



United States Department of Agriculture

Natural Resources Conservation Service

High Resolution Elevation Data NRCS Kansas Implementation

Questions related to this presentation may be directed to:

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Topics

- Data Acquisition in Kansas
- Kansas LiDAR Acquisition
- Derived Products
- Partnerships
- Business Integration
- Return on Investment
- Beneficial Outcomes
- Future Acquisition and Integration

Partnerships

- Kansas Applied Remote Sensing
- Kansas Water Office
- Kansas Geological Survey
- Kansas Department of Agriculture
- Kansas Department of Health and Environment
- Kansas Forest Service
- Playa Lakes Joint Venture
- Kansas Alliance for Wetlands and Streams

Kansas LiDAR Derived Products

- Digital Elevation Model (DEM)
- Digital Surface Model (DSM)
- Canopy—Height Above Ground
- Change Detection
- Intensity
- Hill shade
- Slope
- Contours

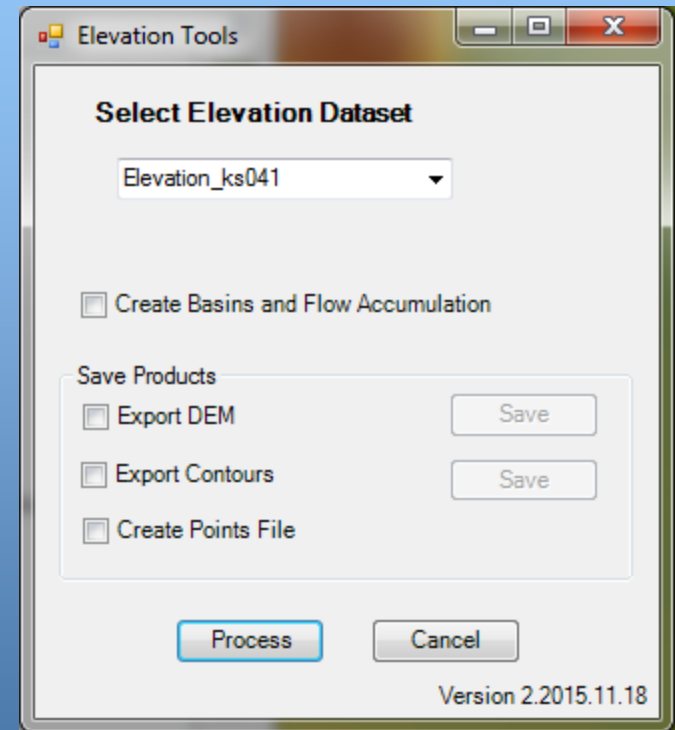
Examples of use will be shown through presentation

Business Process Integration

- Kansas LiDAR Tools
- Engineering
- Conservation Planning and Programs
- Compliance – HEL and Wetlands
- Soils
 - Soil Survey
 - Resource Soil Science

Business Process Integration

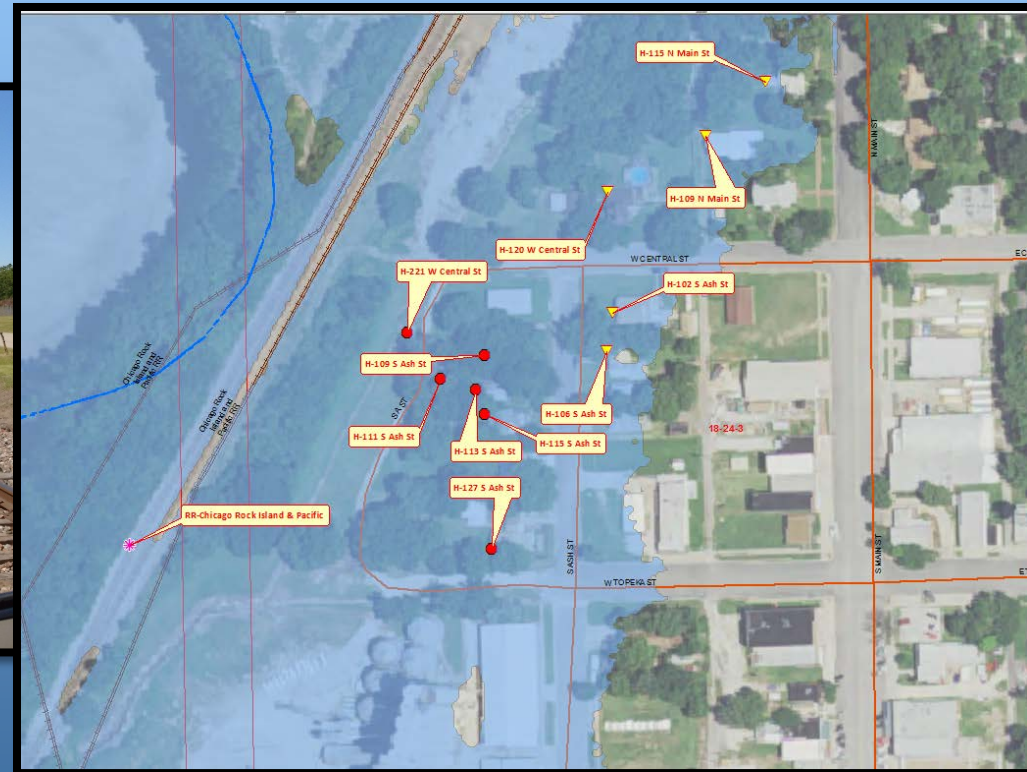
- Kansas LiDAR Tools
 - Elevation Tool
 - HEL Tool (Pilot)
 - Point Filter Tool
 - Engineering Tools



Kansas has developed several tools that assist conservation planners and engineers in the creation of LiDAR derived products and export data to other applications like AutoCAD.

Business Process Integration

- Engineering – Inundation Mapping



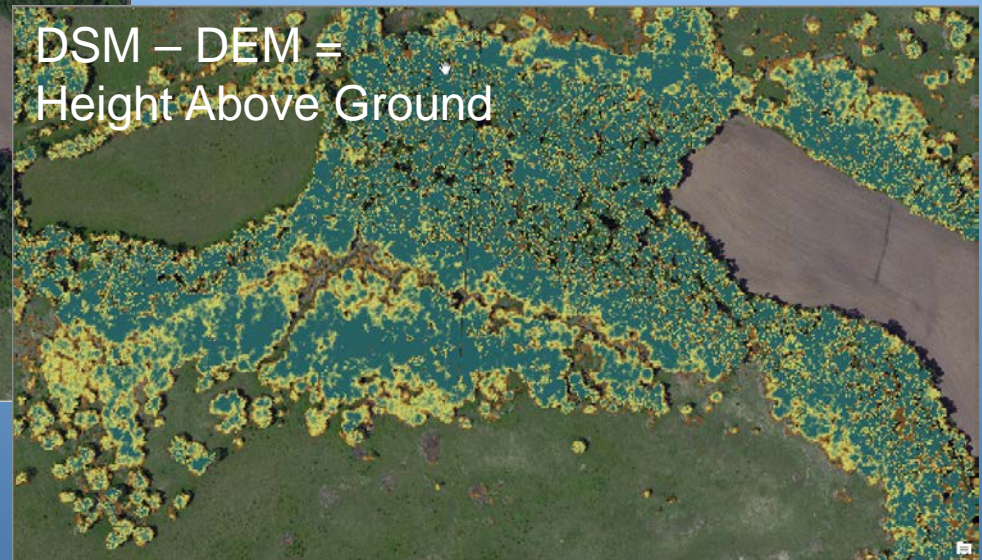
830 PL-566 watershed structures with policy requiring review of downstream inundated zone every 5 years

Business Process Integration

- Conservation Planning—Grazing Lands
 - Slope influence on grazing pattern and utilization
 - Brush management, feasible locations due to slope
 - Water facility locations, gravity flow and tank placement
 - Fence location, non-erosive sites
 - Patch burn firebreaks, ease of travel
 - Structure height and density as it impacts wildlife species such as Lesser-Prairie Chicken

Business Process Integration

- Conservation Planning—Grazing Lands



Example of canopy extent and height dataset derived from LiDAR. This data set can be used to estimate potential stocking rates and areas in need of brush management or timber stand improvement.

Business Process Integration

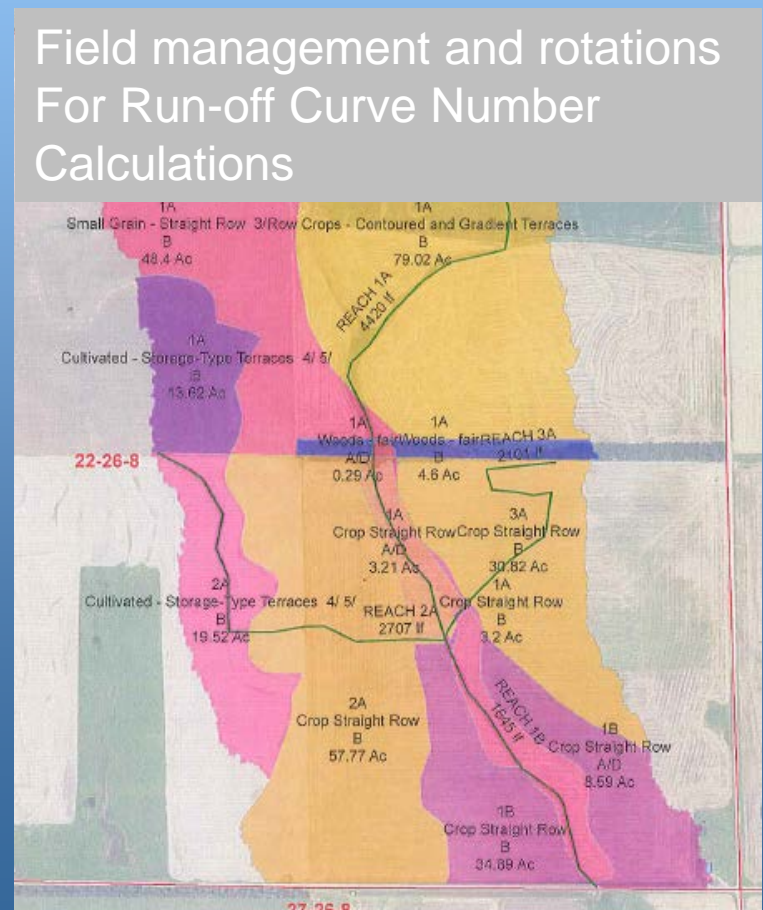
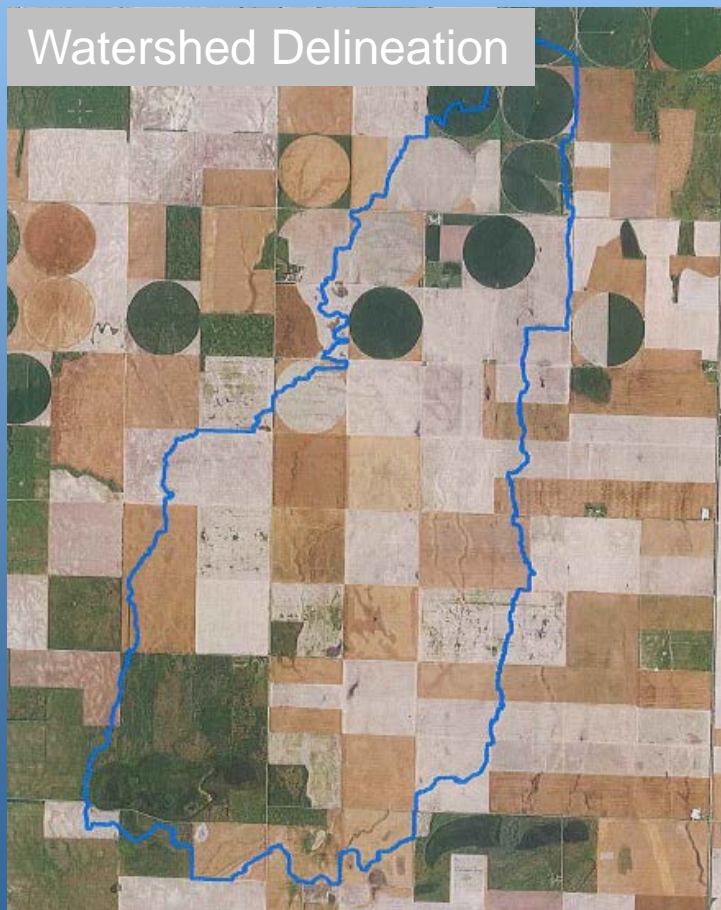
- Conservation Planning—Cropland
 - Higher quality conservation planning
 - Determination of water flow and accumulation
 - Resource Inventory with hill shade
 - Identification of potential erosion areas
 - Potential wetland identification and delineation
 - Preliminary determination for functionality of conservation practices
 - More accurate placement of conservation practices
 - Fewer planning errors leads to fewer contract modifications

Business Process Integration

- Conservation Planning—Cropland
 - Hydrology Determinations
 - Irrigation and Livestock pipeline design
 - Waterway and terrace layout and design
 - Stage Storage determinations for engineering designs
 - Used on more complex sites to supplement onsite survey data

Business Process Integration

- Conservation Planning—Examples

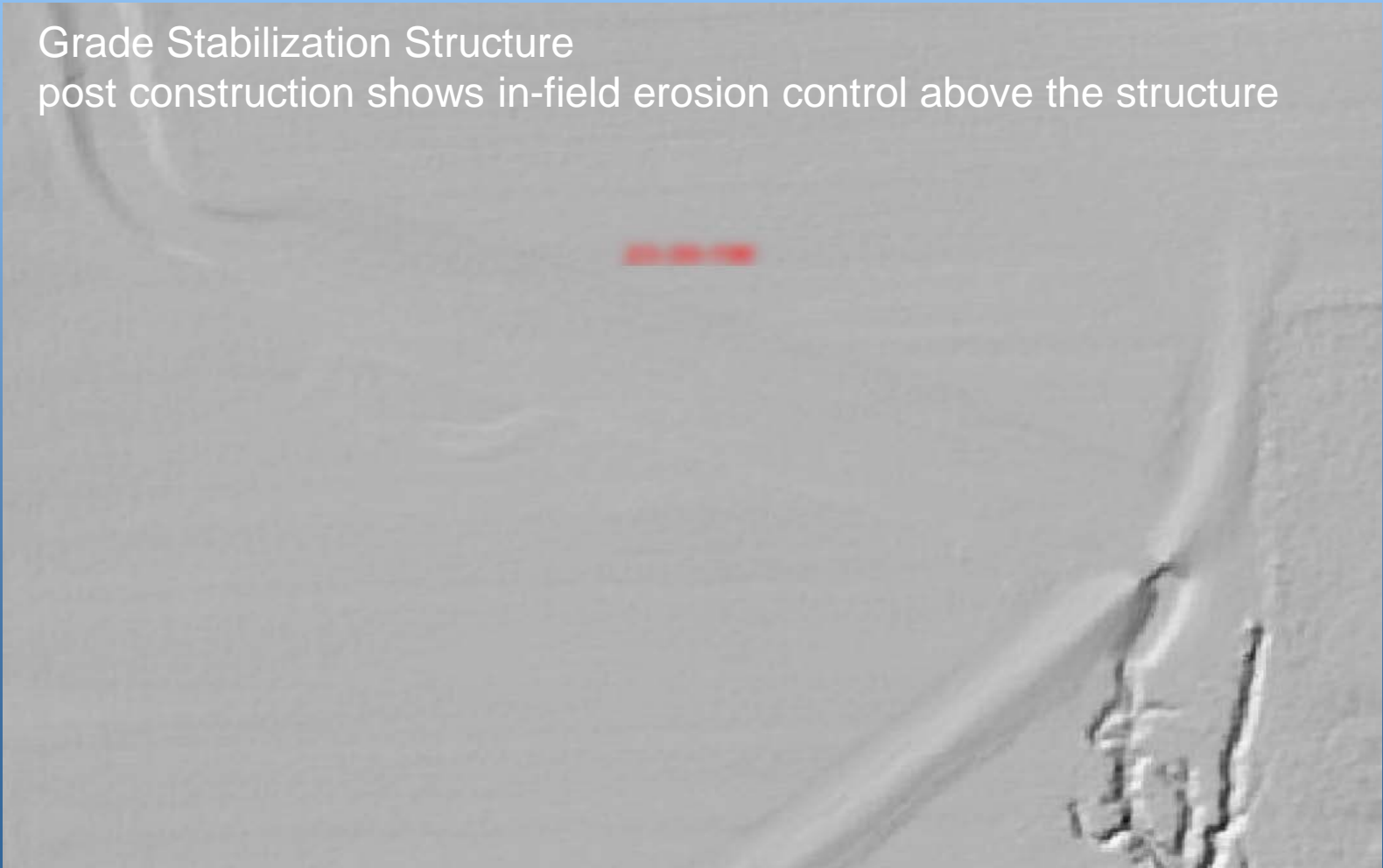


Business Process Integration

- Conservation Planning—Examples

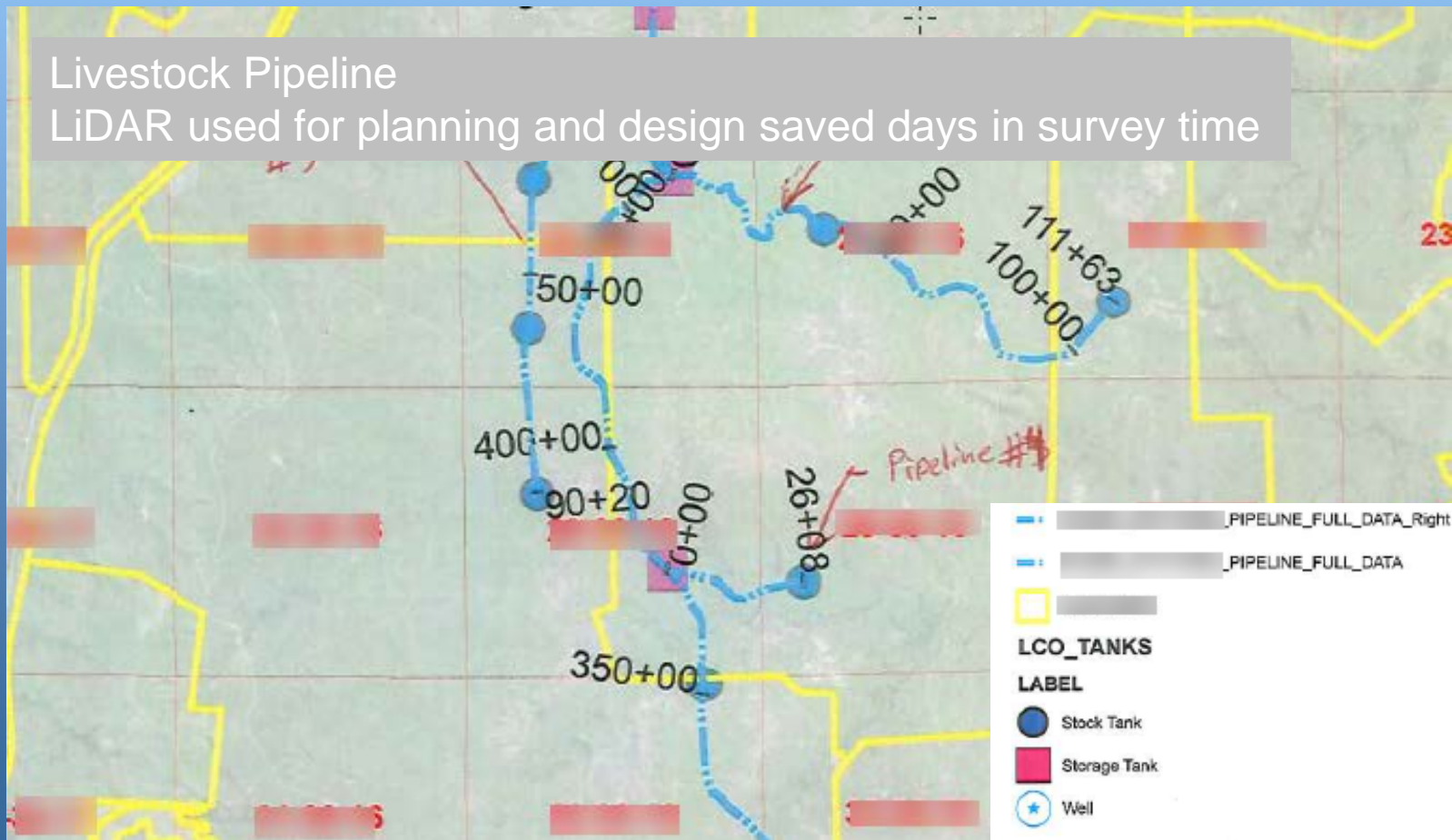
Grade Stabilization Structure

post construction shows in-field erosion control above the structure



Business Process Integration

- Conservation Planning—Examples



Business Process Integration

- Compliance – HEL

HEL Determination Soil Report

Report Generated: June 22 2017 by Chad Volkman

Determination Number:

Total Field Acres: 74.9

County: Republic County, Kansas

Legal:

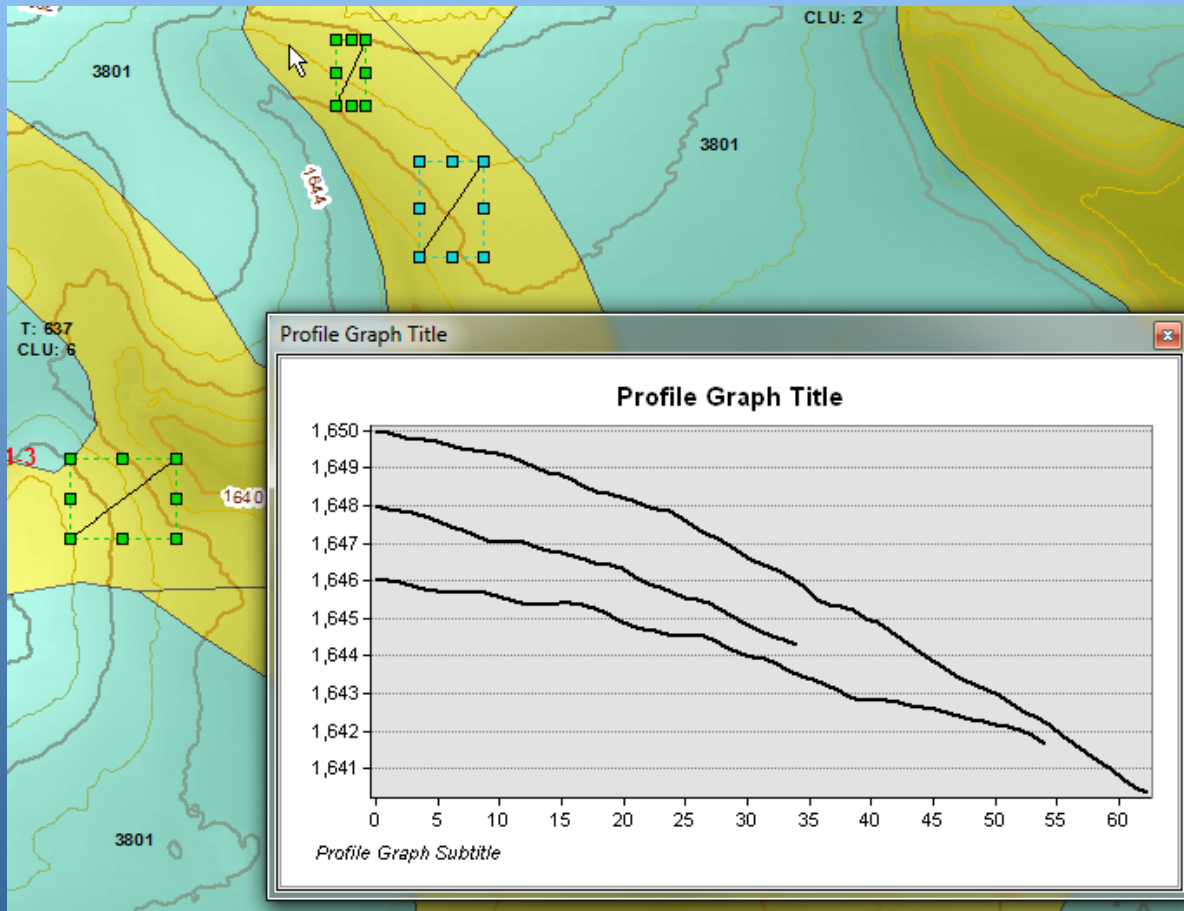
Soil Map Unit Summary				
Acres	Percent	MUSYM	Map Unit Name	Map Unit HEL
40.9 ac.	54.6%	3874	Hastings-Hobbs complex, 0 to 25 percent slopes	Potentially Highly Erodible
29.7 ac.	39.7%	3801	Crete silt loam, 1 to 3 percent slopes, loess plains and breaks	Not Highly Erodible
4.3 ac.	5.7%	3802	Crete silty clay loam, 3 to 7 percent slopes, eroded, loess plains and breaks	Potentially Highly Erodible

Map Unit HEL Summary		
Map Unit HEL	Acres	Percent
Potentially Highly Erodible	45.2 ac.	60.3%
Not Highly Erodible	29.7 ac.	39.7%

Field is Potentially Highly Erodible.

Business Process Integration

- Compliance – HEL



Business Process Integration

- Compliance – HEL

HEL Determination Profile Tool Report

Report Generated: June 22 2017 by Chad Volkman

Determination Number: [REDACTED]

Location: Republic County, Kansas

Legal: [REDACTED]

Profile Number	Slope Length (ft)	Percent Slope	LS
1	204.259	4.706	0.578
2	111.298	3.32	0.328
3	177.222	2.464	0.284

$175.0 \times 0.32 \times 0.397 / 5.0 = 4.44267$

R x K x Average LS / T = EI

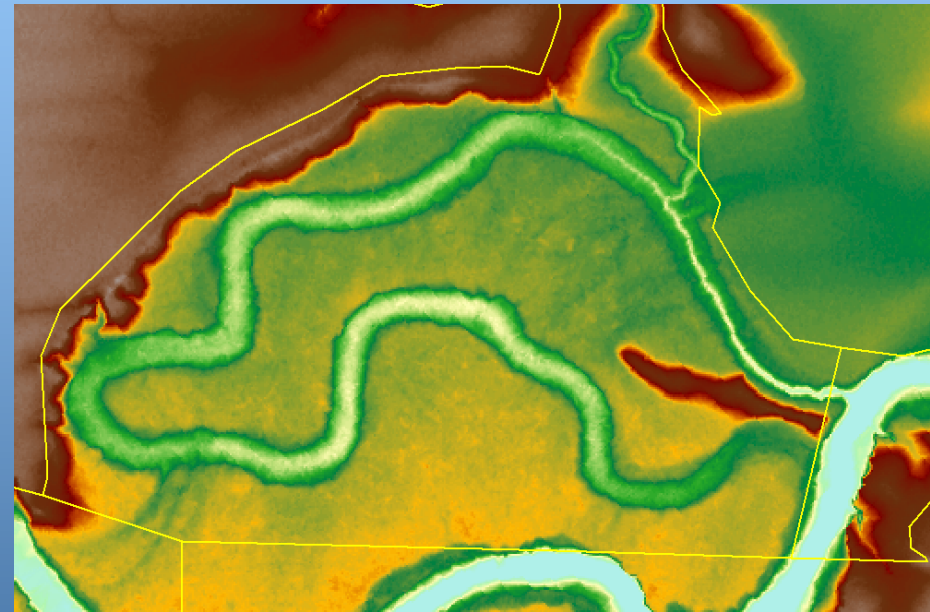
Soil Mapunit: 3874, Hastings-Hobbs complex, 0 to 25 percent slopes

Field is NHEL



Business Process Integration

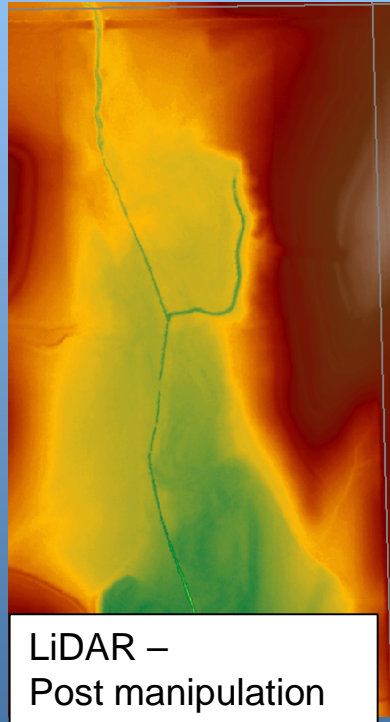
- Compliance – Wetlands



Often potential wetland areas are not visible on imagery. Without LiDAR there is no pre-mapping, and much more time walking.

Business Process Integration

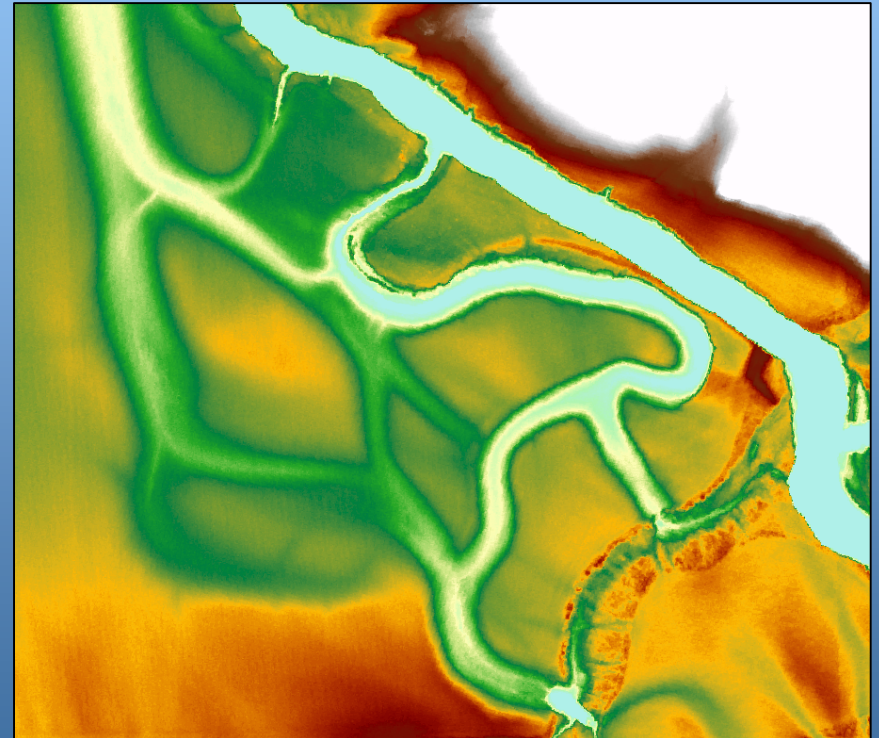
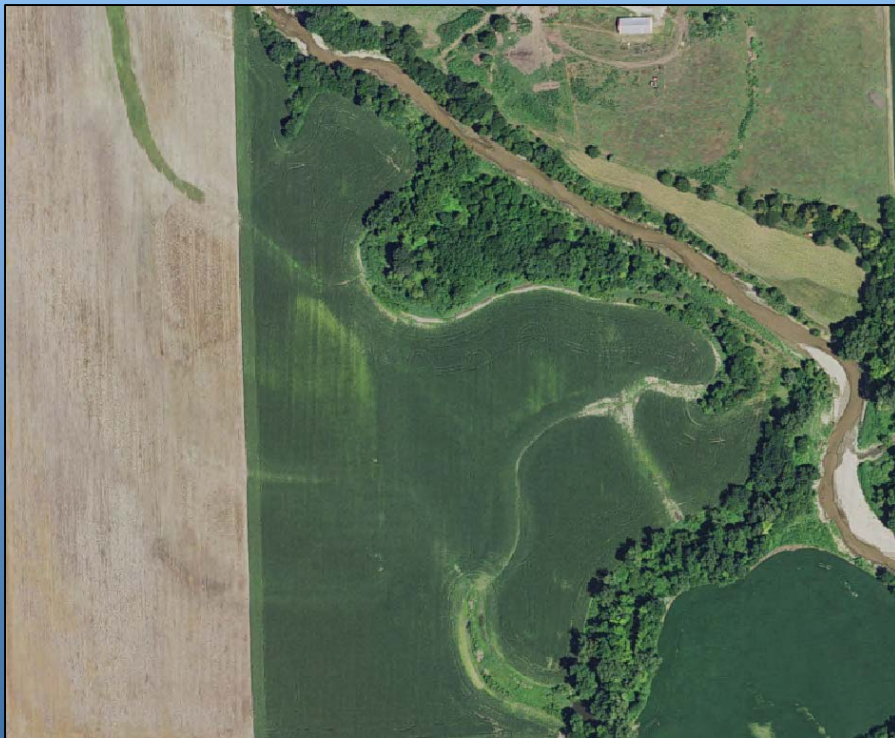
- Compliance – Wetlands



Multiple acquisitions of imagery and LiDAR will allow the agency to see timing, location, and amounts of cut and fill due to manipulation.

Business Process Integration

- Soils – Resource Soil Science



DEM derived from LiDAR can show channel movement over time due to the detailed vertical resolution of the dataset.

Return on Investment

- Survey 1
 - Identify and score potential used of LiDAR and derived products
 - Identify and score tangible and intangible benefits
- Survey 2
 - Quantify time savings
 - Qualify work product quality

Return on Investment

Survey 1 potential uses

- Engineering, Soils, Planning, Range, Other
- Plan and Practice Alternatives
- Maps for owners and operators
- Drainage Area, Slope, Flow Length
- Watershed scale planning
- Wetland identification and determination

Return on Investment

Significant savings with use of LiDAR or derived products

- Field Survey During Planning (17,220 hours, \$624k)
- Field Survey During Design (13,956 hours, \$516k)
- Determine Drainage Area/Slope/CN/Q (13,744 hours, \$497k)
- Planning Design Alternatives (9,782 hours, \$352k)
- Designing Waterways (5,038 hours, \$177k)
- Designing Livestock Pipelines (4,316 hours, \$155k)
- Dam Breach Analysis/Hazard Classification (3,390 hours, \$146k)
- Designing Terraces (2,545 hours, \$85k)
- Designing Wetland Restoration/Enhancement (1,136 hours, \$50k)
- Wetland Determinations/Hydrology (1,044 hours, \$44k)

Return on Investment

- Survey 2 details
 - Workload over given 12 month period
 - Time to complete work product
 - Without LiDAR
 - With LiDAR
 - Two FTE groups
 - GS-5/7/9 at \$30/hr
 - GS-11/12 at \$45/hr
 - Computed 12 month period
 - ~84,000 hours saved
 - ~\$3.1 million budget savings
 - ~40 FTE savings

Beneficial Outcomes

- Efficiency gains in business workflow
- More alternatives being provided to producers
- Higher quality conservation planning
- Increased accuracy for conservation practice measurements
- More efficient use of federal funds and lower cost for producer implementation
- Fewer modification, cancellations, terminations
- Additional information for appeals
- Increased coordination with partnerships

Future Acquisition and Integration



Surveying Technical Note
210-SRVN-01

January 2015

Using LiDAR for Planning and Designing Engineering Practices

Kansas concludes quicker ROI with statewide QL2 coverage, more business integration, and continued compliance with policy

Table 3 Examples of minimum LiDAR quality level recommended for practice design use and applicable practice types

Design use	Applicable practice types	Minimum quality level requirement
Stage storage computations	Wetland or water impoundment stage storage areas	QL 2
	Pond or dam reservoir impoundment stage storage areas	QL3
Excavation	Wetland macrotopography areas	QL 2
Waterway channel hydraulics	Grassed waterways, terraces, etc.	QL 2
Grade and location	Pipelines and irrigation systems	QL 3
Channel/floodplain cross sections	Flood routing/stage capacity	QL 2
Watershed hydrology: area, slope, and flow length determination	All types	QL 3

Discussion



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