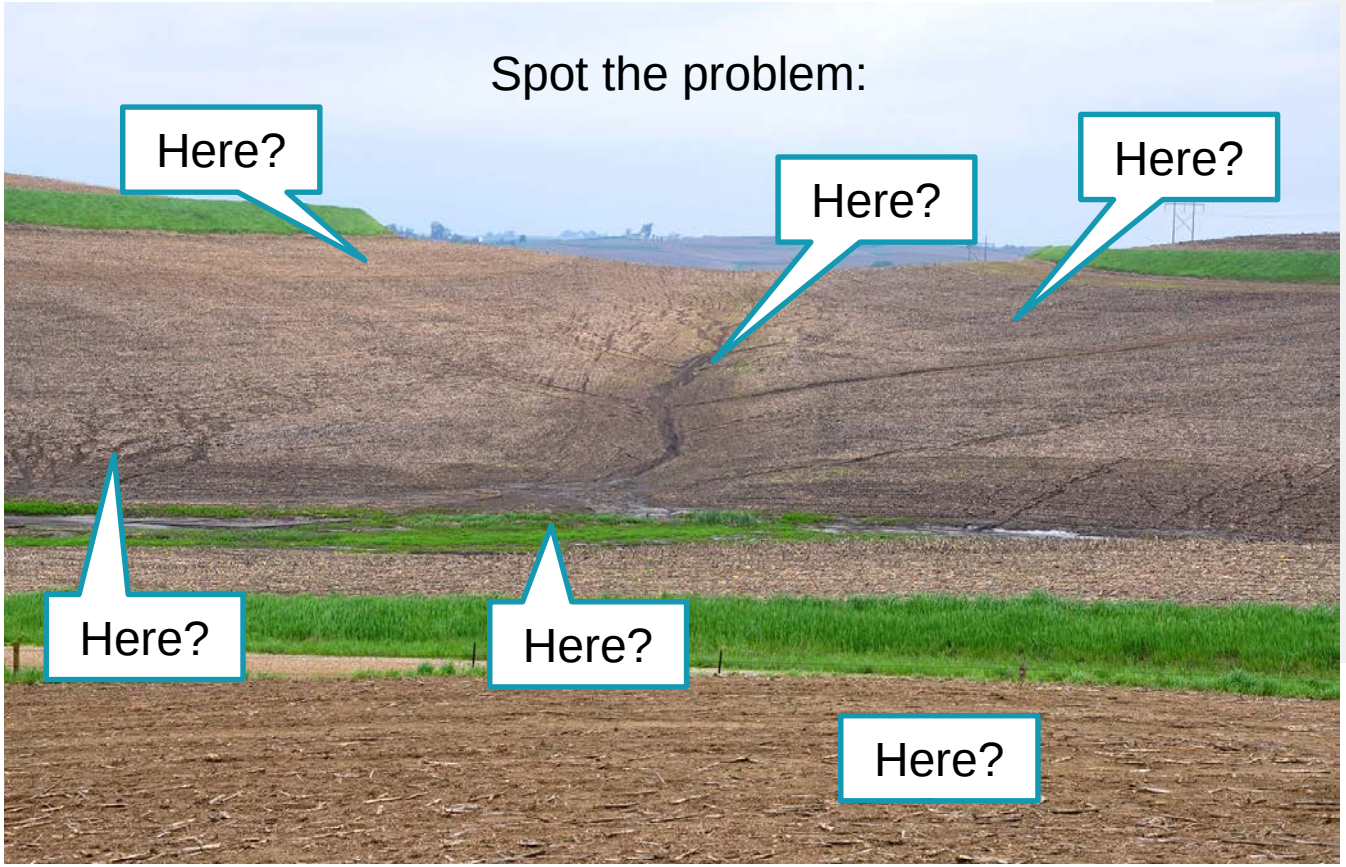
- Higher infiltration = less runoff, less erosion potential

- Think broad – don't focus solely on the "trouble-spot"



Gully Formation – Management Summary

What can you do to positively impact the contributing area?

- To reduce raindrop impact and keep aggregates stable?
- To capture and store more water rather than promoting run-off?
- To slow down run-off, giving more infiltration opportunity?
- To reduce the potential energy of that overland flow?

Many of these can be brought about through management and vegetation…

Beyond Management and Vegetation

- Management and Vegetation alone will not heal all gully erosion.
- Structural Measures may be needed.
- What type of conservation practice used is dependent on many factors.
    - Soils
    - Contributing Drainage Area
    - Land Slope/Grade of Drain
    - Outlet Conditions
        - Culvert
        - County Road
        - Neighbors Field
        - Rangeland/Pastureland

Little Ark River Watershed Soils

Hydrologic Soil Group	Definition	Acres of Watershed in HSG	Percentage of Watershed in HSG
A	Soils with low runoff potential. Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep well drained to excessively well-drained sands or gravels.	62,344	7.14
B	Soils having moderate infiltration rates even when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well drained to sell drained soils with moderately fine to moderately coarse textures.	148,482	16.99
C	Soils having slow infiltration rates even when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures.	343,452	39.31
D	Soils with high runoff potential. Soils having very slow infiltration rates even when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material.	314,447	35.99
Other	Water, dams, pits, sewage lagoons	4,975	0.57
Total		1,742,426	100.00

Gully Problem Areas

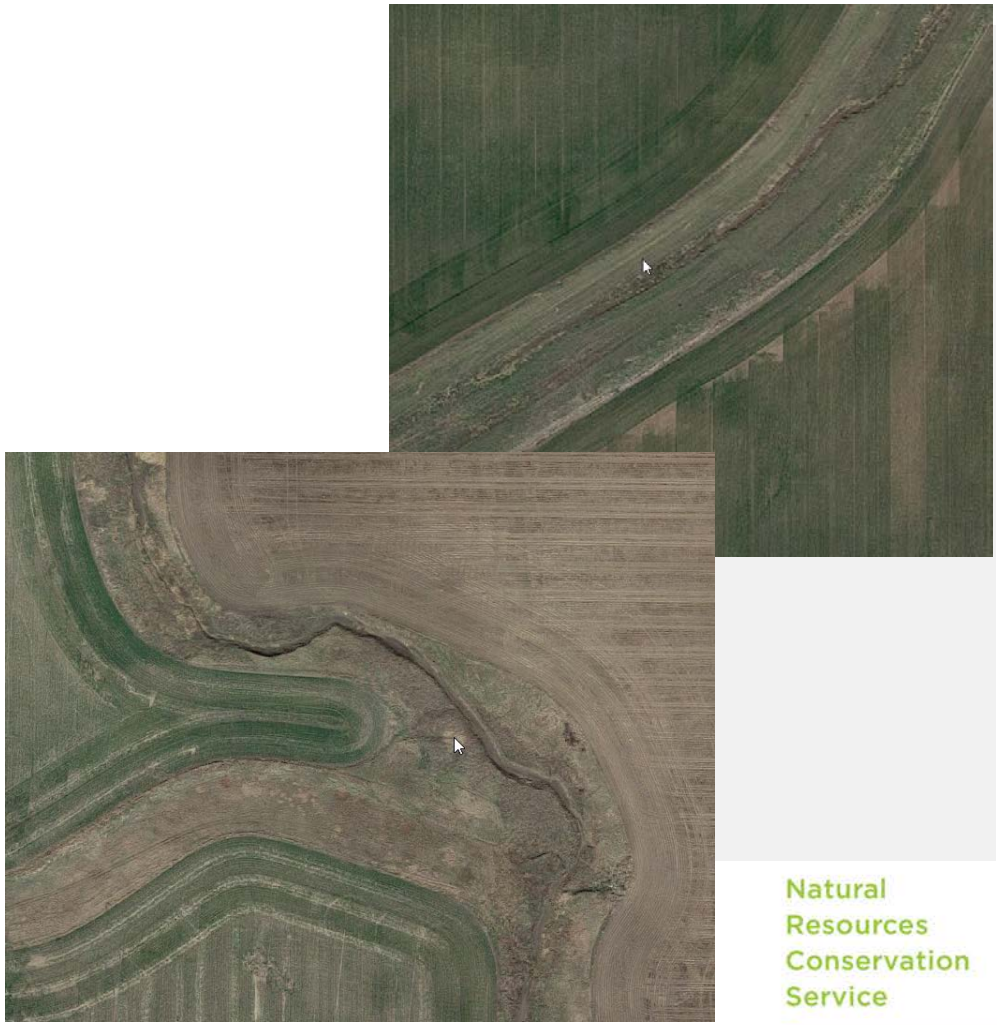
- Along Creeks and Rivers

Gully Problem Areas

- Downstream of Culverts

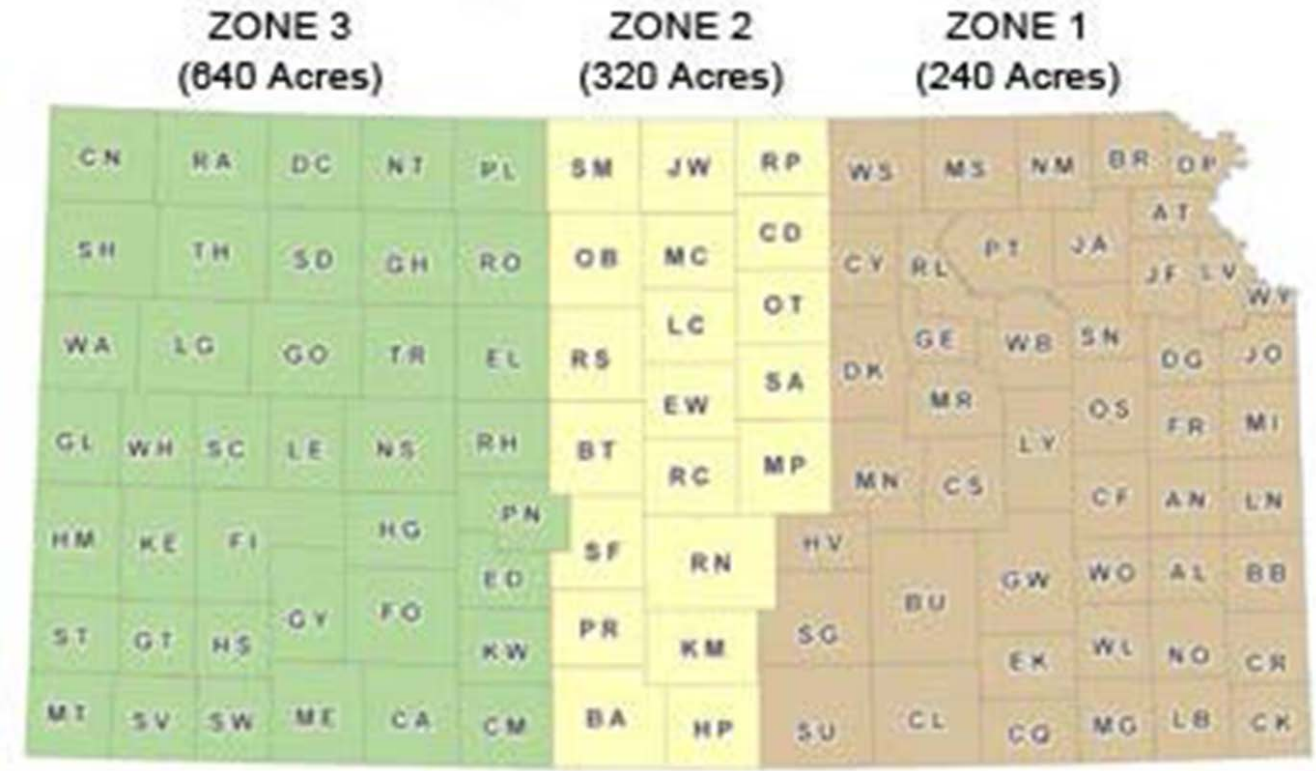
How Big is too Big!!

- Little Ark Watershed Characteristics
  - Heavy Clays (75% of the watershed Hydrologic Soil Groups C and D
  - Flat Land Slopes in General
  - Typical Conservation Practices may not be the best option
- Doesn't take much drainage area to start causing issues



When does it become a Creek?

- Rule of Thumb…300 acres of drainage area or more. Typical Grassed Waterway becomes unfeasible due to size and tendency to erode.



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Structural Practices for Ephemeral Gullies

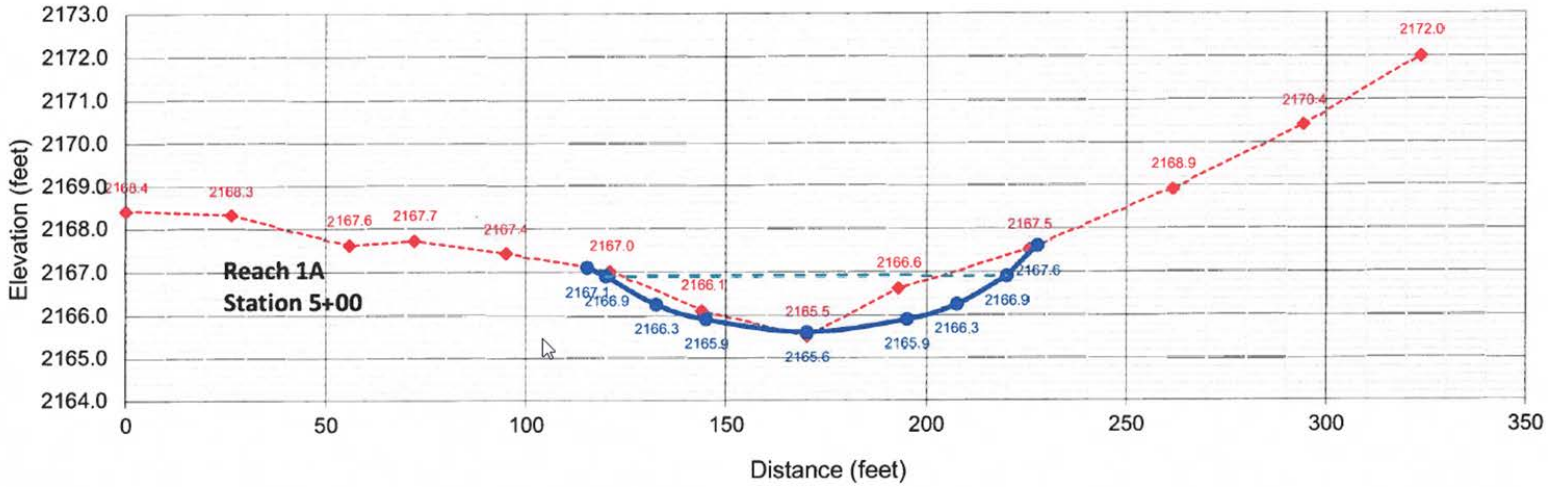
- Terraces
  - Gradient
  - Storage Type with Underground Outlet Pipe
- Diversions
  - Gradient
  - Storage Type with Underground Outlet Pipe
- Waterways
  - Grassed or Annually Vegetated
- Water and Sediment Control Basins
  - With Underground Outlet Pipe

Structural Practices for Classic Gullies

- Waterways
- Grade Stabilization Structures
  - Concrete Drop Structures
    - Big Concrete Block
    - Poured Structures
  - Embankment/Pipe Outlet
- Critical Area Planting with Minor Shaping
  - Newer Concept
  - Work with Nature instead of against it.
  - Fluvial Geomorphology!!!

Critical Area Planting with Minor Shaping

- Channel Forming Rainfall Event is 1.2-1.5 year interval storm event
- Typical NRCS Design Criteria is 10-year 24- hour rainfall event
- Allows flow to access the floodplain



Additional Sources of Sediment

- Streambank Erosion is another major source
- Maintaining Riparian Areas is more cost effective in reducing the sediment load from streambank areas

Riparian Areas in the Little Ark

Figure 24. Riparian Inventory of the Streambank Targeted Area.[24]
Data from USDA/NRCS, 1991.

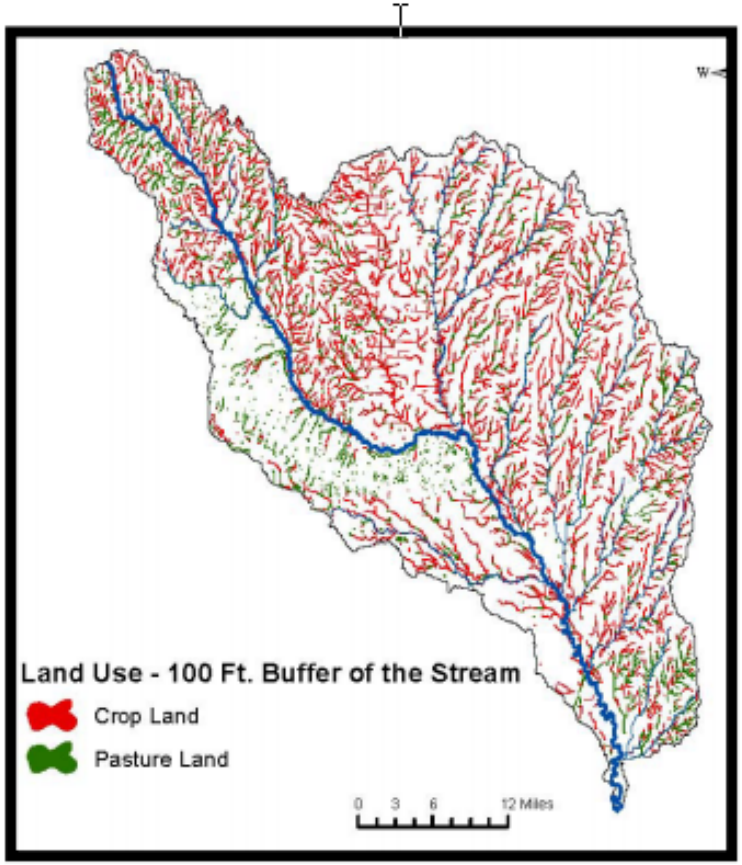
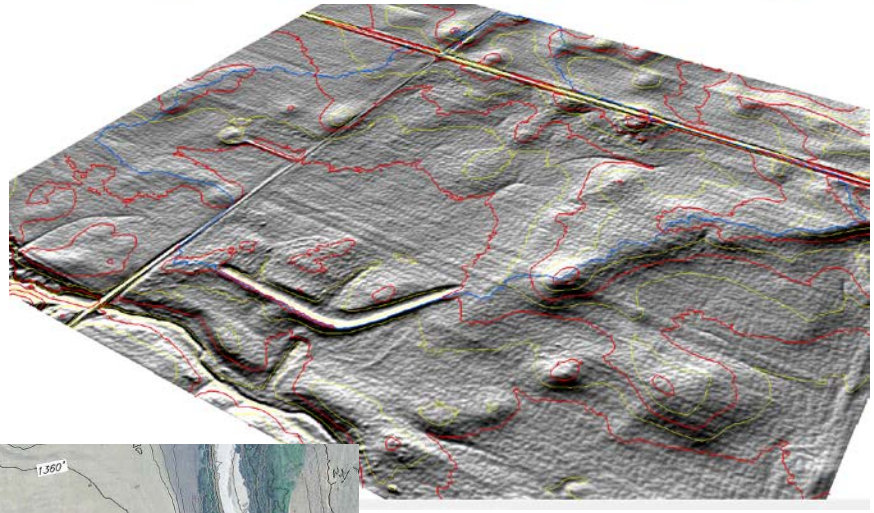


Table 18. Riparian Land Use

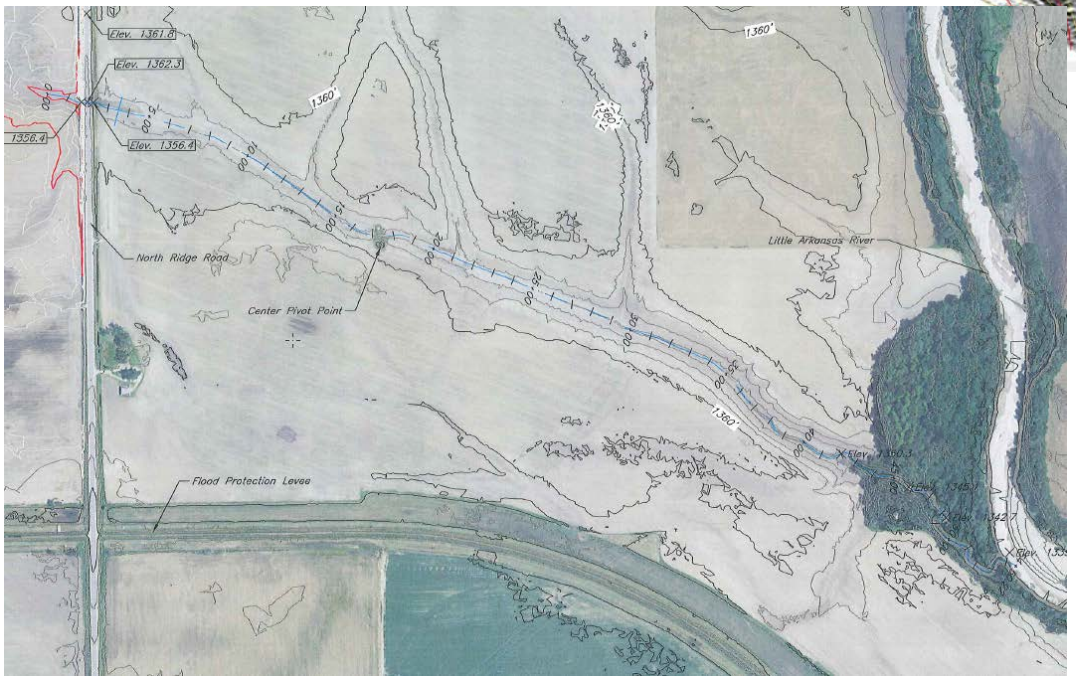
Land Use	Acres	Percent
Barren Land	58	0.08
Crop Land	35,123	47.61
Crop/Tree Mix	5,264	7.14
Forest Land	9,274	12.57
Pasture	10,764	14.59
Pasture/Tree Mix	8,354	11.32
Shrub/Scrub Land	136	0.18
Urban Land	1,625	2.20
Urban/Tree Mix	840	1.14
Water	2,332	3.16
Total	**73,770**	**100.00**

Innovative Tools

- LiDAR



- USGS Stream Stats
  - https://streamstats.usgs.gov/ss/



Things to take away

- No “Cookie Cutter” approach in dealing with water erosion
- Higher Infiltration = Less Runoff
- Traditional Approaches can be modified to fit producers objectives while reducing soil erosion

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