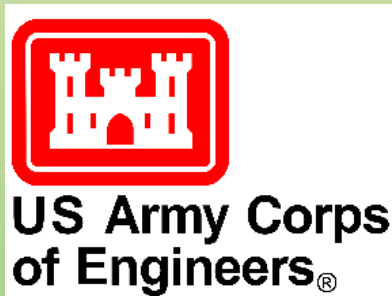


Sands Draw Grassland Restoration Part II – Sediment Traps

An Examination of Surface Flow Transport Using Sediment Traps: Youth
Outdoor Education

Engineering With Nature® (EWN®)
Natural and Nature-based Features (NNBF) Playbook
for the Arid Southwest
Workshop
Date: 7-8 May 2025



Joneen S Cockman – AZ BLM Safford (Retired)
David J Henson – Eastern Arizona College (Retired)



ACKNOWLEDGEMENTS

- National Environmental Education Foundation
- National Fish and Wildlife Foundation
- BLM Science Initiative

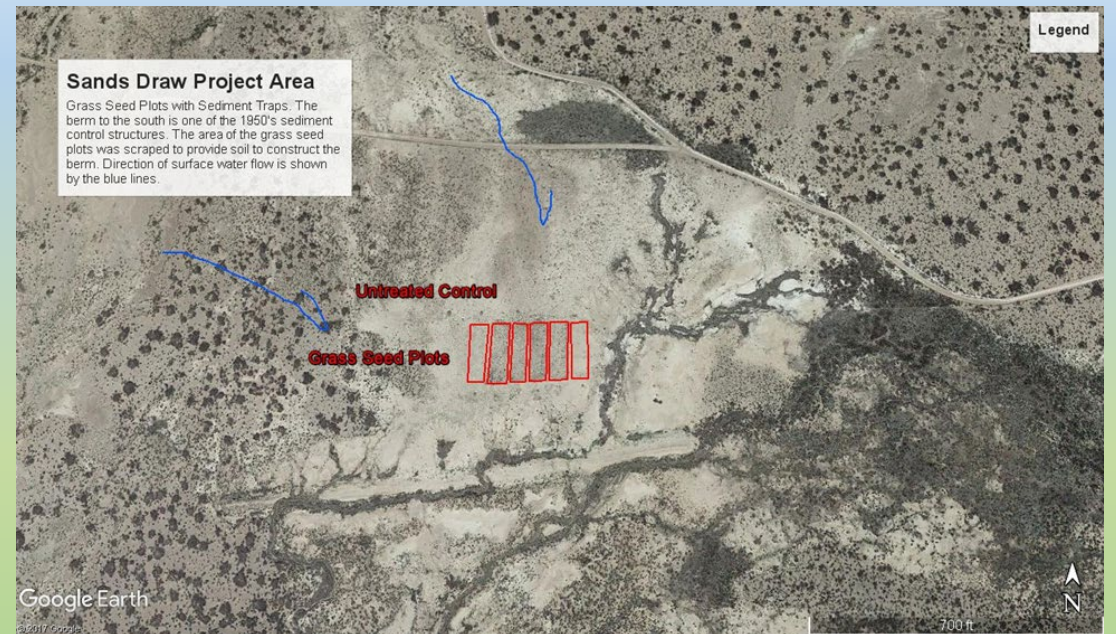


INTRODUCTION

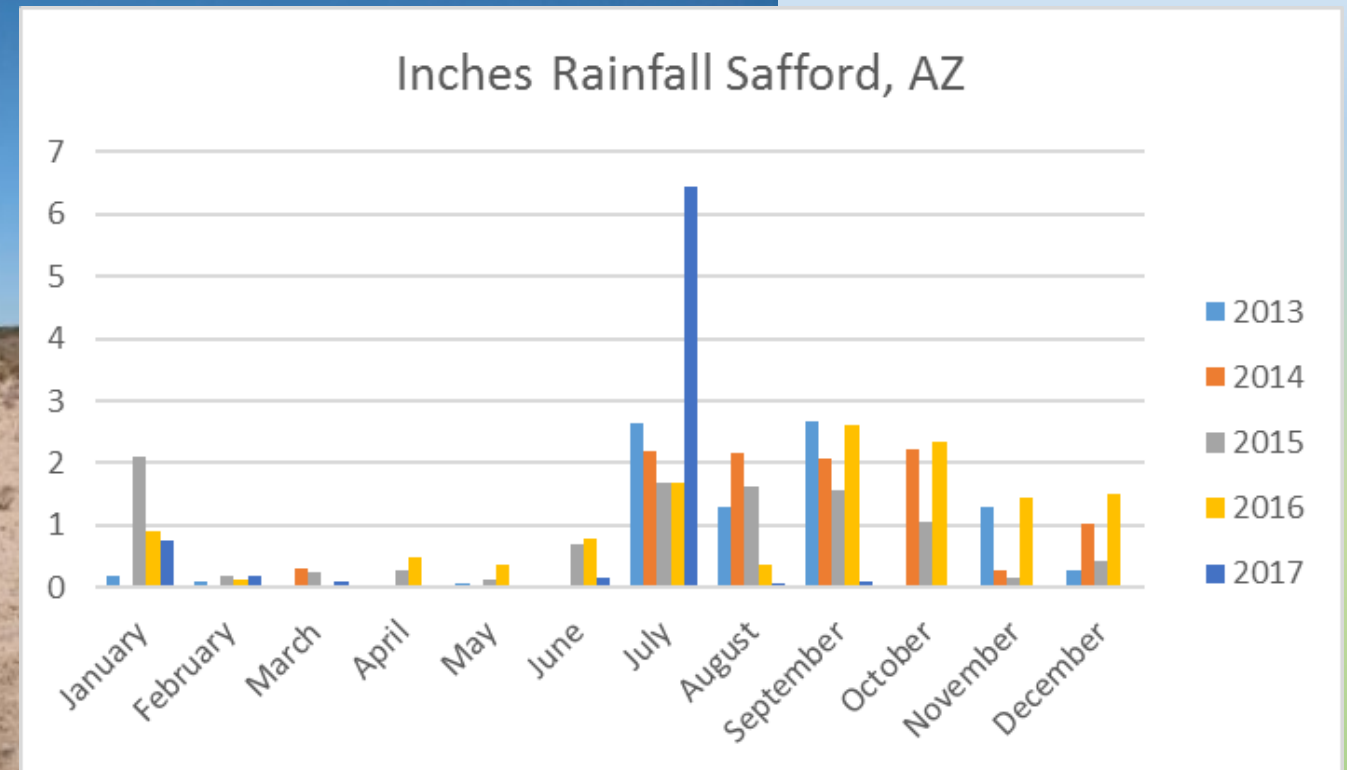
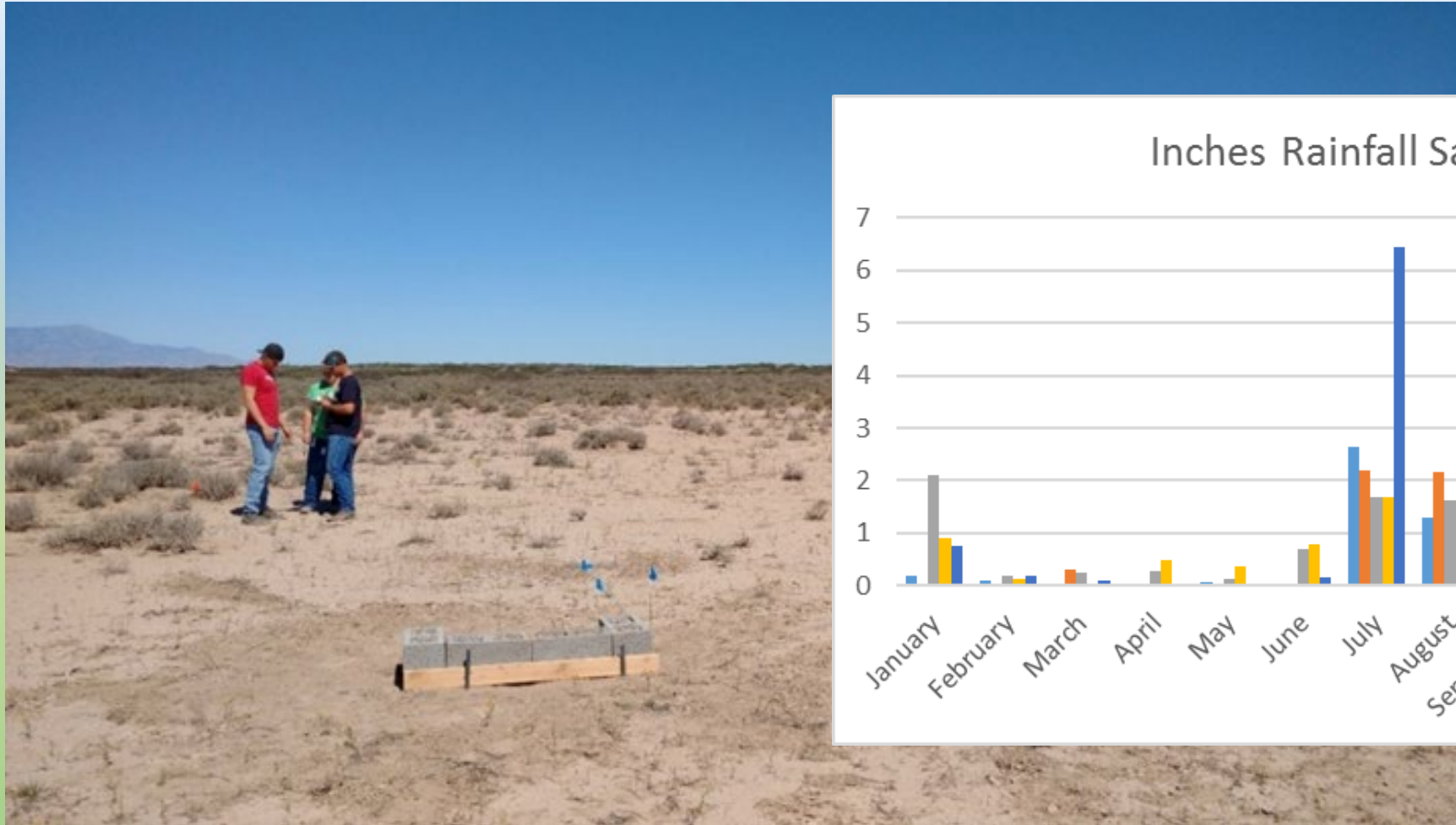
- Heart of San Simon Valley north of I10 occupies 253 square miles.
- 25-50% highly eroded
- Historic grasslands.
- 1950s large earth dam structures
- Grass plots initiated in 2013
- Sediment traps added in 2015



LOCATION AND SETTING



Climate



MATERIALS AND METHODS



Grass Seed Plot Design

Grass seed plots incorporated a stratified random split plot design to examine:

Imprinting –v- Drilling

Mulches

Gravel

Pecan branch

Gravel & Pecan branch

Sediment traps were installed within plot to capture surface flow from west to east (east traps) and north to south (south traps).



NATIVE PLANT SEED MIX		
Species	LB Pure Live Seed	Seeding Rate
Plains bristlegrass	4 lb	2.85 lb/ac
Bush muhly	2 lb	1.43 lb/ac
Sand dropseed	2 lb	1.43 lb/ac
Mesa dropseed	2 lb	1.43 lb/ac
Alkali sacaton	2 lb	1.43 lb/ac
Winterfat	4 lb	2.85 lb/ac
Seed sources: Curtis & Curtis @ Clovis, NM and Armenta Seed @ Gilbert, AZ		

Sediment Trap Construction

The Henson Sediment Trap (HST)

- Plyboard
- Cinderblocks
- Cement Pegs
- Nails
- Gravel
- Whisk broom & dust pan
- Sediment capture area 1.185 cubic ft.









Methods: Rainfall Events and Sample Periods

- USGS rain gage for Safford, AZ
- 25 miles NW study area
- Ideal collection time is immediately following rainfall event.
- Access not always possible due to washed out roads.
- Sample times constrained to biology class schedule.



Methods: Track rainfall between sample periods.
Storm events may not have measurable ppt.

- 9/16/16: August ppt 0.36 in, 6 of 16 Tstorms w/ measurable ppt.
- 11/22/16: October 2.33 in, 3 of 14 Tstorms w/ measurable ppt.
- 5/2/17: April – May 0 of 5 Tstorms with measurable ppt.
- 9/8/17: Aug – Sept. 5 of 19 Tstorms with measurable ppt.

Methods: Effect of PPT and Collection Times on Sediment Data

- Two fall 2016 sample periods preceded by substantial rain
 - 2.1 in ppt on 9/7, sampled on 9/16
 - Heavy rains 10/8 and 10/9 sampled 11/22 (6 weeks later)
- May 2017 and Sept. 2017 sample days had no ppt for a month or more prior to sample day.
- WHEN DOES THE WIND NOT BLOW IN THE SAN SIMON???
 - Sediments will dry out in the trap and blow away between sessions if not monitored shortly after rainfall events.

Methods: Plot Slope

Table 5. Percentage Slope Within Treatment Plot		
	N-S Slope	E-W Slope
Imprint-Gravel	0%	0%
Drill – Pecan	0%	0%
Imprint – Pecan Gravel	0%	0%
Drill – Pecan Gravel	0.67%	0%
Imprint – Pecan	1.3%	0%
Drill - Pecan	0.67%	0%

Methods: Particle Size

Table 1. Soil Sieve Mesh Size and Textural Correlation		
Soil Sieve Mesh Label	Mesh Size Opening (inches)	Textural Equivalent
# 5	0.51"	Gravel
# 10	0.07125"	Fine gravel
# 35	0.0173"	Coarse sand
# 60	0.0092"	Medium sand
# 120	0.0047"	Fine sand
# 230	0.0029"	Silt/Clay

RESULTS AND DISCUSSION



East Trap –v- South Trap Within Treatment

- All treatments across sample sessions showed the east trap capturing more sediment than the south traps.
- Imprint-v- Drill
 - Gravel
 - Pecan
 - Gravel & Pecan



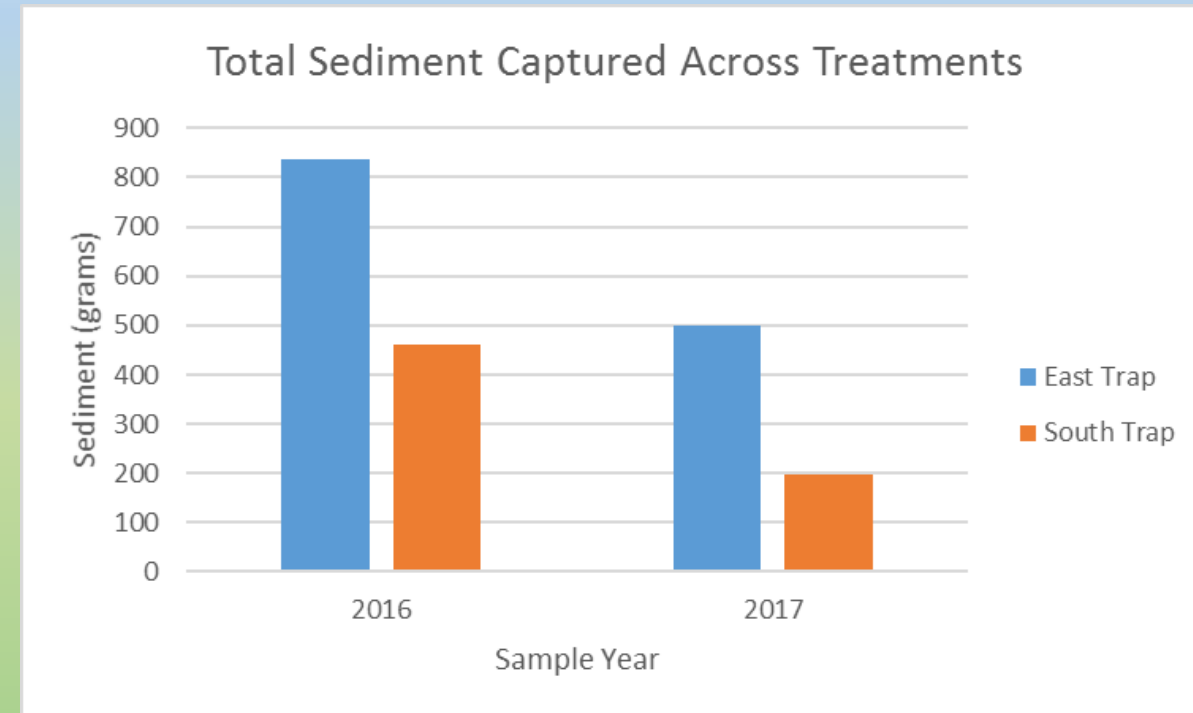
IMPRINT



DRILL

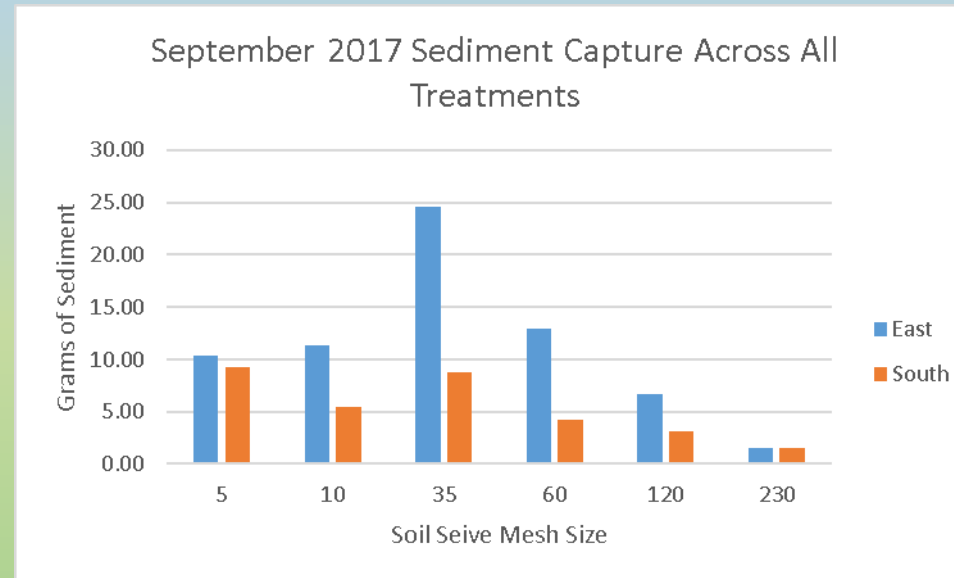
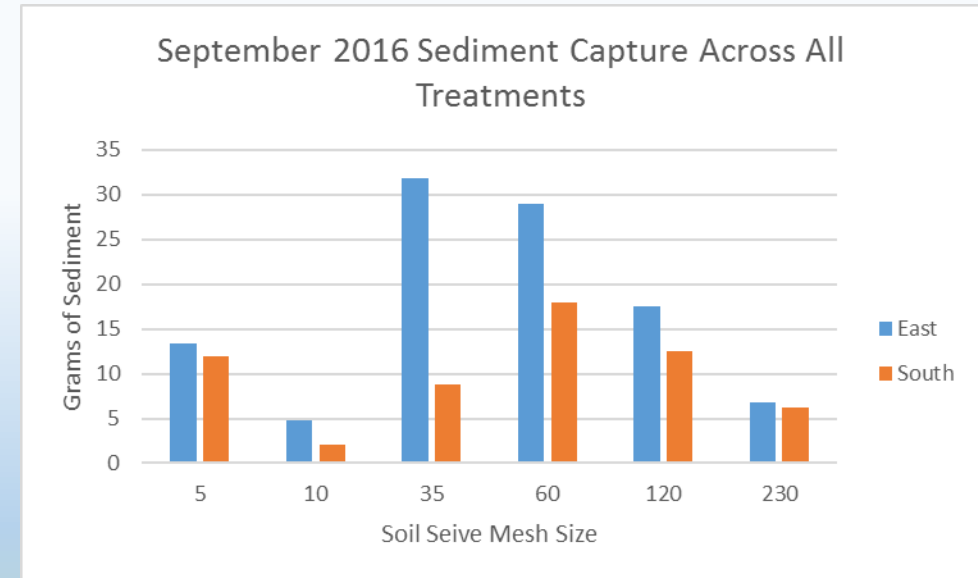
Results: Sediment Capture

- East sediment traps captured more sediment than south traps.
 - Combined years $P=.06$
 - 2016 $P=0.12$
 - 2017 $P=0.13$
- Sediment capture in 2017 was reduced from 2016.
 - Reduction in sediment over time.



Particle Size Dominated Coarse and Medium Sand

Total sediment trapped across all treatments within year/season showed that sediment traps located on the east side of the plots consistently captured more sediment than traps located on the south end for all four collection periods ($P \leq .098$, $.083$, $.018$, $.043$ respectively).



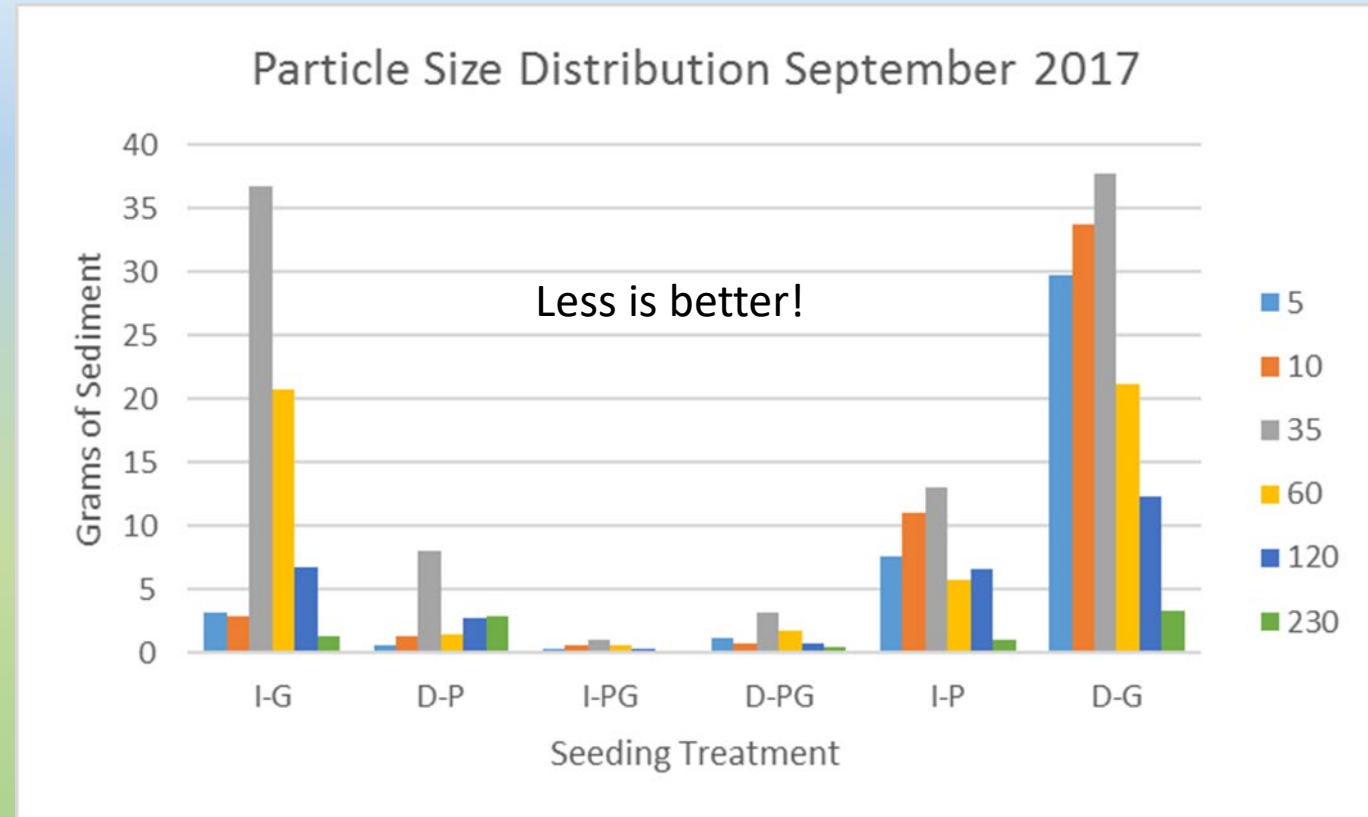
Student's T, 1 tail,
unequal variance:

Sept 2016: $P \leq .098$

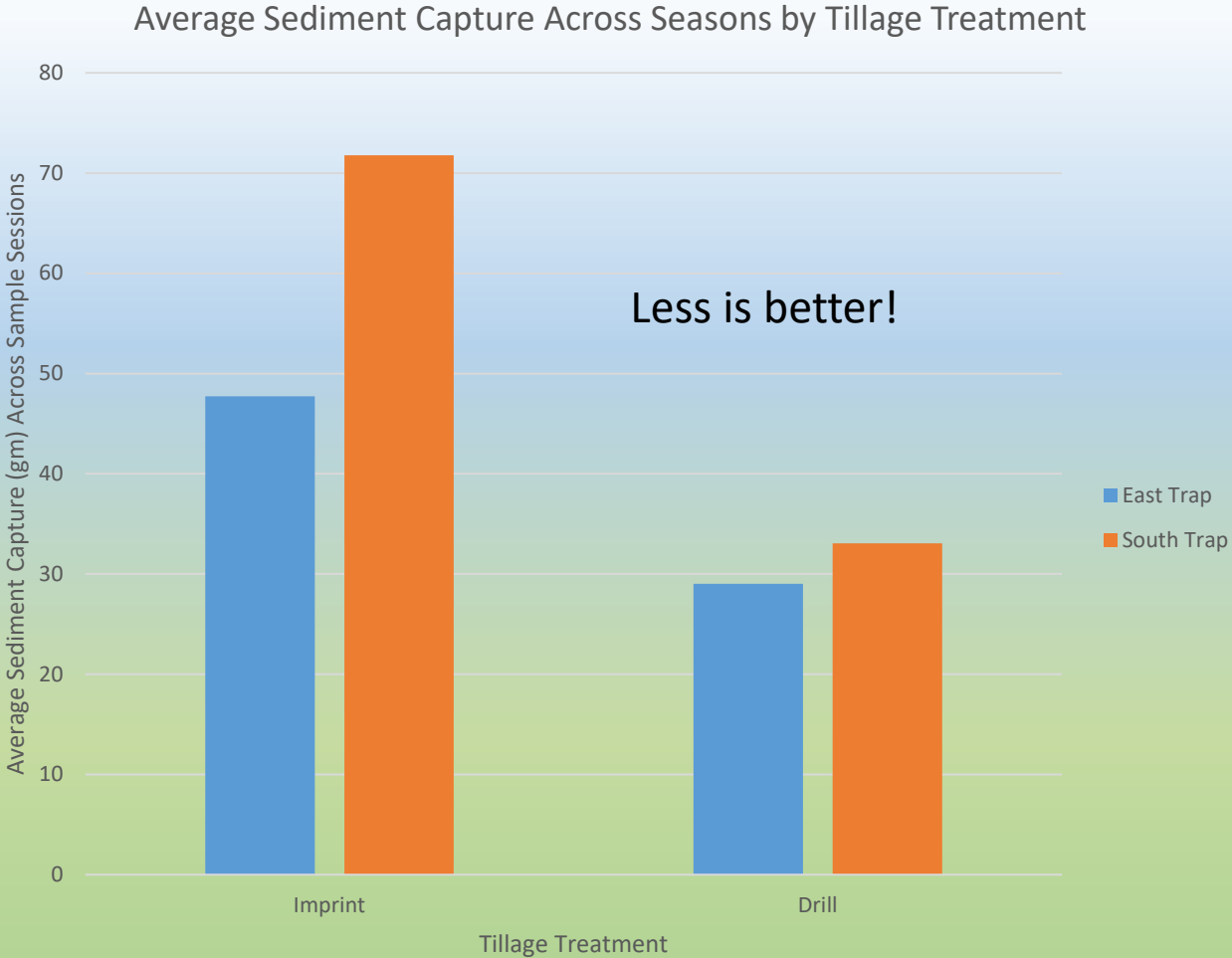
Sept 2017: $P \leq .043$

Results: Particle Size Distribution

- Within particle size, Gravel treatments (I-G, D-G) had the greater mass in capture.
- Treatments with pecan branches had lower sediment captures indicating the effectiveness of pecan branches to slow down surface flow and settle sediment across the plot.
- Finer particle sizes were the smallest portion of captured sediment.



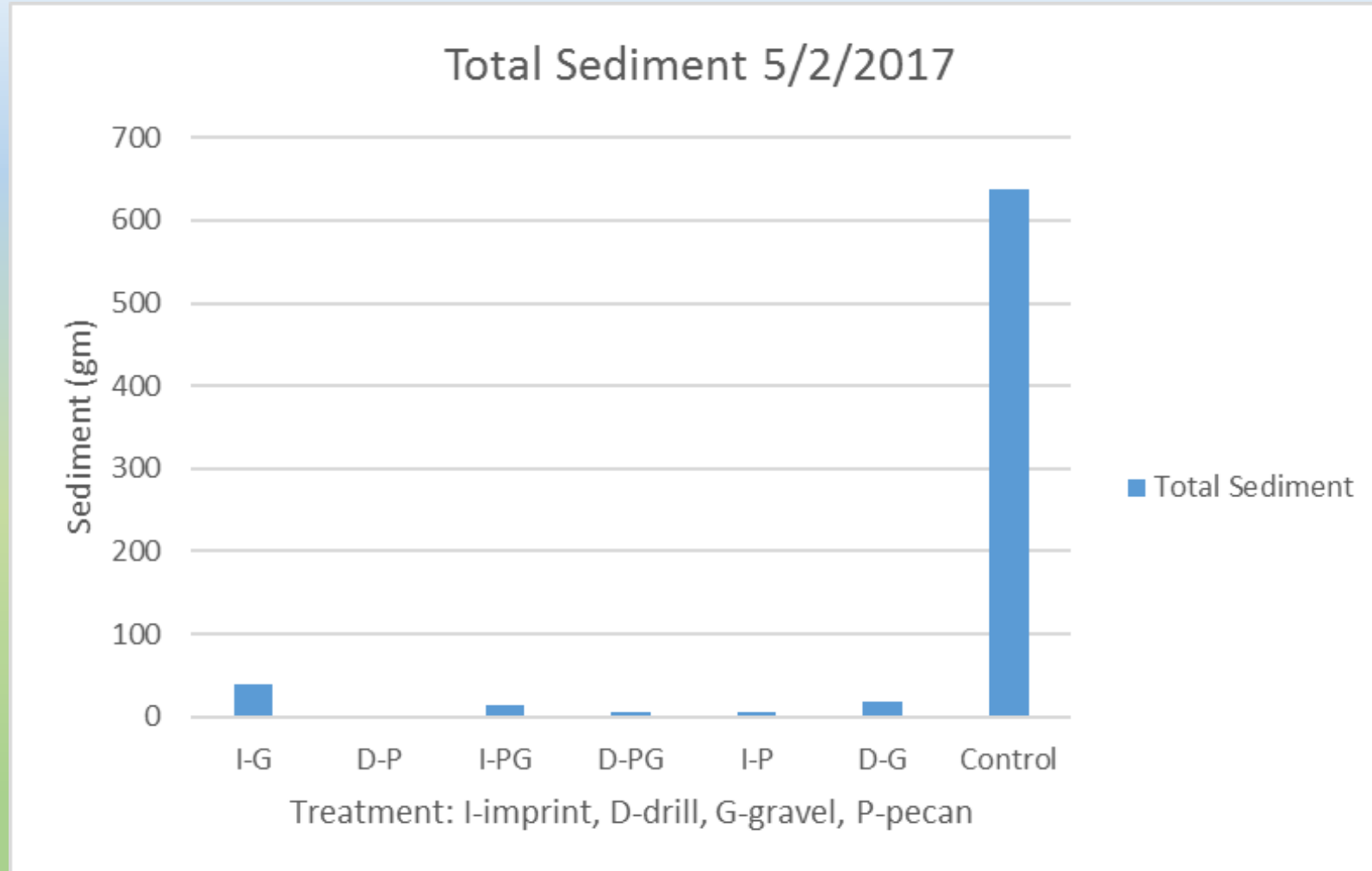
Imprint –v- Drill	
Student's T	P
Imprint East > Drill East	0.230
Imprint South > Drill South	0.423
Imprint South > Imprint East	0.094
Drill South > Drill East	0.141
1 tail, unequal variance	



Comparison Between Paired Treatments

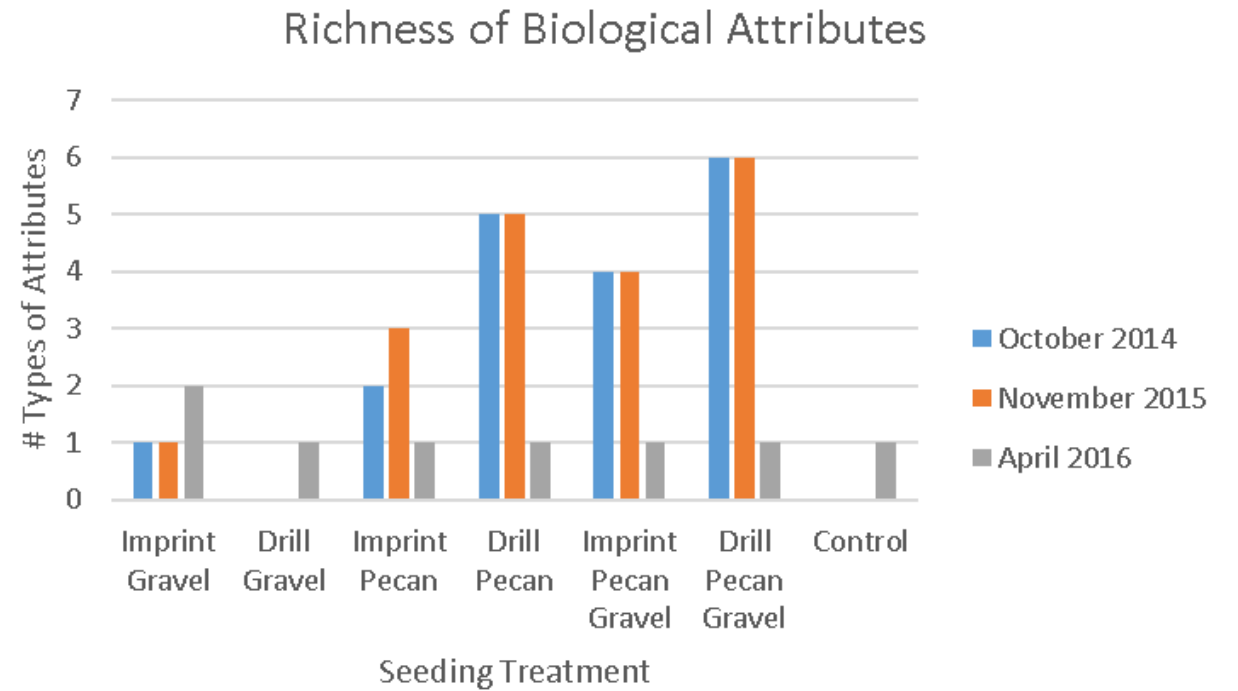
Comparison		P, 2 tails, unequal var.	Result	Interpretation (Less Sediment Capture Means that More Sediment is Held on the Plot)
Imprint	Gravel -v - Pecan	0.108	I-G>I-P	Pecan is more efficient on imprinted plots.
Drill	Gravel -v - Pecan	0.214	D-G>D-P	Pecan is marginally more efficient on drilled plots.

Treatments –v- Control....Do Something!



Biological Attributes

Biological Attributes Recorded with Density Data	
Biological Attribute	Unit of Measure
ANTS	Number
BONES	Number
BUG HOLE	Number
DUNG BEETLE	Number
KANGAROO RAT MIDDEN	% Coverage
MITES	Number
RABBIT PELLET	Number
SPIDER	Number
TERMITE ACTION	% Coverage



BIOLOGICAL ATTRIBUTES (# Types of Attributes)							
	Imprint Gravel	Drill Gravel	Imprint Pecan	Drill Pecan	Imprint Pecan Gravel	Drill Pecan Gravel	Control
October 2014	1	0	2	5	4	6	0
November 2015	1	0	3	5	4	6	0
April 2016	2	1	1	1	1	1	1



SUMMARY – Pecan Branches are Great!

Doing something is better!

- East traps capture more sediment than south traps.
 - There was a slope effect.
 - N/S 0-1.3%, E/W-0%
- Imprint traps capture more sediment than drill traps.
 - Drilled plots were more effective at capturing sediment before it got to the trap.
- Pecan branch treatments were the most efficient on both drilled and imprinted plots.



Take Home Message

- Doing something is better than nothing!
- Don't just stand there and let it wash away!

Photo of the San Simon at the last drop structure before it flows into the Gila River.



Thank you, crew
leaders!
Eastern Arizona College

Shawn Nelson 2015-2016



Kyle Tate 2013-2014



Amber Caldwell 2017-2018



