

LIDAR: Statutory Compliance Benefits for Nebraska Natural Resources

2011 Nebraska GIS Symposium

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Overview

- Statutory Responsibilities
 - The South-Central LiDAR project
 - Applications:
 - Storage
 - Morphology
 - Hydraulics
 - Mapping
 - Benefits
 - New stuff!
- 

Statutory Responsibilities:

- Surface Water Administration and Appropriation
 - Safety of Dams and Reservoirs
 - Flood Plain Management
 - Compacts and Decrees
 - Groundwater Management and Protection Act
- 

The South-Central Project:

Funding Collaborators:

- RWBJV and PRRIP
- USGS, USDA-NRCS KS and NE
- DNR
- Central Platte, Tri-Basin, Lower Republican, Little Blue, and Upper Big Blue NRDs
- Kansas GIS Policy Board

Other Funding Sources:

- NET
- NRCS Conservation Innovation Grant
- IWMPPF

In-Kind Contributors:

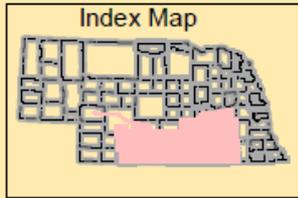
- USFWS
- NGPC

Specifications:

- 0.7 and 1.4 meter GSD
- Vertical accuracy: 18.5cm @ 1.4m GSD
- Vertical accuracy: 9.2cm @ 0.7m GSD
- Classifications: unclassified, ground, low point and noise, water, overlap
- Data collected under leaf-off conditions

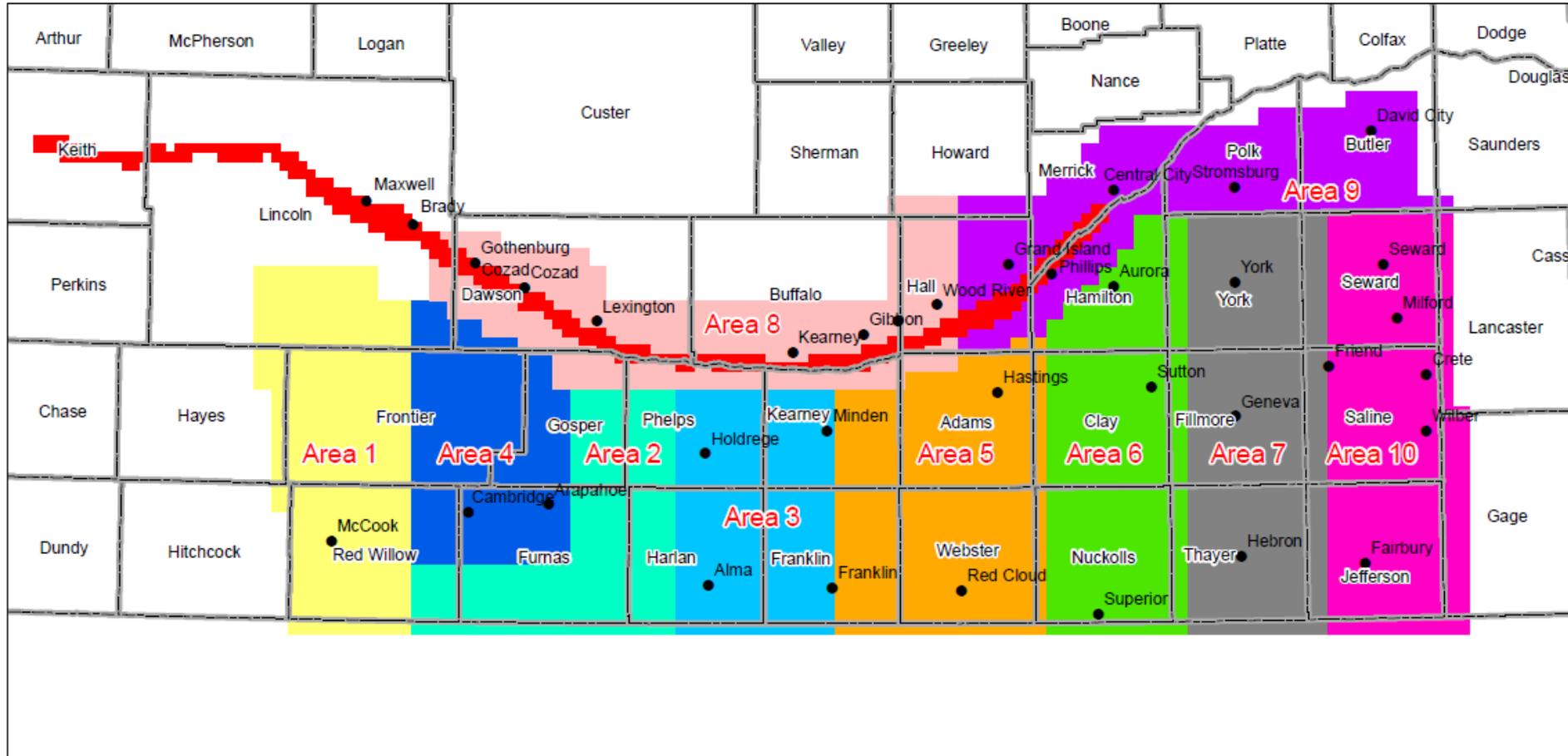
LIDAR - South Central Nebraska

Sub-District 1 and Sub-District 2



Legend

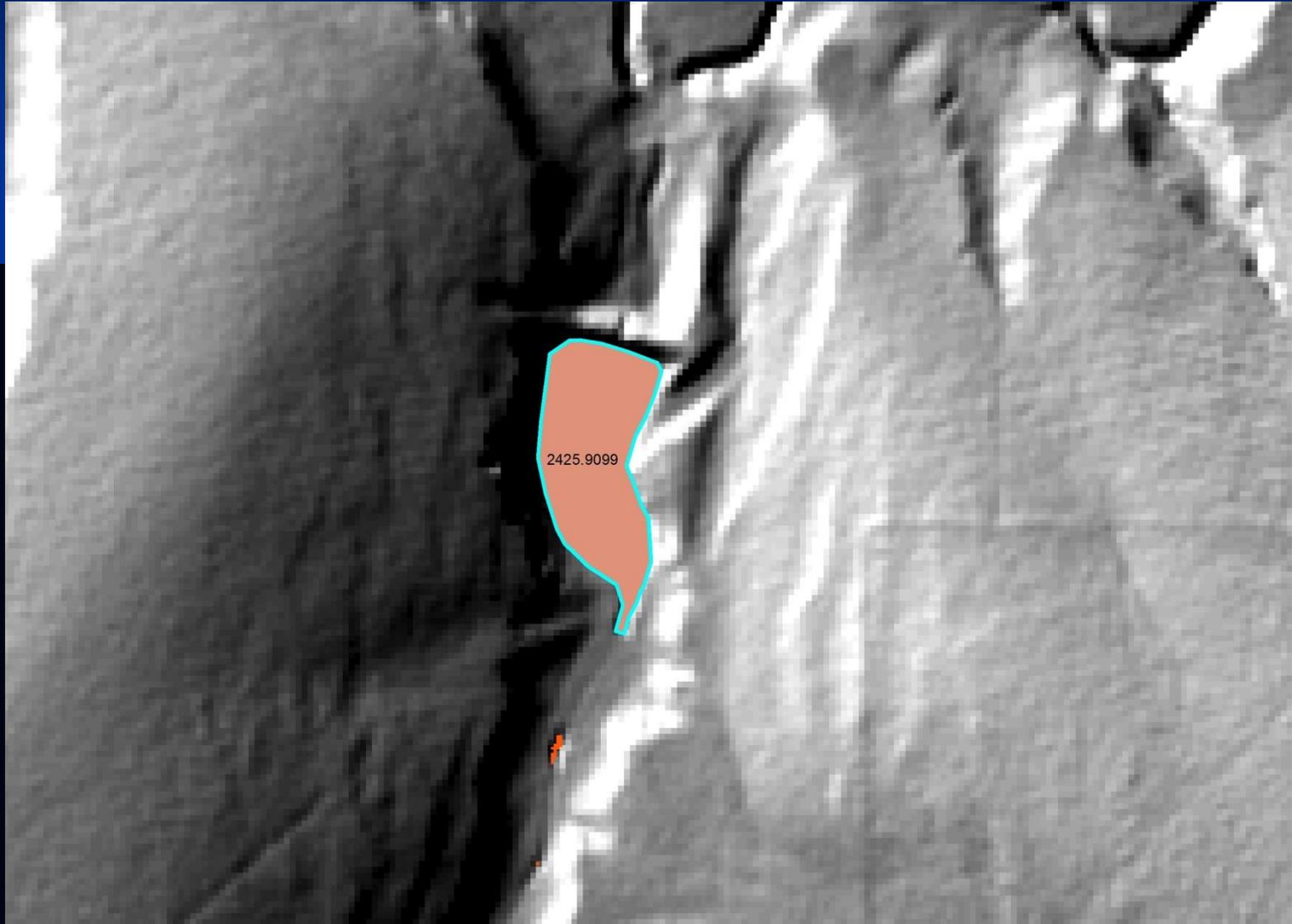
- Subdistrict 1 Platte River
- Subdistrict 2 - Central Nebraska
- sub2_area1_grids
- sub2_area2_grids
- sub2_area3_grids
- sub2_area4_grids
- sub2_area5_grids
- sub2_area6_grids
- sub2_area7_grids
- sub2_area8_grids
- sub2_area9_grids
- sub2_area10_grids
- County Bounds
- Cities



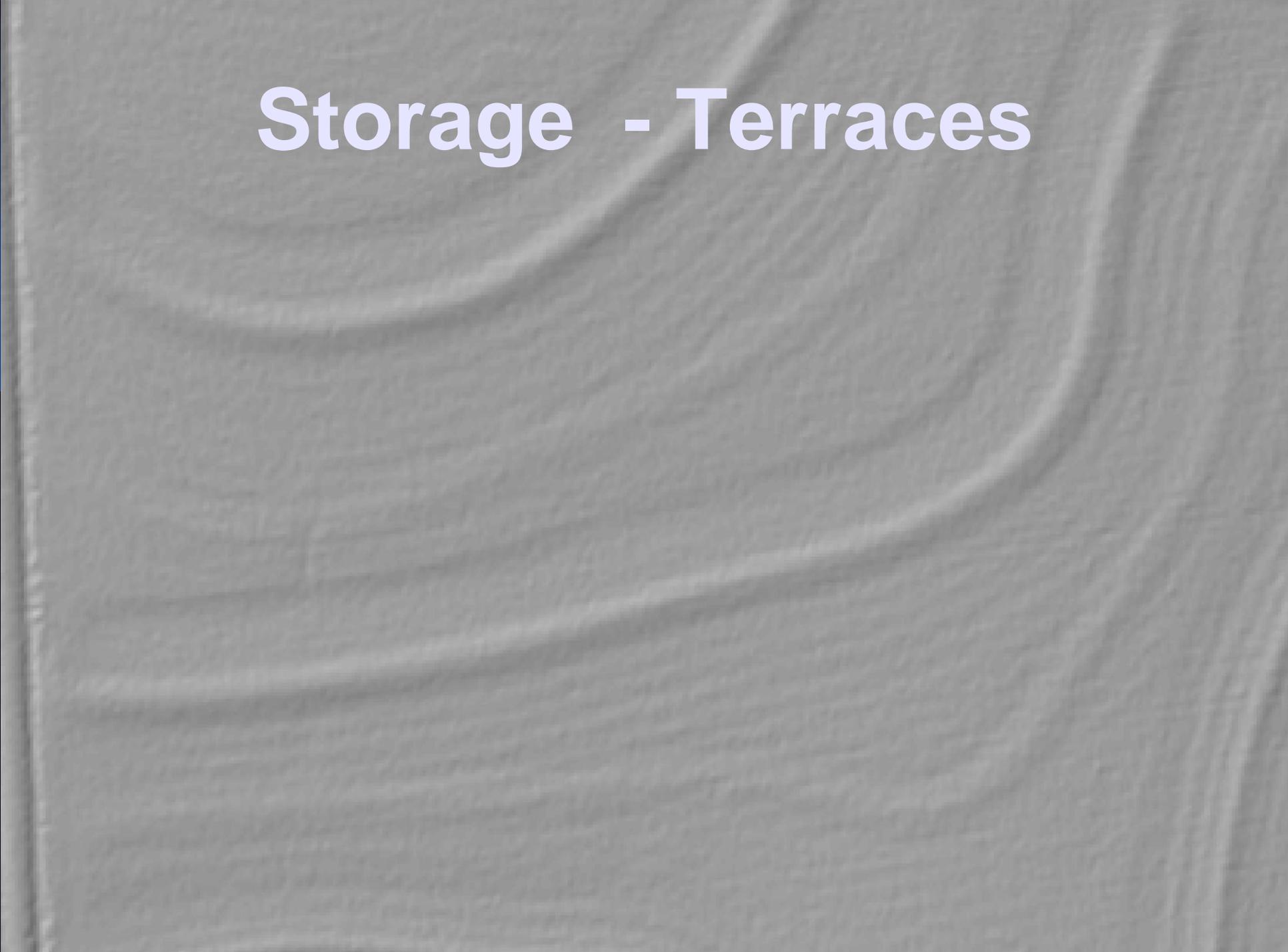
Application – Storage

- PRRIP – small water bodies
 - Groundwater Management and Protection Act – conservation practices
- 
- A decorative graphic consisting of several thick, blue, wavy lines that flow from the bottom left towards the right side of the slide, creating a sense of movement and depth.

Storage – Small Reservoirs



Storage - Terraces

An aerial photograph showing a series of terraced fields on a hillside. The terraces are arranged in a curved, step-like pattern, following the contour of the land. The fields are separated by low, earthen walls. The overall appearance is that of a well-maintained agricultural landscape.

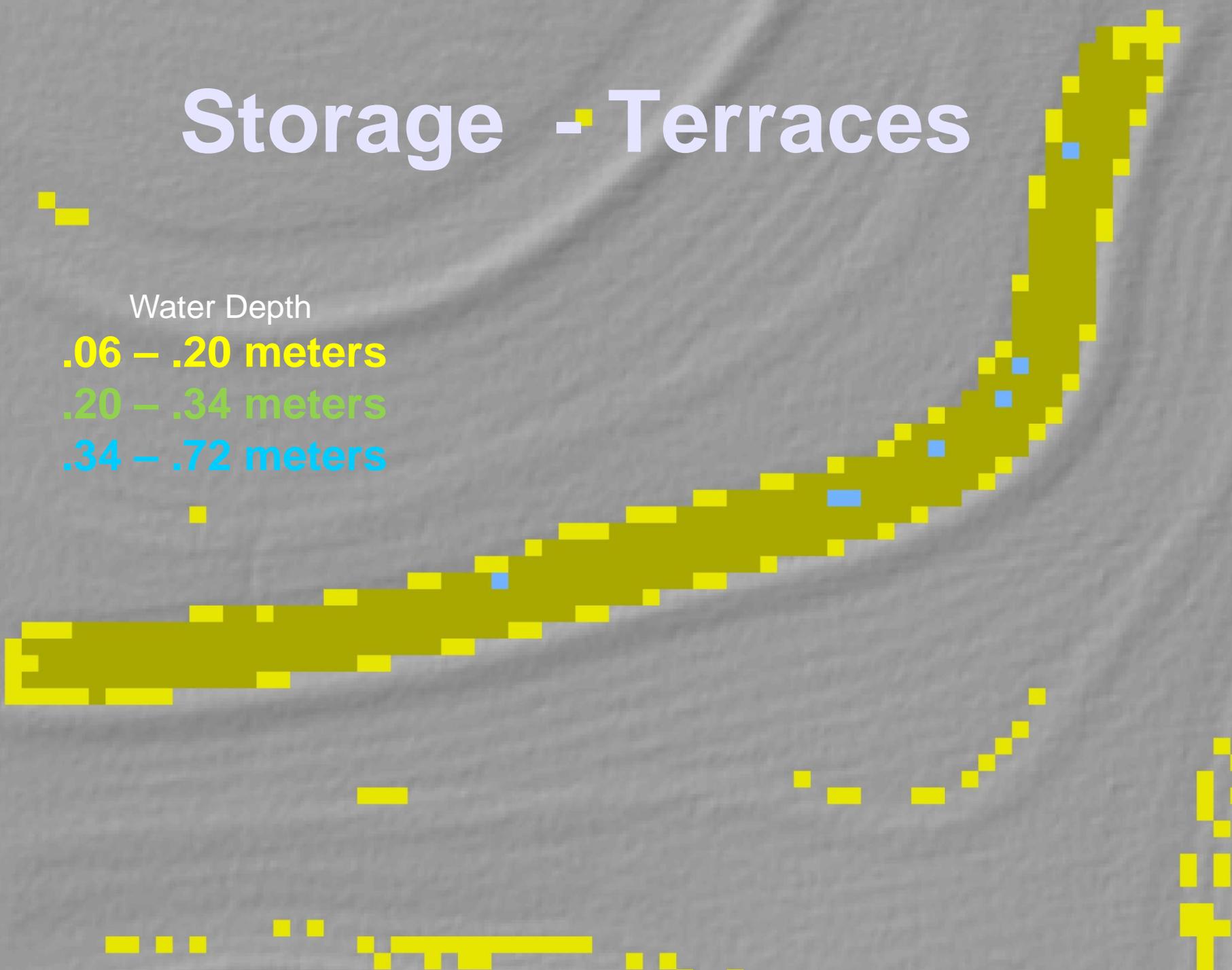
Storage - Terraces

Water Depth

.06 – .20 meters

.20 – .34 meters

.34 – .72 meters



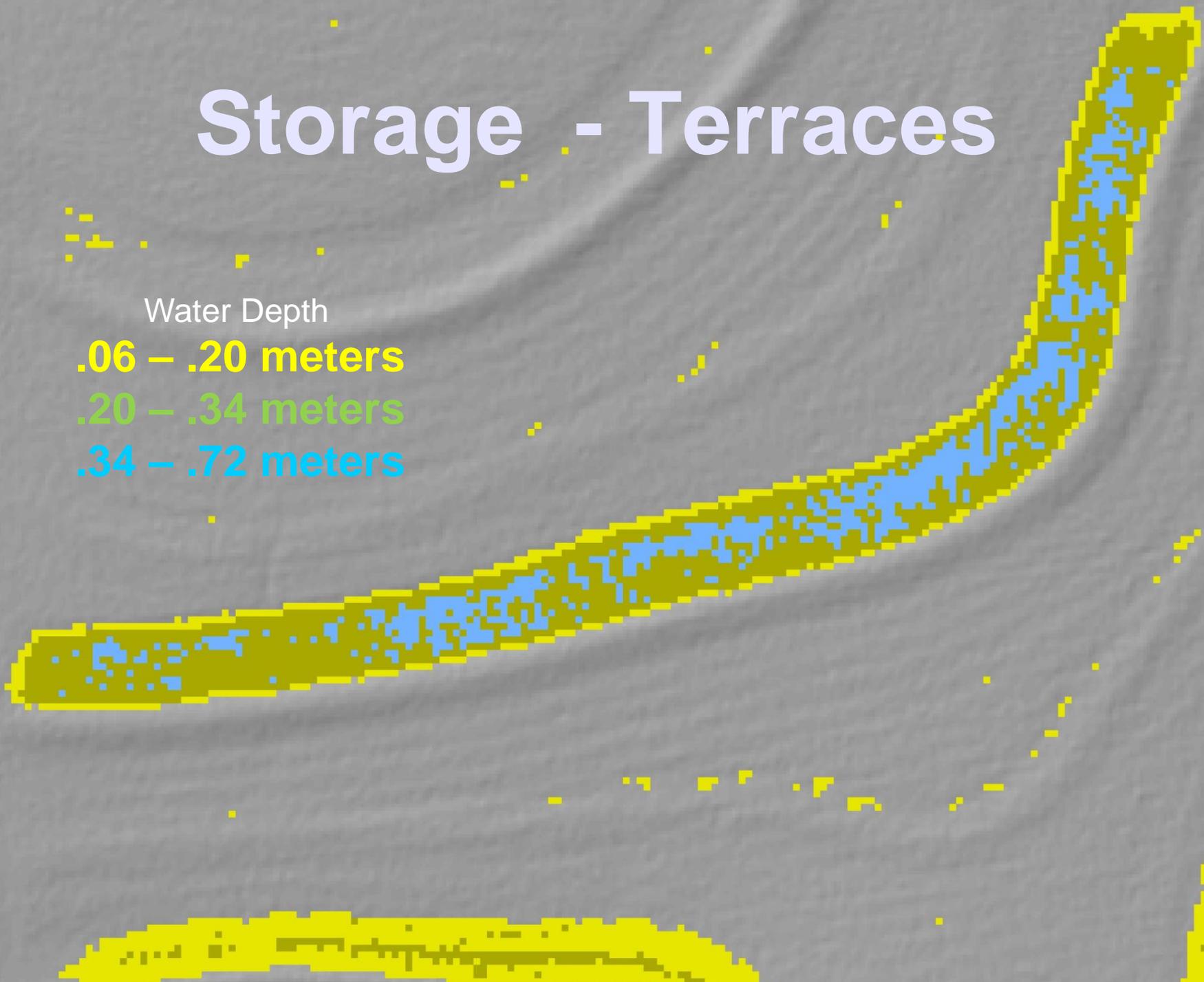
Storage - Terraces

Water Depth

.06 – .20 meters

.20 – .34 meters

.34 – .72 meters



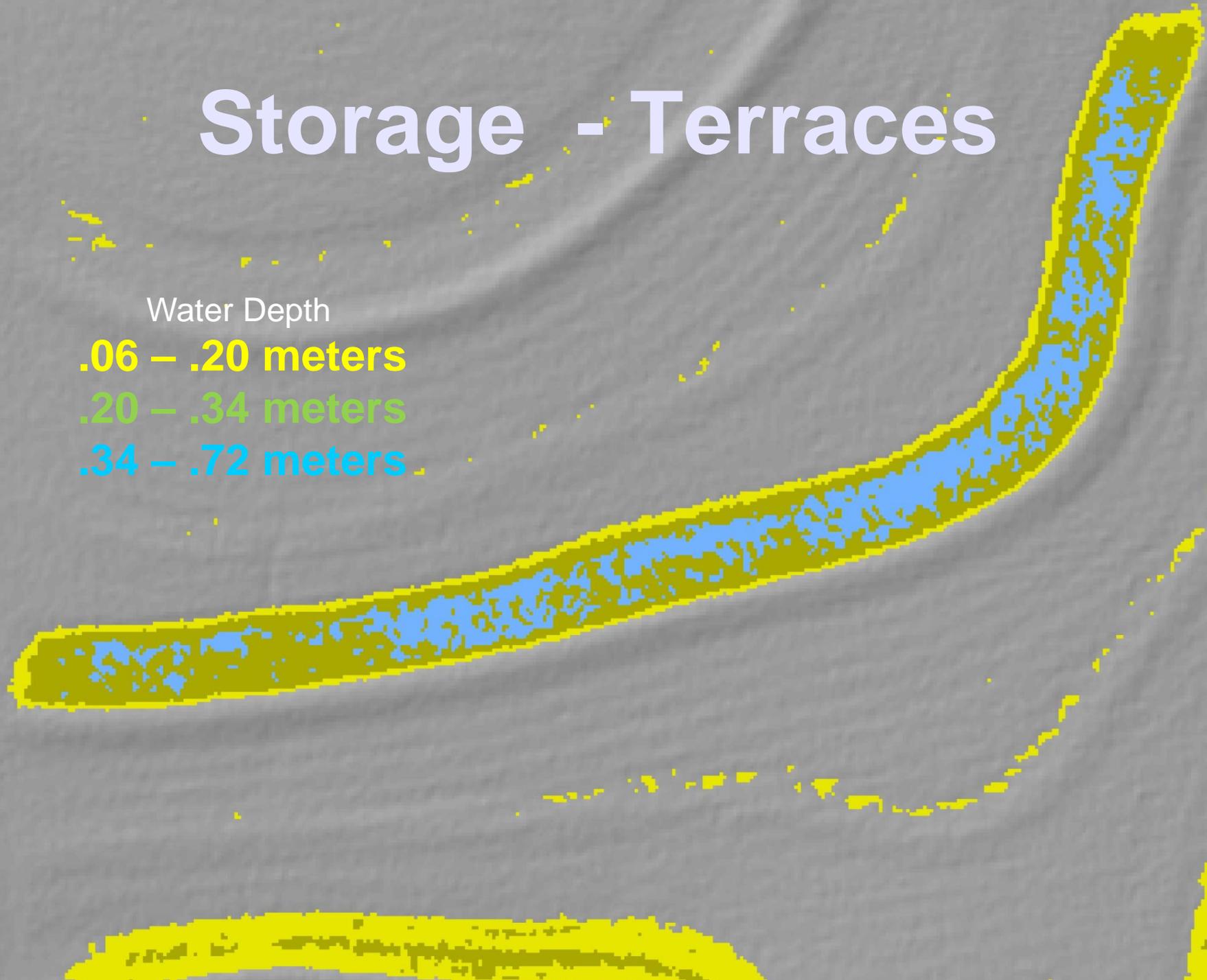
Storage - Terraces

Water Depth

.06 – .20 meters

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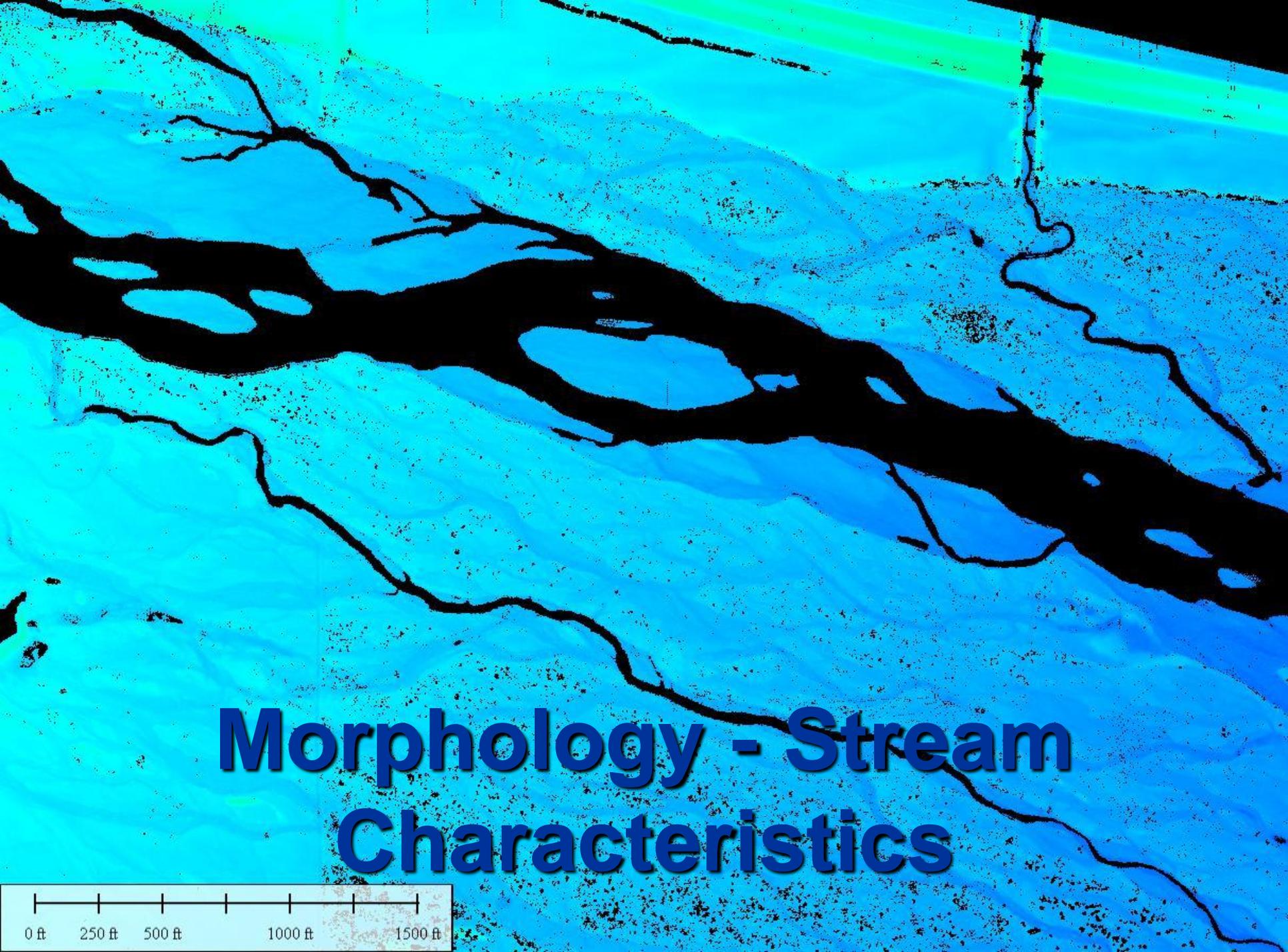
.34 – .72 meters



Application - Morphology

- PRRIP – Stream characteristics in the central Platte
- Natural Resources Districts – Local information and support



An aerial photograph showing a complex network of streams and rivers. The main stream is a wide, dark, meandering channel that flows from the upper left towards the lower right. It has several large, irregular oxbow-like features. Numerous smaller, narrower streams branch off from the main channel, creating a dense, dendritic pattern across the landscape. The terrain appears to be a mix of open fields and wooded areas, with the streams cutting through them. In the bottom left corner, there is a scale bar with markings at 0 ft, 250 ft, 500 ft, 1000 ft, and 1500 ft. The text 'Morphology - Stream Characteristics' is overlaid in the lower center of the image in a large, bold, blue font.

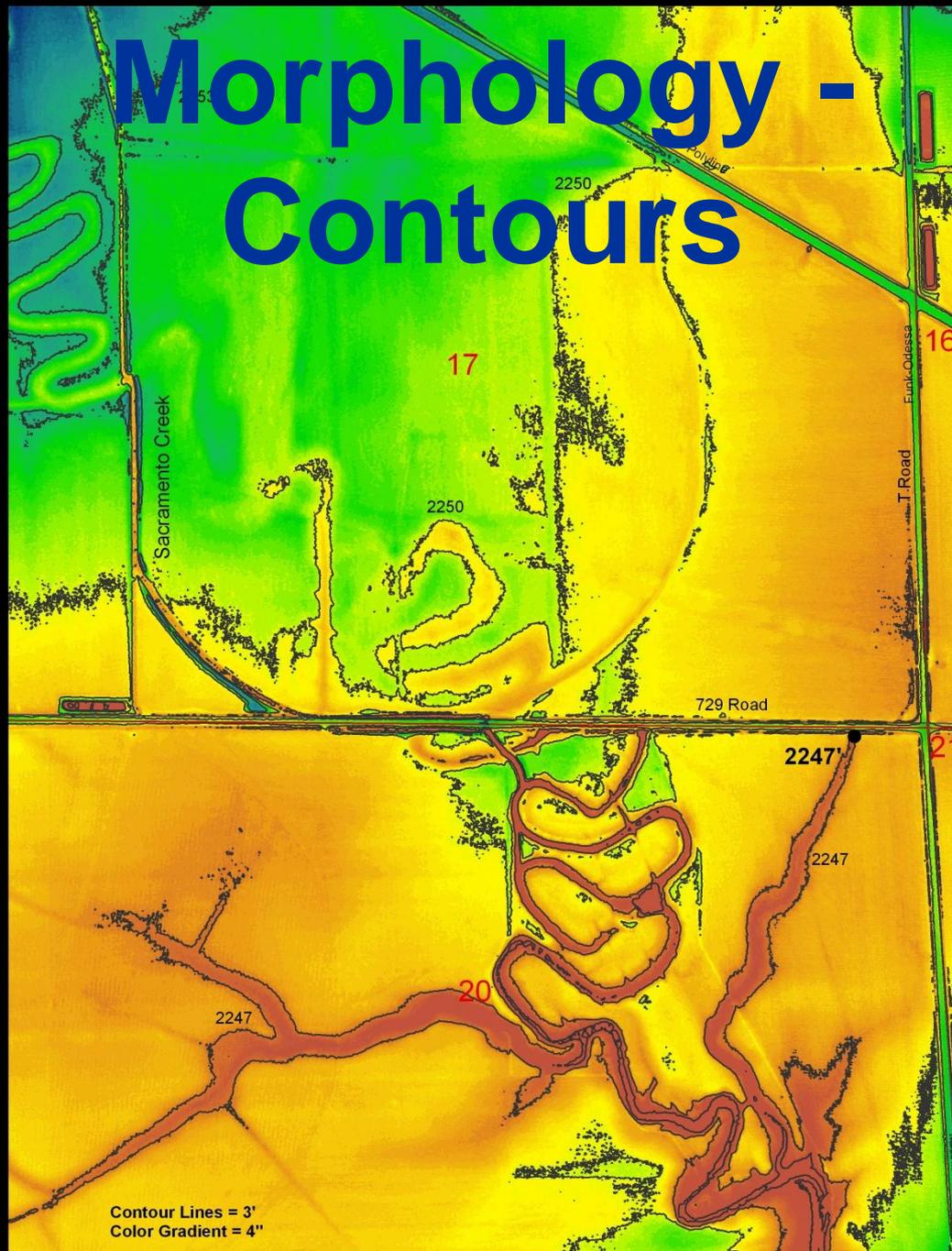
Morphology - Stream Characteristics

0 ft 250 ft 500 ft 1000 ft 1500 ft

Morphology – Stream+



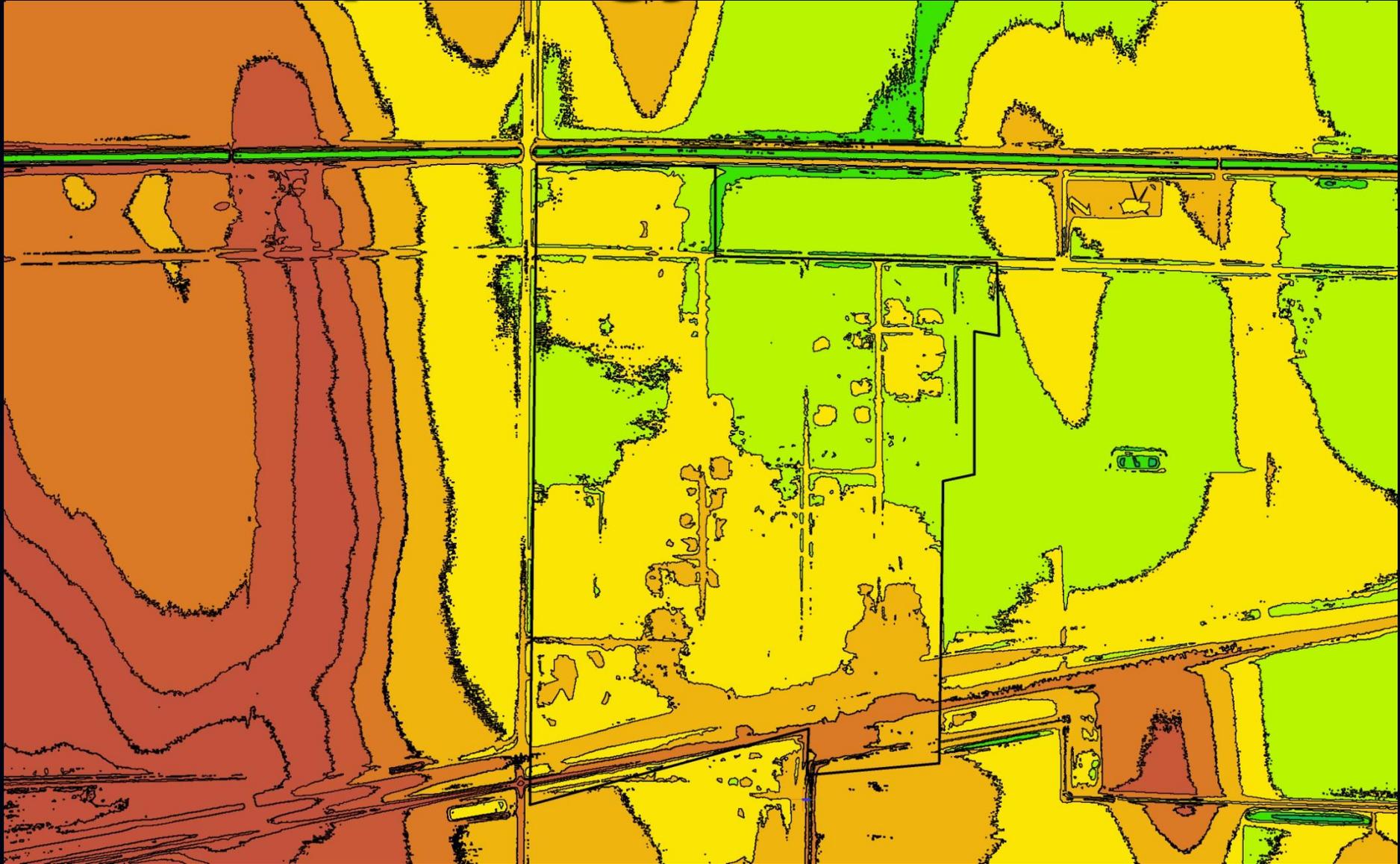
Morphology - Contours



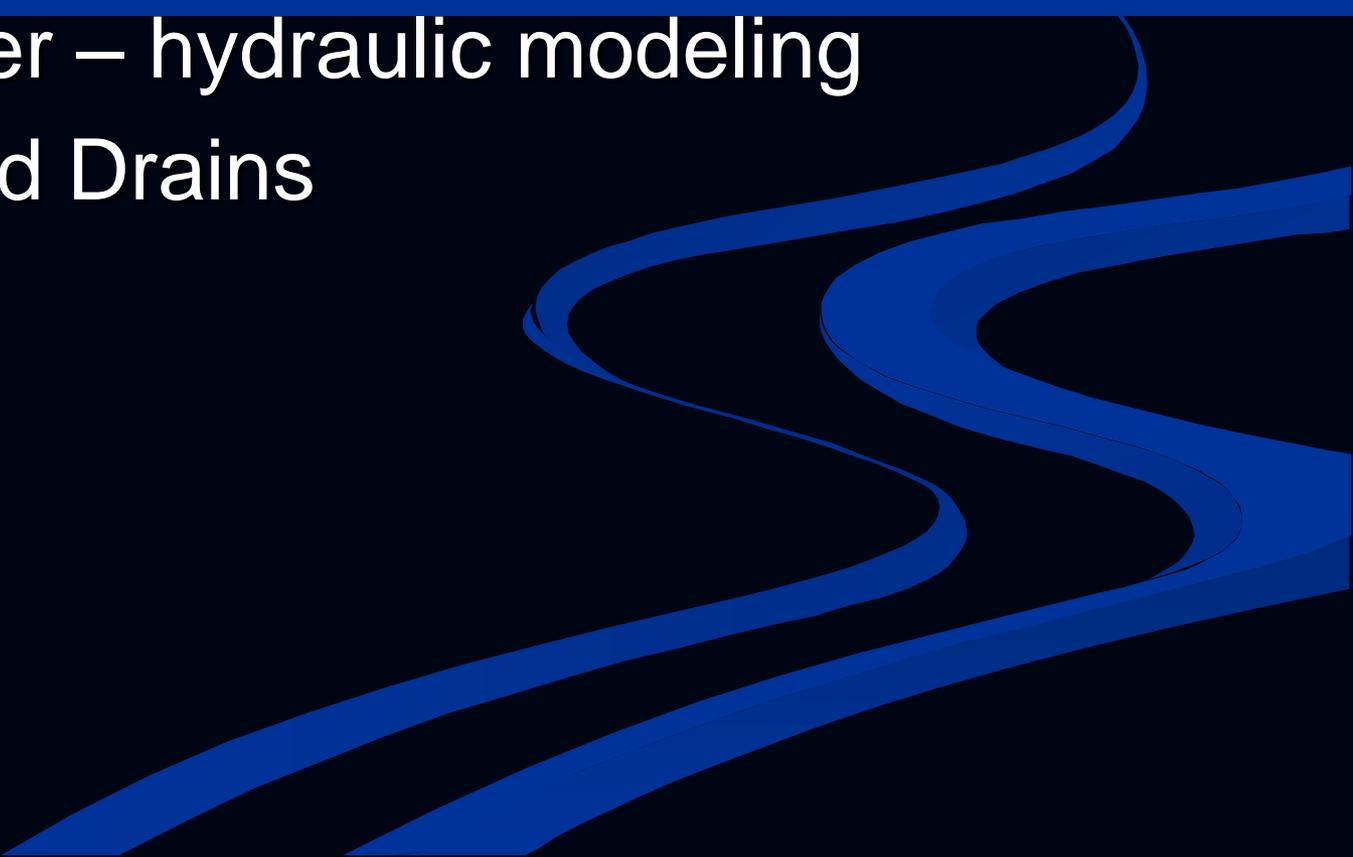
Morphology – Contours



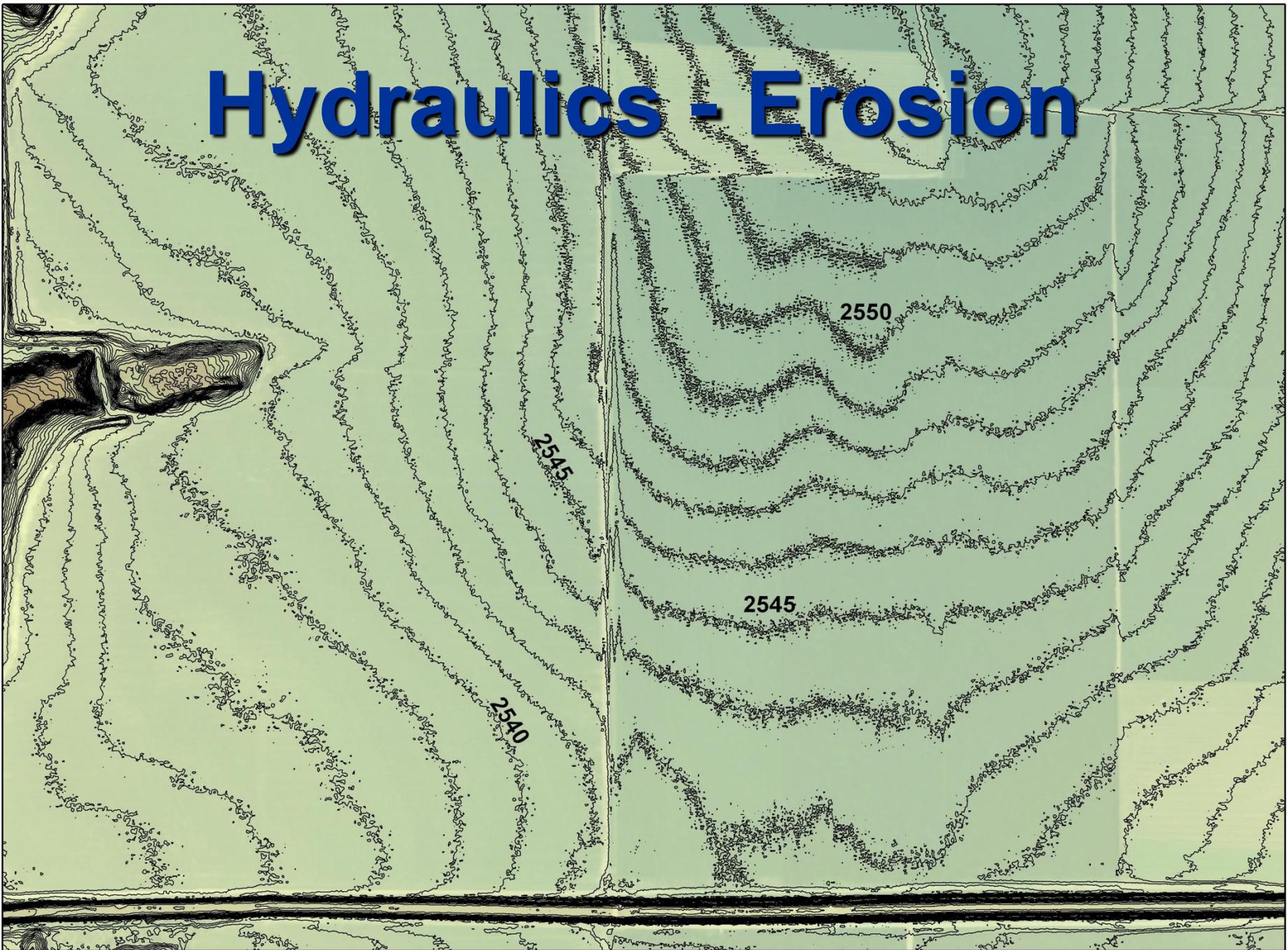
Morphology – Contours



Application - Hydraulics

- Tri-Basin Natural Resources District – landowner assistance
 - Platte River – hydraulic modeling
 - Canals and Drains
- 
- A decorative graphic consisting of several thick, blue, wavy lines that flow from the bottom left towards the right side of the slide, creating a sense of movement and representing water.

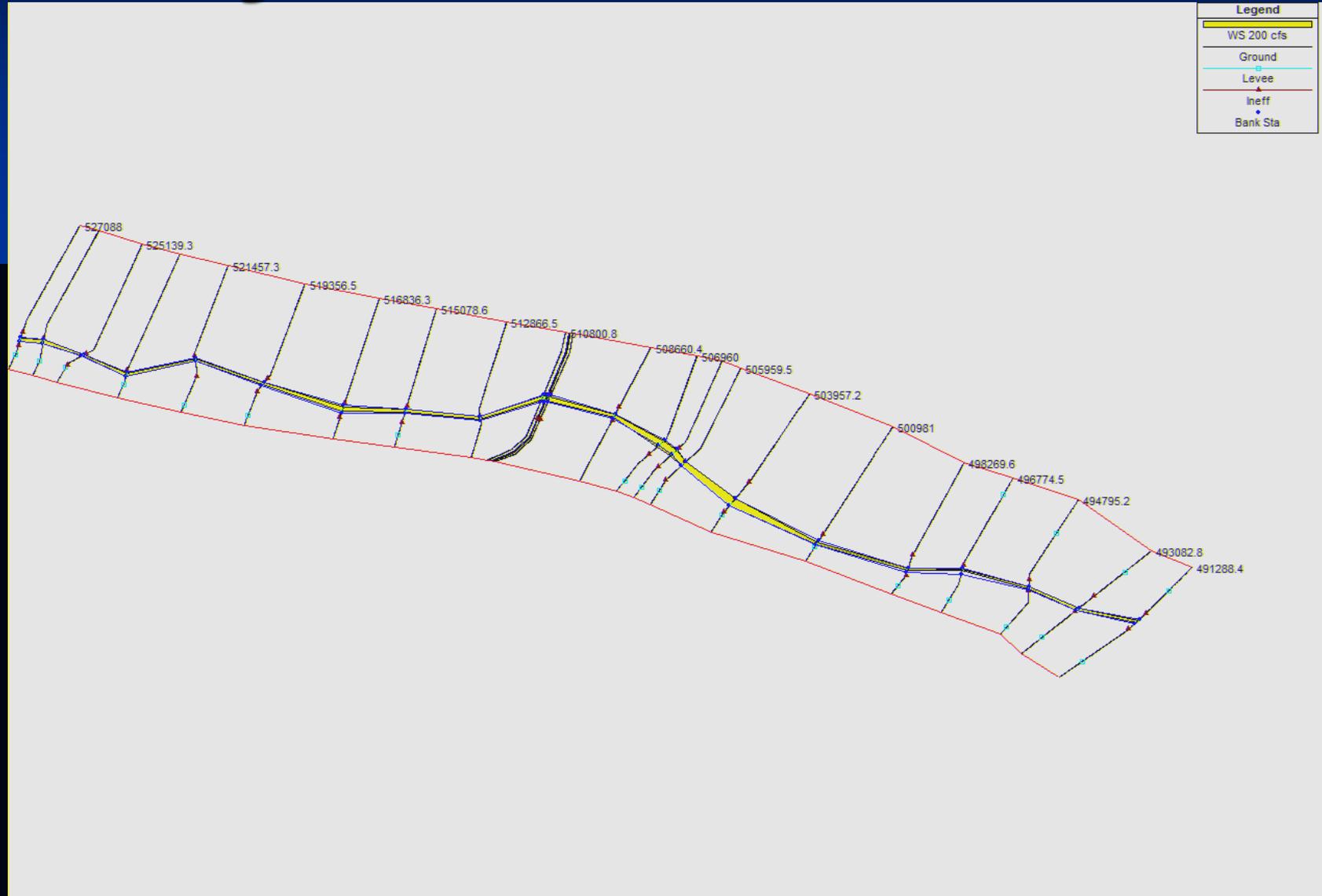
Hydraulics - Erosion



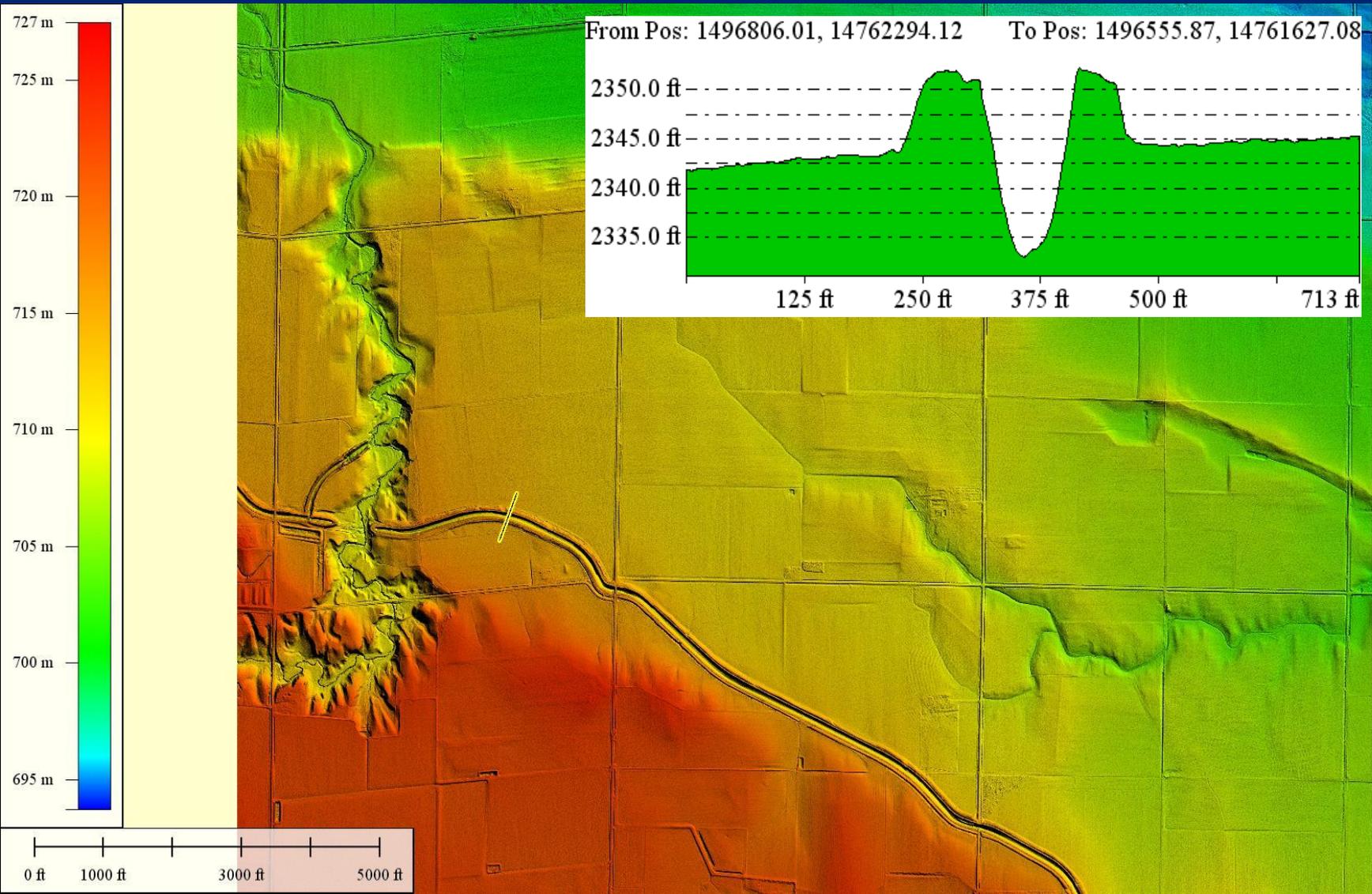
Hydraulics - Streams



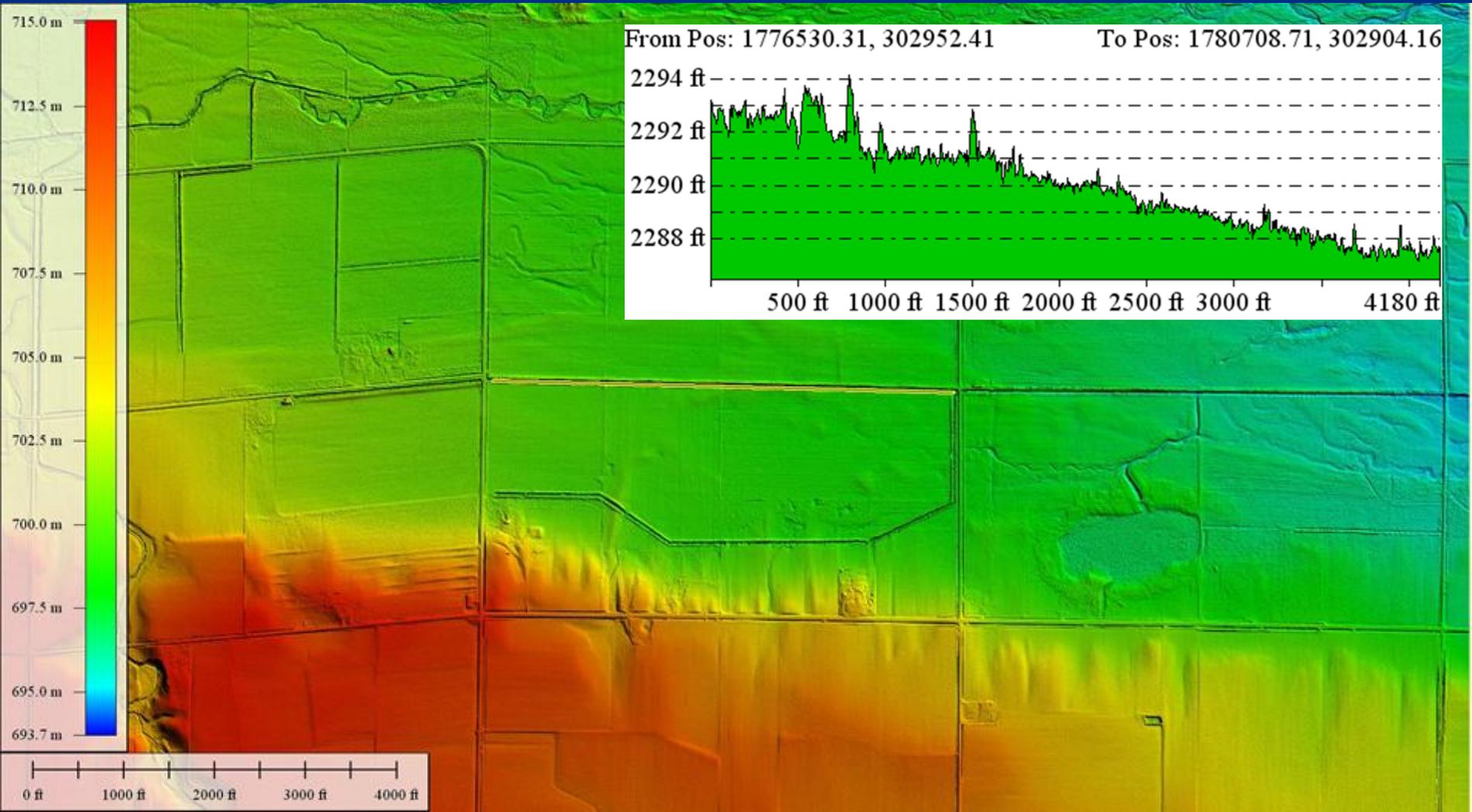
Hydraulics - Streams



Hydraulics – Canal Profile



Hydraulics – Drain Profile

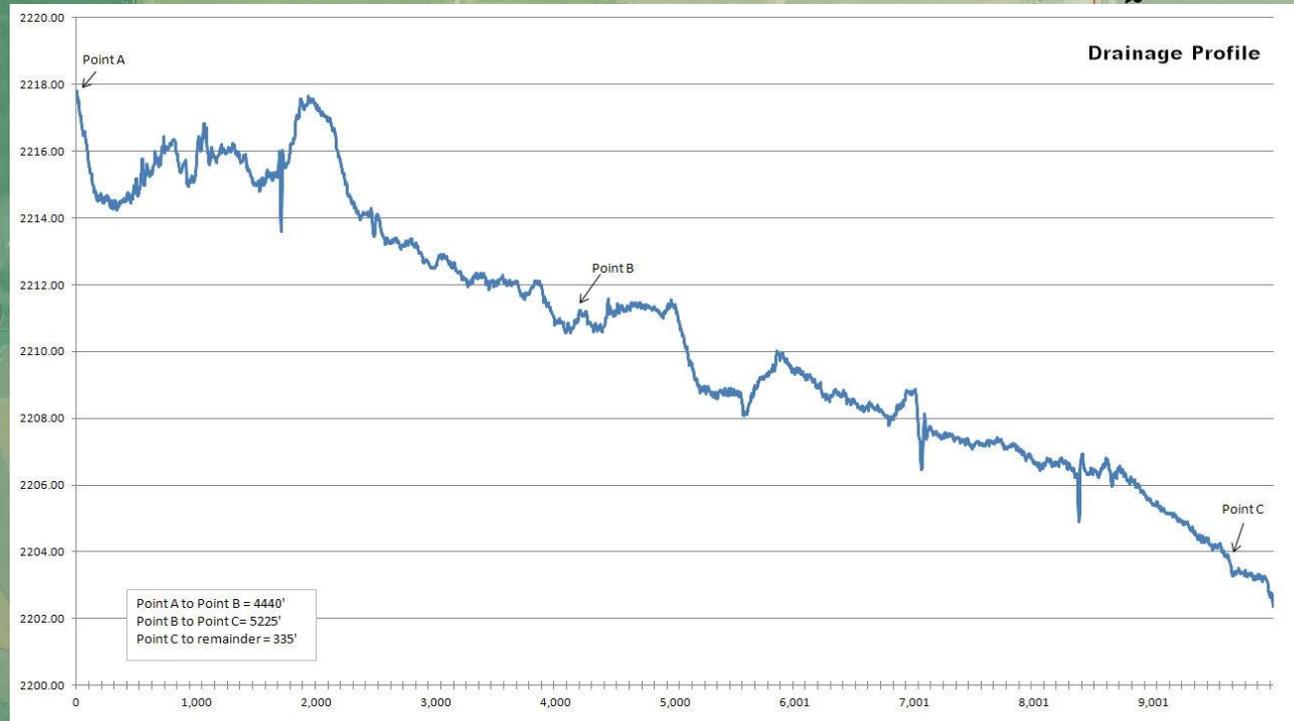


Tri-Basin Natural Resources District Proposed Odessa IPA

747 Road (River Road)

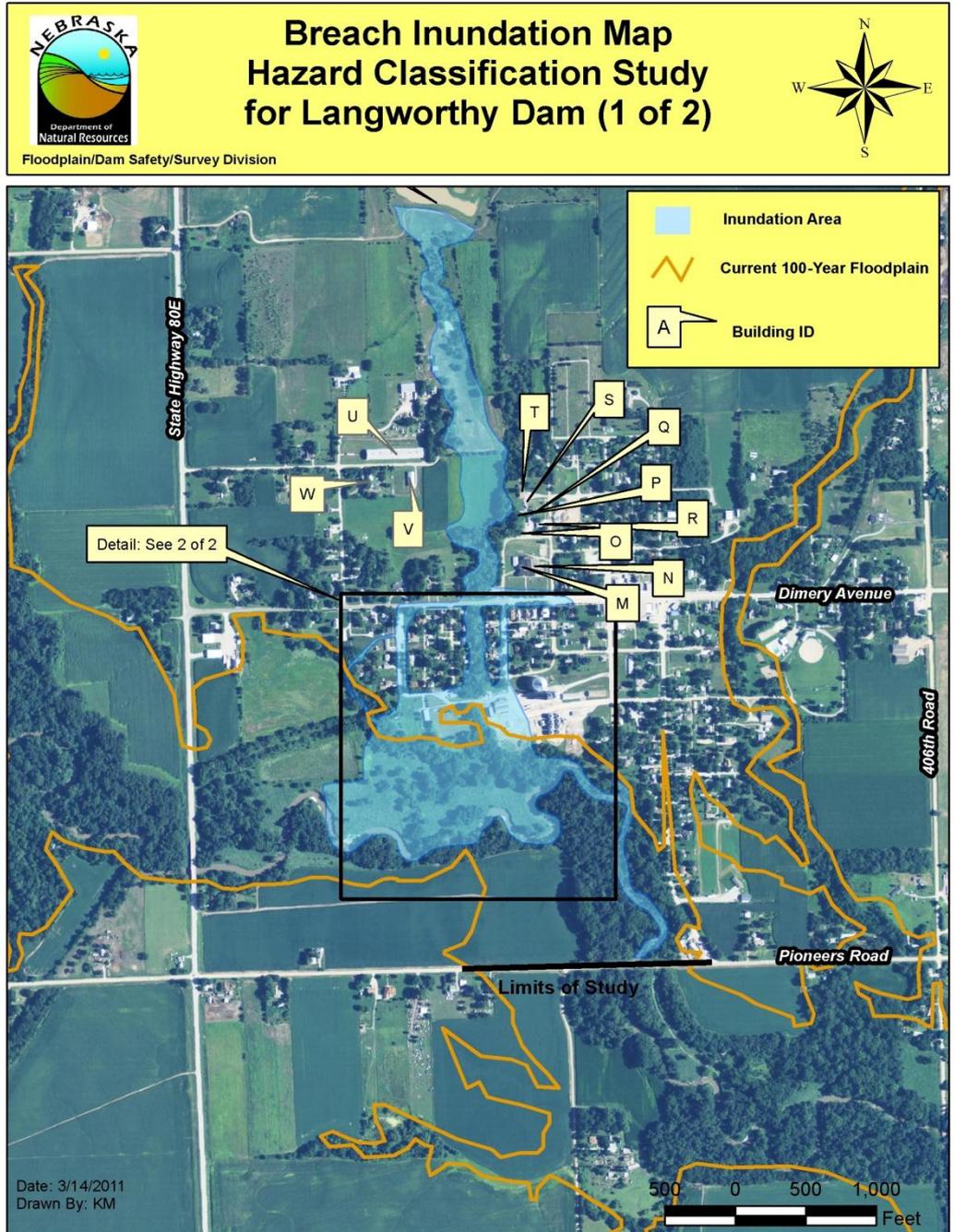
- Proposed Drain
- Sections
- Color contour = 3 feet

Proposed drain would be approximately 10,000 feet in length.



Hydraulics – Drain Design

Hydraulics – Dam Safety

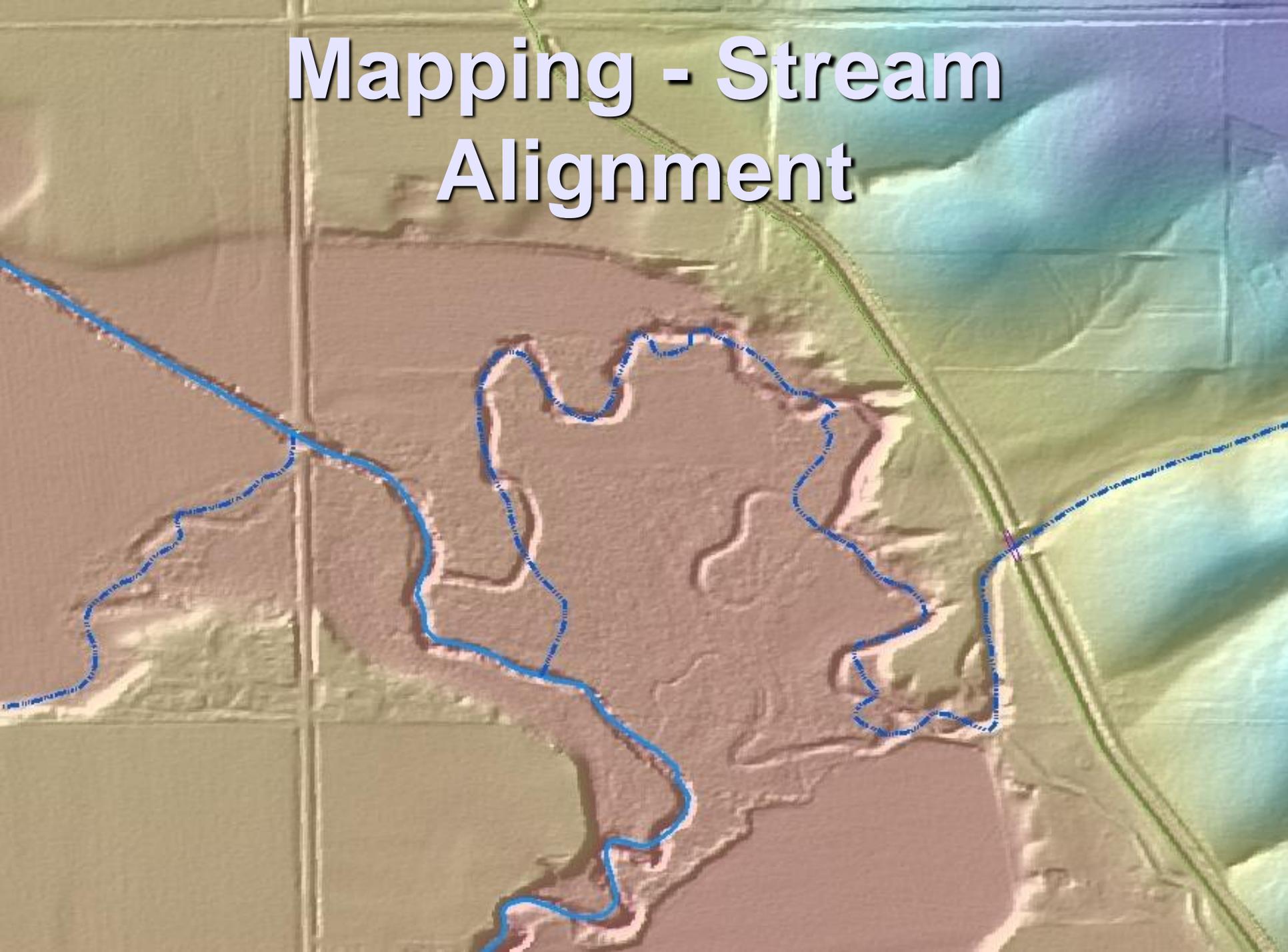


Application – Mapping:

- National Hydrography Dataset
- Floodplain Management
- Planning

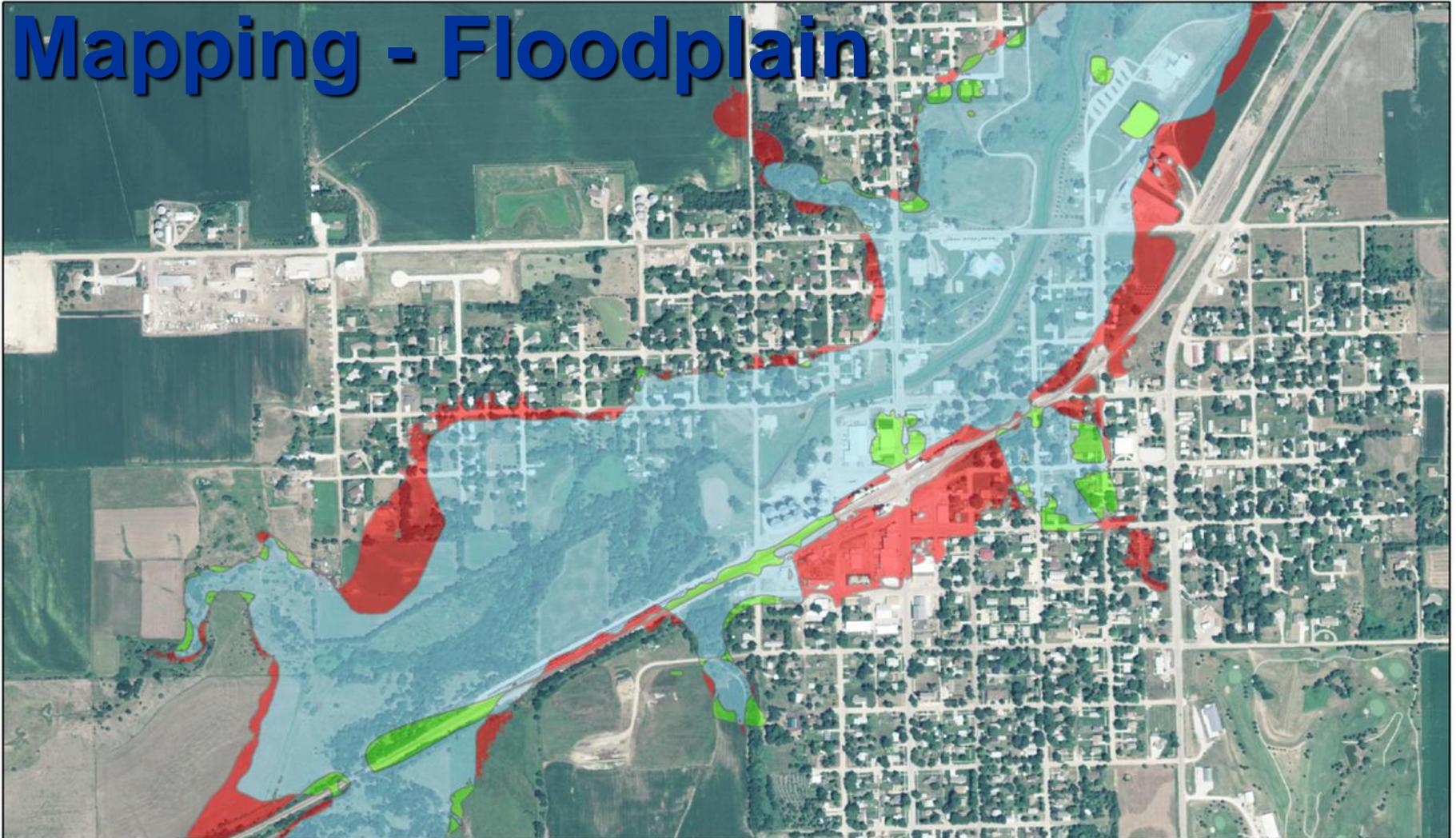


Mapping - Stream Alignment



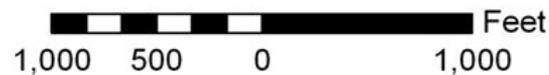
Floodplain Changes: 30 Meter DEM to LiDAR Topography

Mapping - Floodplain



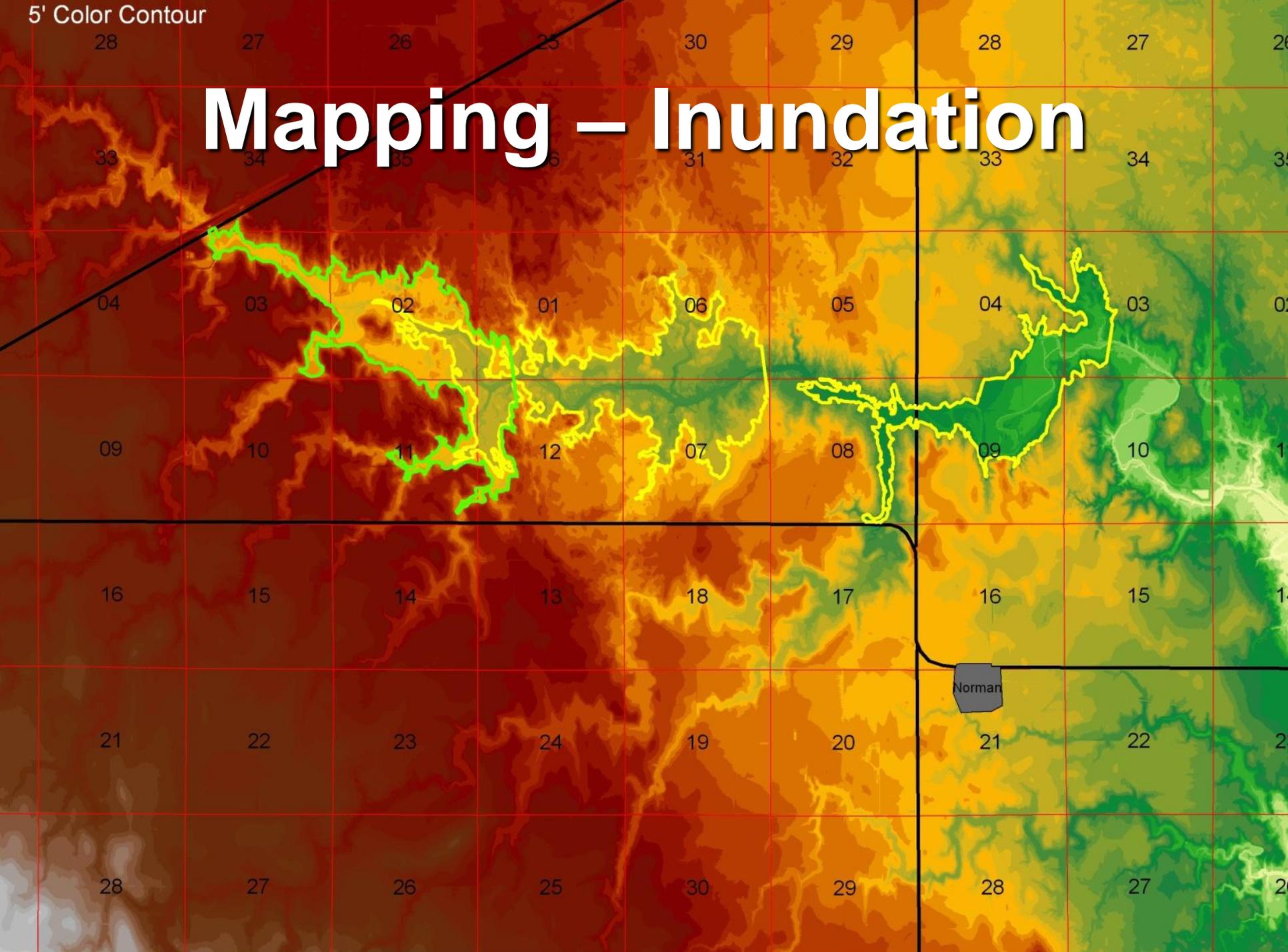
Legend

-  Area Inundated with LiDAR
-  Area Removed with LiDAR
-  No Change



5' Color Contour

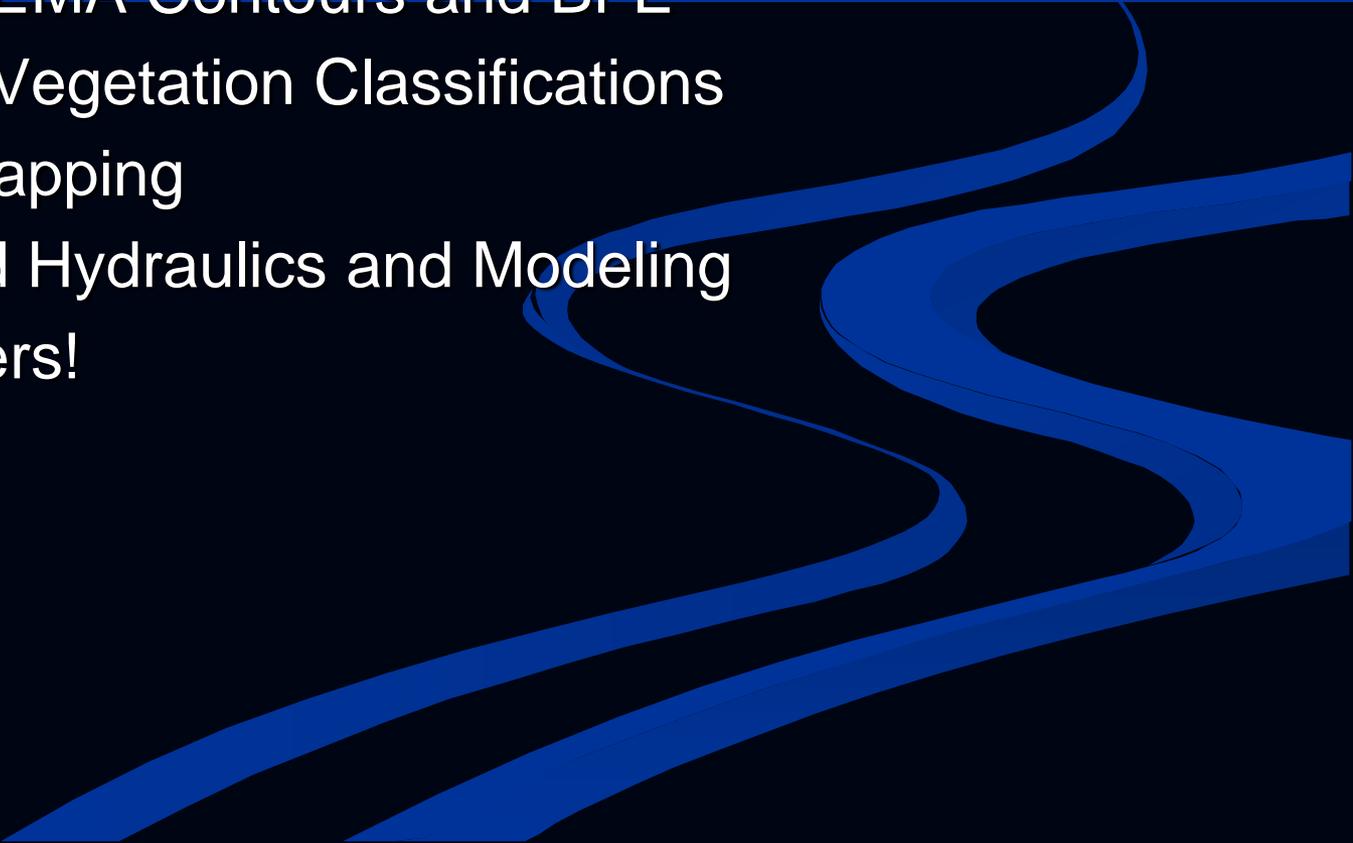
Mapping – Inundation



Benefits:

- Pre-feasibility level planning
 - Dispute resolution
 - Improved risk management
 - Better technical accuracy
 - Reduced field work
 - Accuracy assessment is supported
 - Save \$
- 

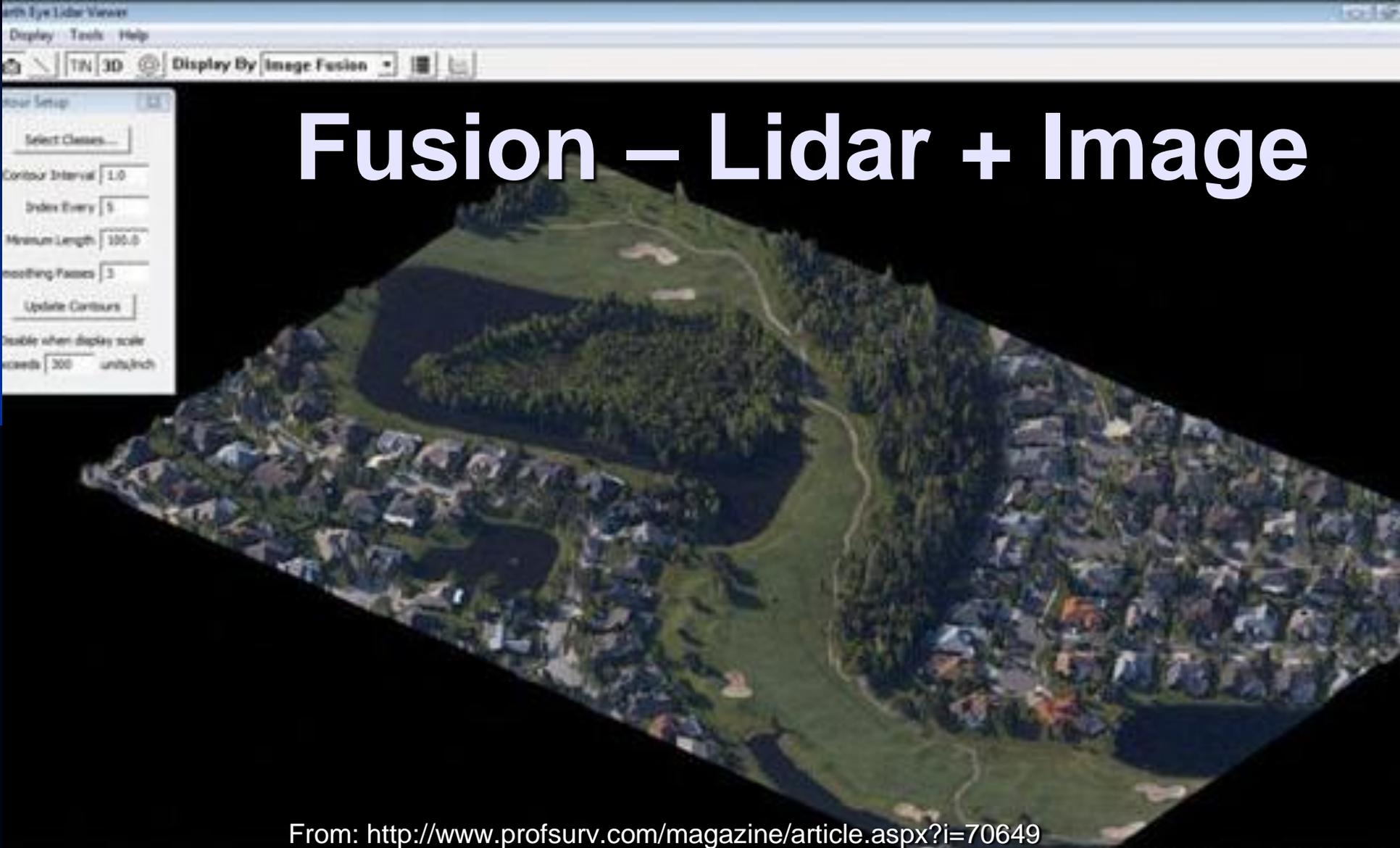
Value-added Benefits:

- HAVE: Detailed Survey Elevation >One Million Points/Square Mile
 - Develop FEMA Contours and BFE
 - Complete Vegetation Classifications
 - Change Mapping
 - Streambed Hydraulics and Modeling
 - Many Others!
- 

New Stuff:

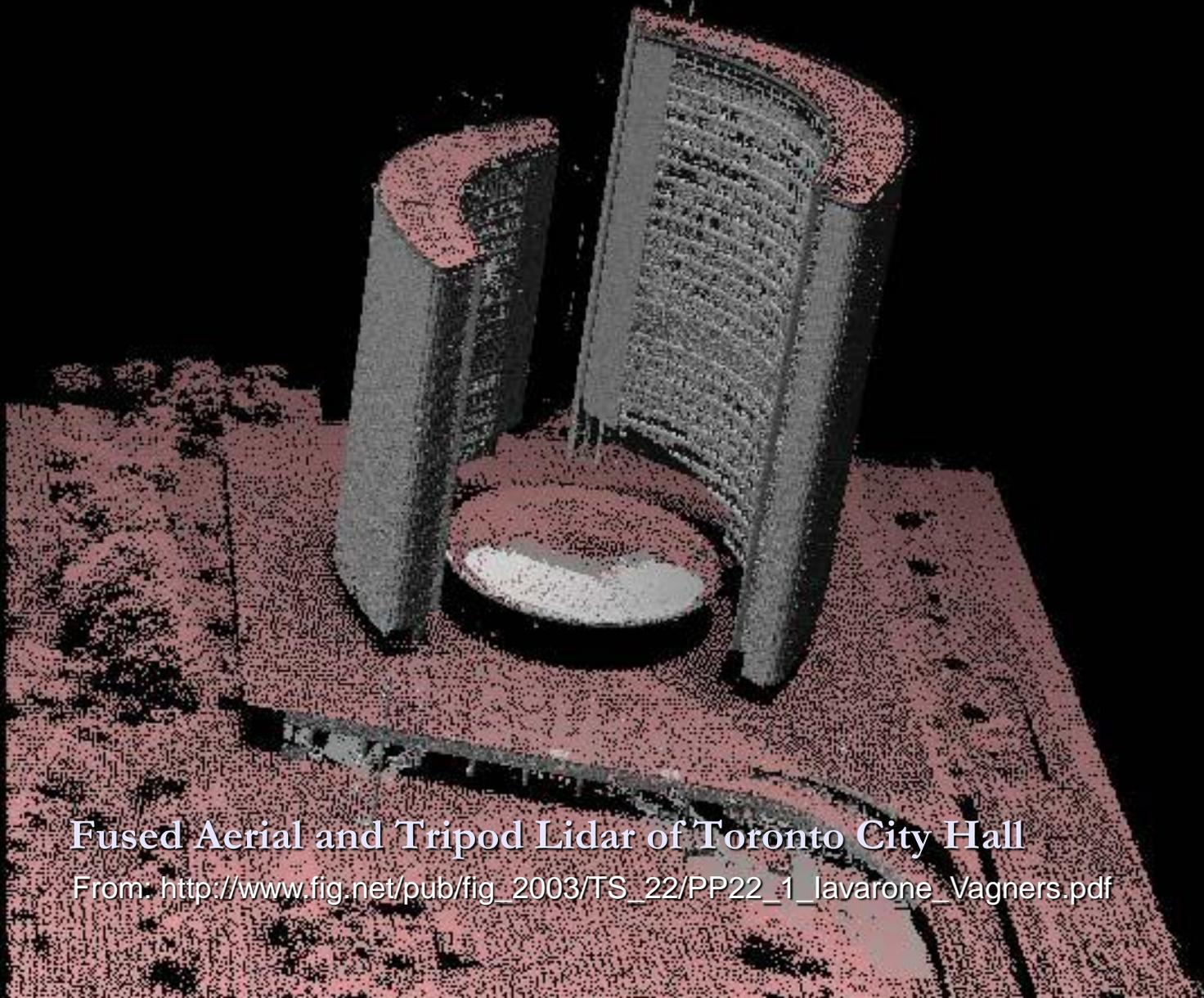
- Fusion:
 - LiDAR + other stuff
- Flash:
 - 1 pulse, many points





Earth Eye's fusion approach to multi-sensor image capture can enable clients to "walk the ground" from their desktop, or in this case, to walk the fairway.

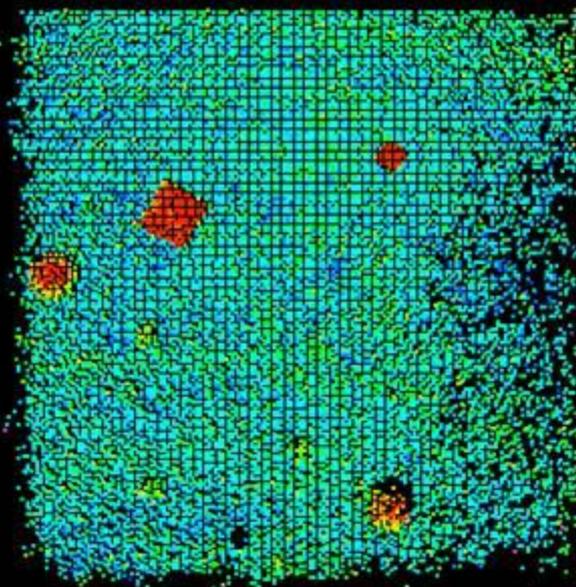
Fusion – Lidar + Lidar



Fused Aerial and Tripod Lidar of Toronto City Hall

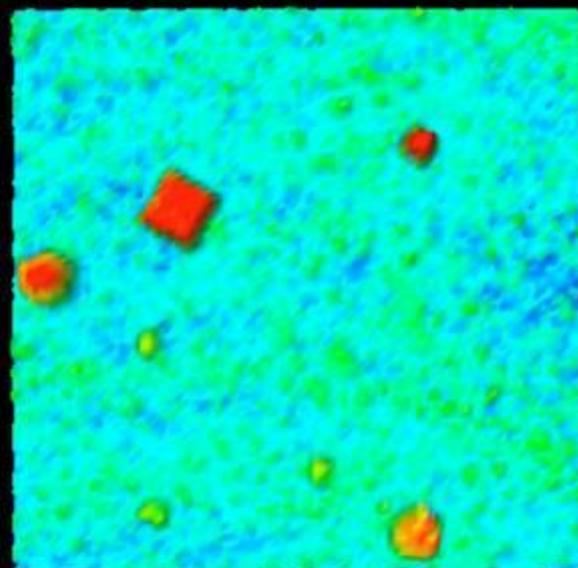
From: http://www.fig.net/pub/fig_2003/TS_22/PP22_1_lavarone_vagners.pdf

3D Points



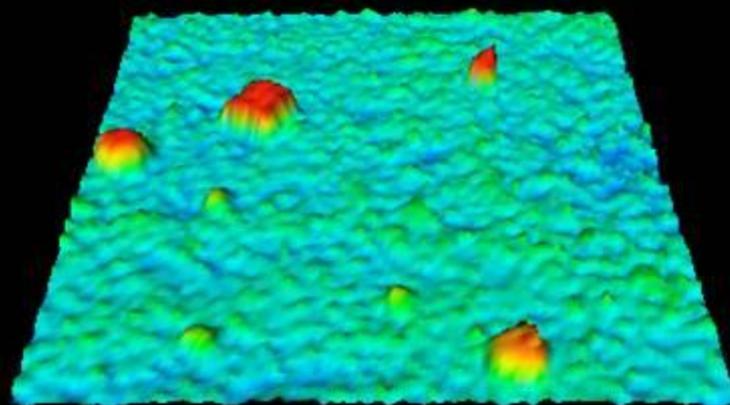
Example Flash
Lidar Image
From Field test

Top View

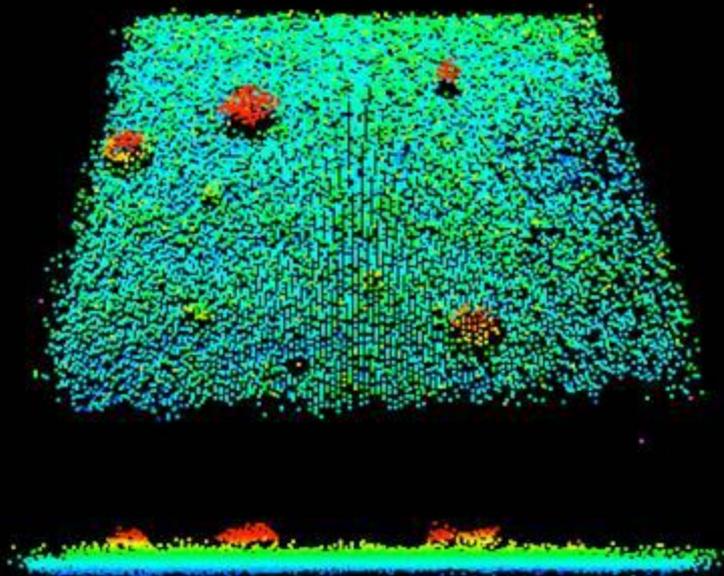


Elevation Map

Oblique View



Side View



Benefits - Funding

2009 estimate for statewide LIDAR at FEMA standards was ~\$8 million -or- \$0.16 per acre!

\$ Benefits:

- Costs Have Fallen
- Many Competent Contractors
- Bundled with Imagery
- Fused with other data
- Leveraged among many stakeholders



Thank You!

Questions?

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Abstract:

- A recently completed regional-scale Light Detection and Ranging (LiDAR) project along the middle Platte River and in much of south-central Nebraska is proving valuable for a number of natural resources applications. These include: storage volume computations for small reservoirs and conservation terraces; effects of river morphology changes on endangered species habitat, hydraulics, and base flood elevations; and rainfall/runoff calculations useful for watershed, floodplain, and dam breach mapping. This presentation illustrates examples of value realized from existing LiDAR data. It will further provide a sneak peek at emerging techniques that may generate additional value.