

IOWA STATEWIDE FLOODPLAIN MAPPING PROGRAM



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Brief History

- 1993 Floods
 - Major flooding in Midwest
- Statewide LiDAR Project: 2005-2010
 - Floodplain mapping was not primary impetus for project
- 2008 Floods
 - Only 15 years since last widespread flood event (1993)
 - Flood of record in many parts of state
 - Flood risk awareness rose significantly
- State Response
 - Rebuild Iowa Advisory Commission
 - \$640 Million Statewide Disaster Relief CDBG Grant
- Federal and State Mapping Investment
 - \$4.3 Million for LiDAR (State & Federal Agencies)
 - \$15 Million in CDBG Funds (\$150k / County)
 - \$2 Million State Infrastructure Appropriation (SFY 2009)
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- Iowa Flood Center (U of I)

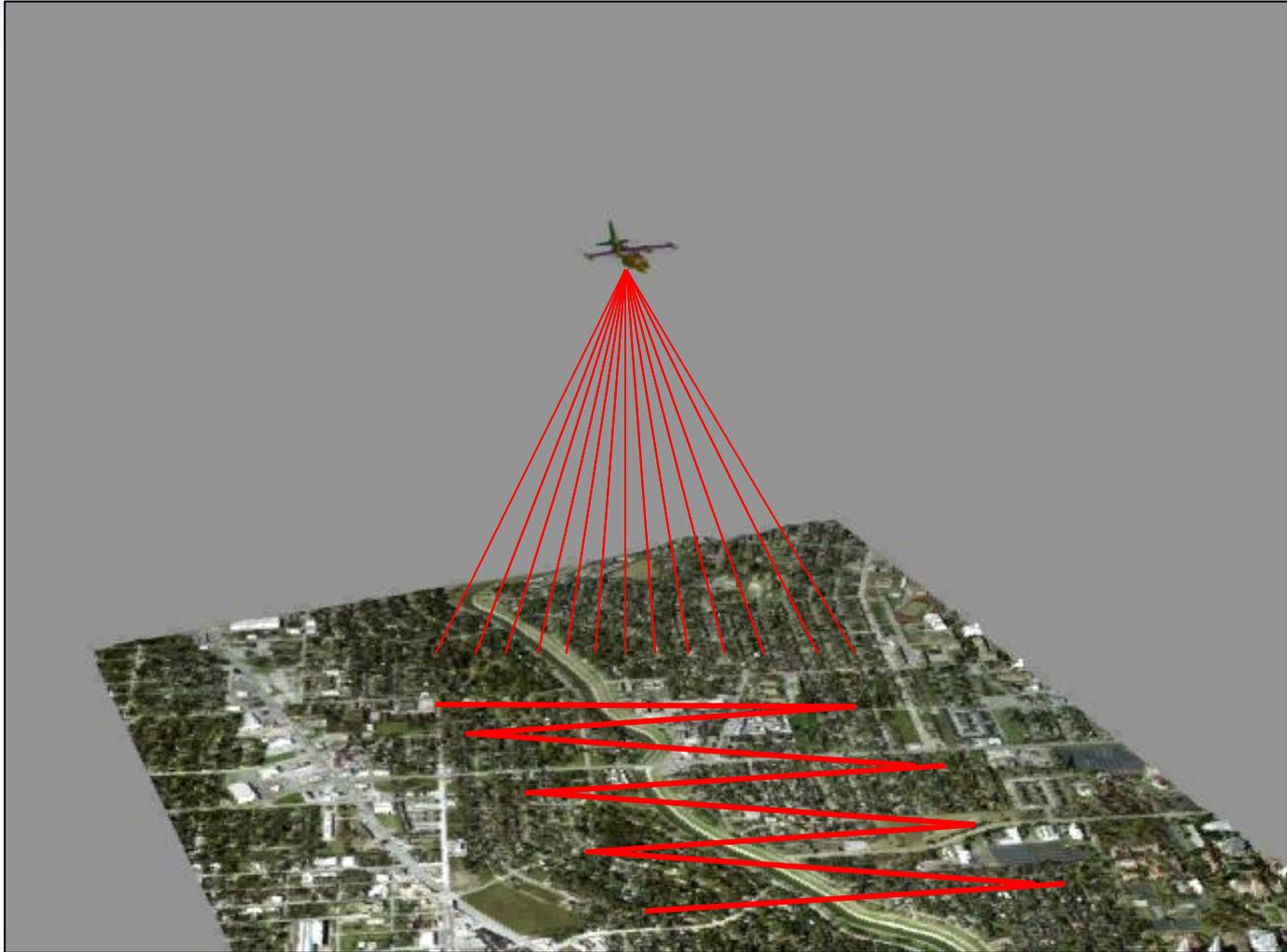
LiDAR Components

Light Detection and Ranging

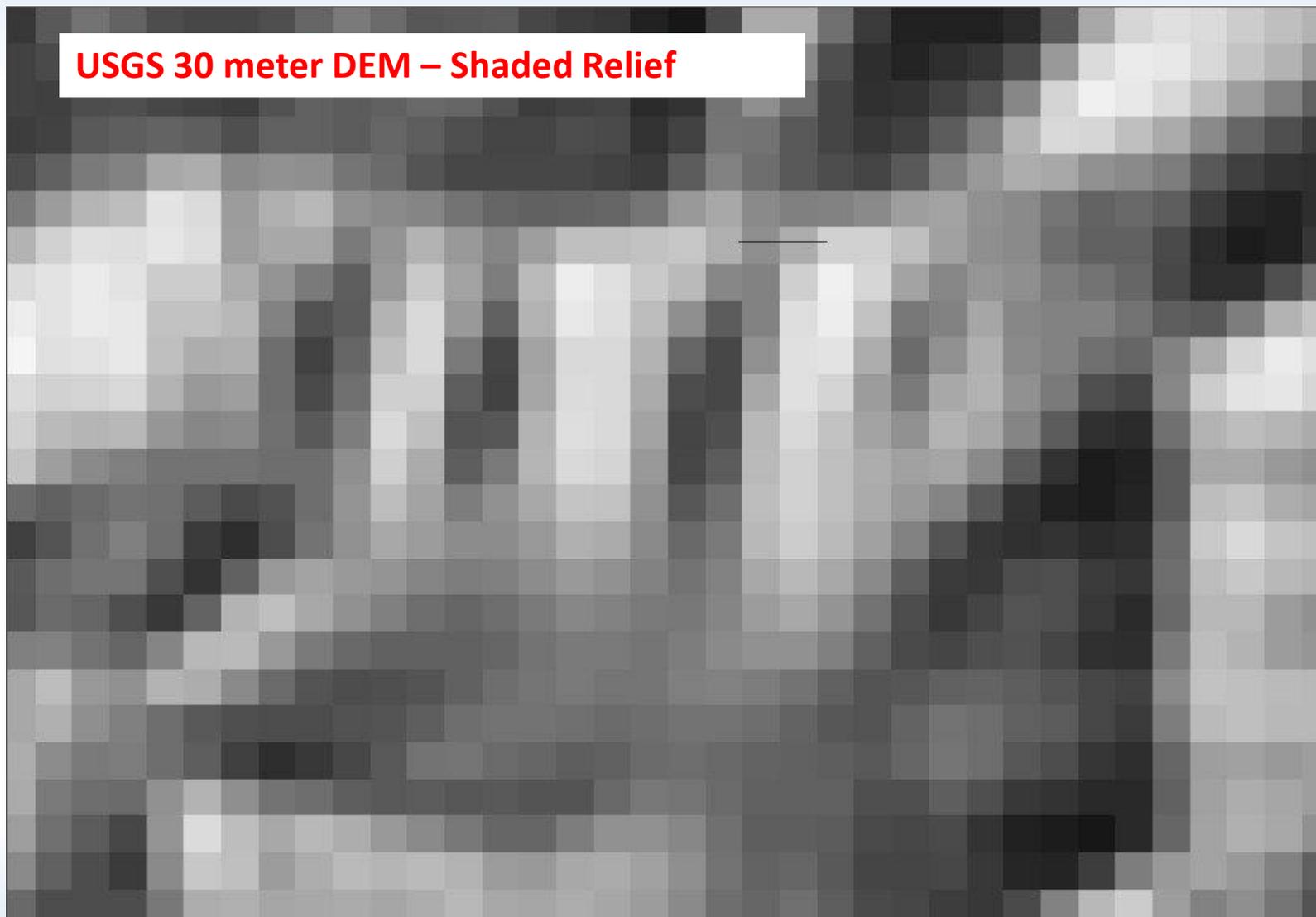
- Laser Rangefinder
- IMU (INS)
- GPS
- On board computer



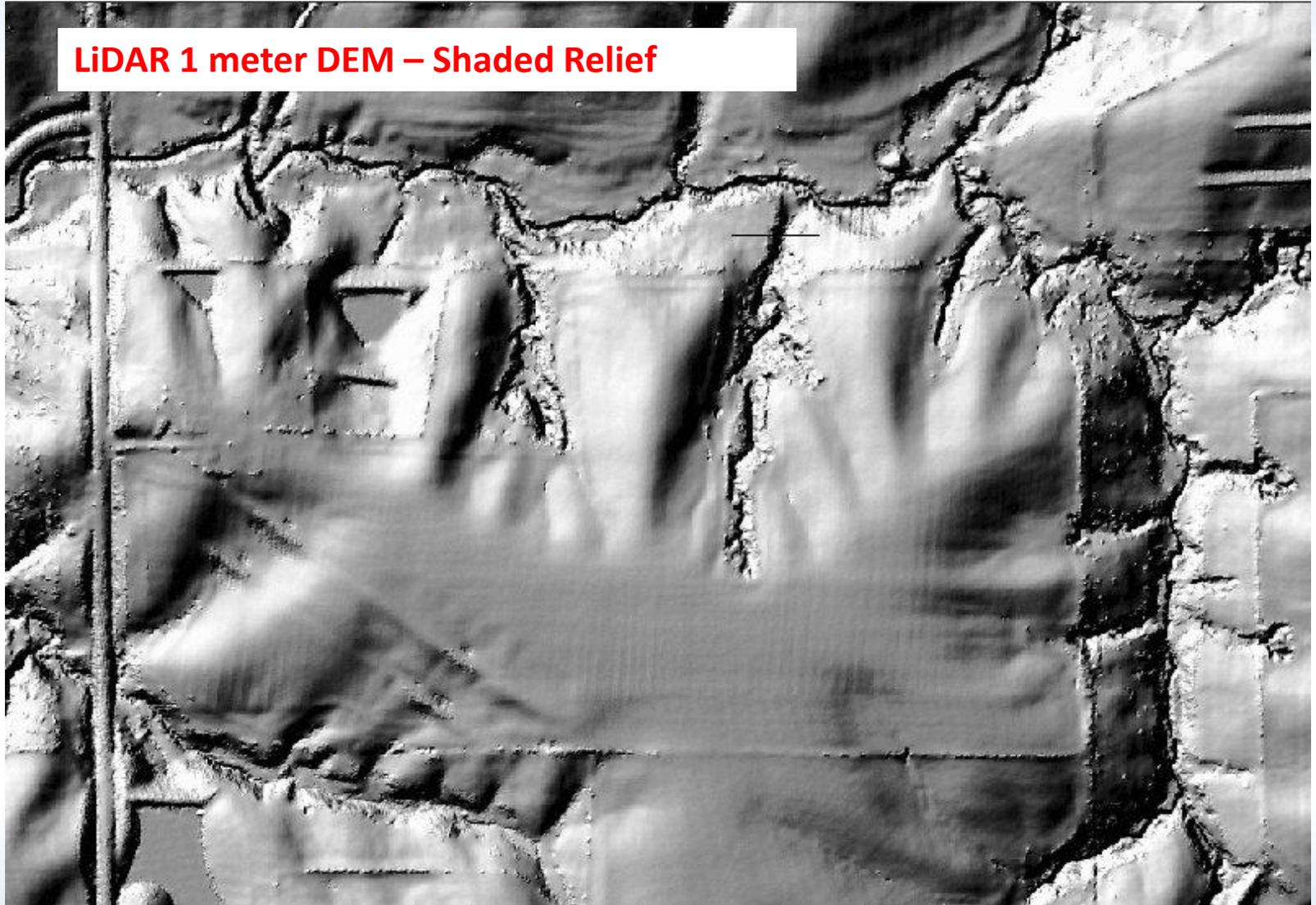
Scanning LiDAR



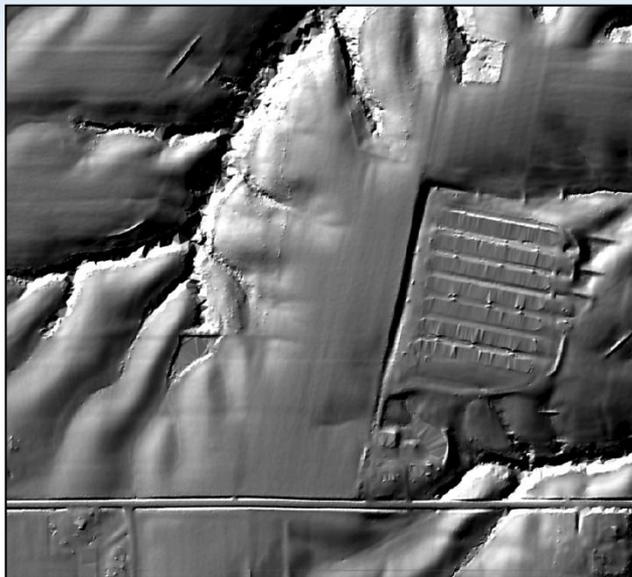
USGS 30 meter DEM – Shaded Relief



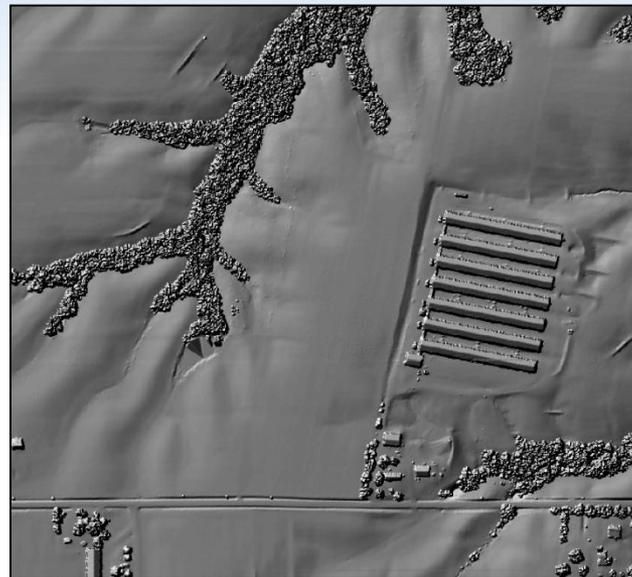
LiDAR 1 meter DEM – Shaded Relief



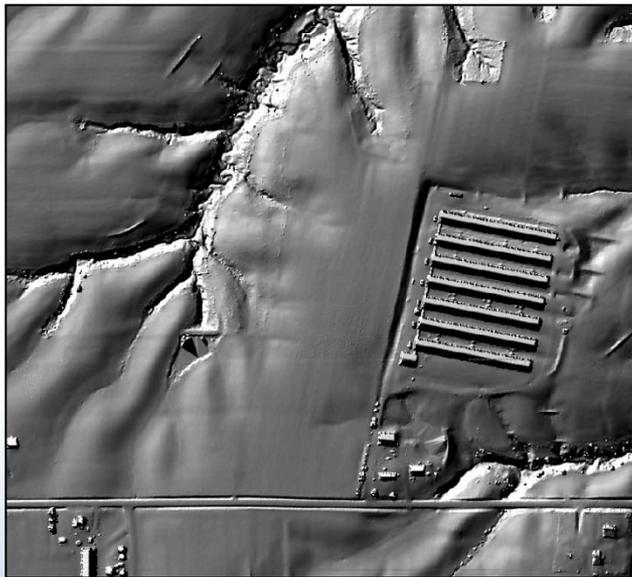
Bare Earth



First Return



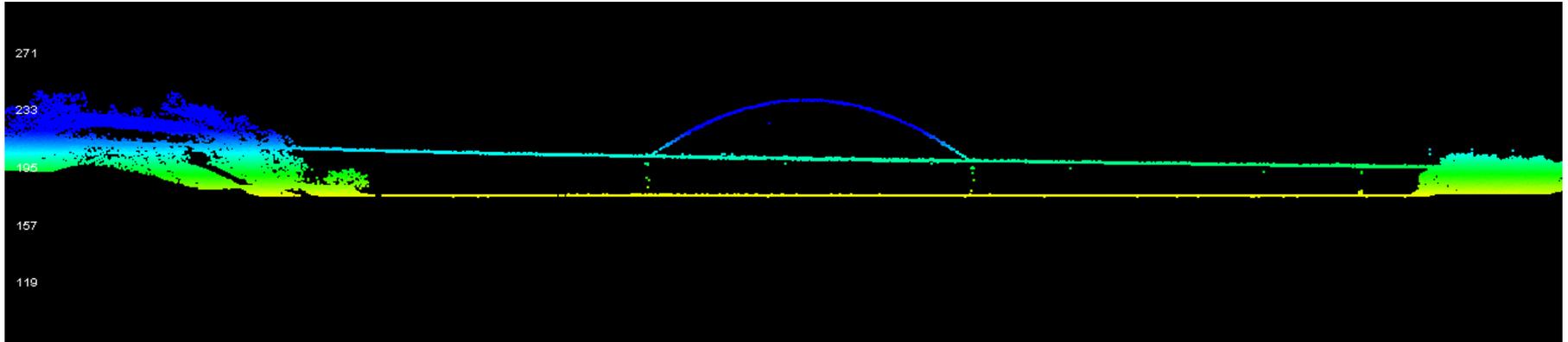
Last Return

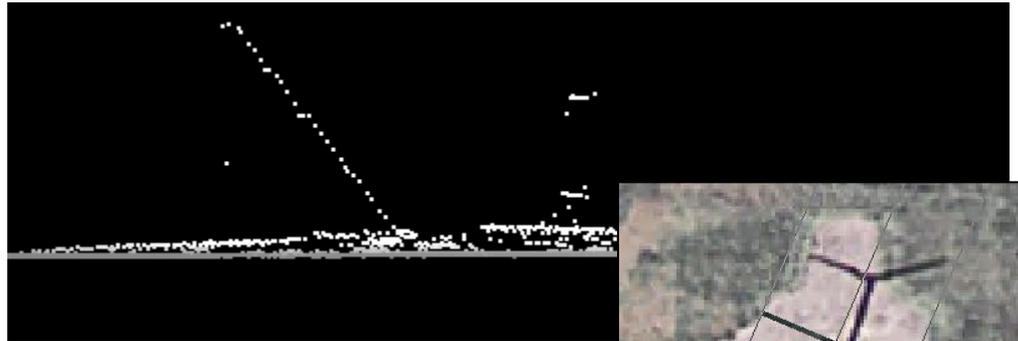
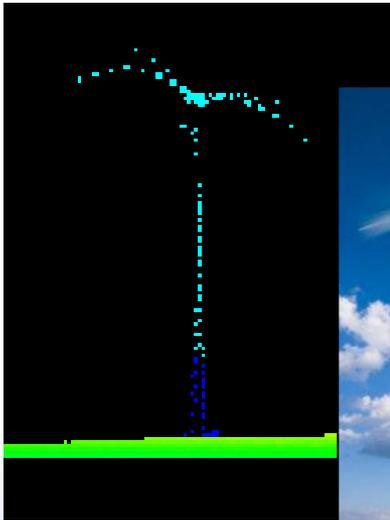
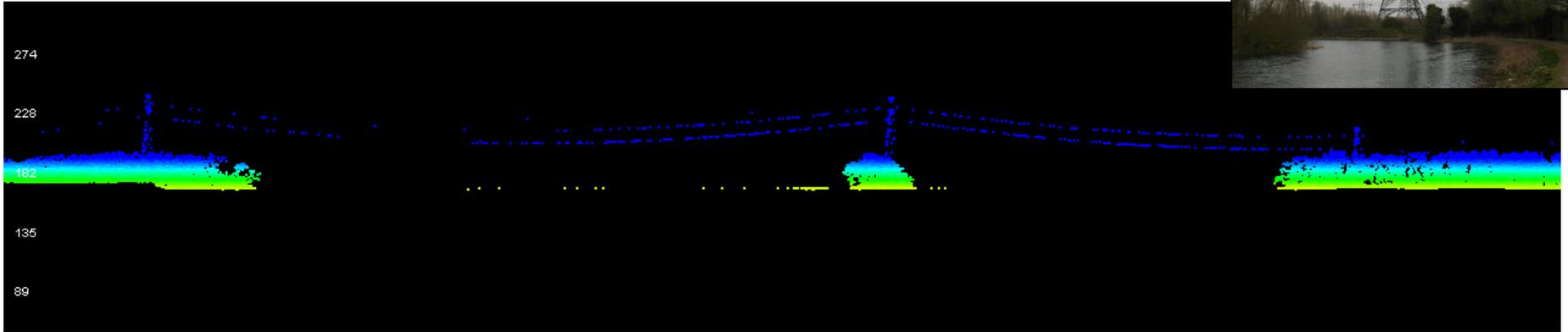


Intensity



Examples





Flood Insurance Rate Map vs. Work Map

- **Flood Insurance Rate Map (FIRM)**

- The insurance and floodplain management map produced by FEMA that identifies, based on detailed or approximate analyses, the areas subject to flooding during a 1% annual chance (100-year) flood event in a community
- Flood insurance risk zones, which are used to compute actuarial flood insurance rates, also are shown
- In areas studied by detailed analyses, the FIRM shows Base Flood Elevations (BFEs) to reflect the elevations of the 1% annual chance flood
- For many communities, when detailed analyses are performed, the FIRM may also show areas inundated by the 0.2% annual chance (500-year) flood and regulatory floodway areas

- **Work Map**

- Map reflecting the results of a study showing flooded areas for various flood events:
 - 1% and 0.2% annual chance floods (i.e. 100-Yr. and 500-Yr.)
 - Other flood events (e.g. probable maximum)
- Provides the basis for the presentation of this information on a Flood Insurance Rate Map (FIRM) that FEMA will approve and publish
- Disclaimers will indicate “Best Available Data” and may only be used for specific purposes under a community’s floodplain ordinance

Uses For Work Maps

- Land Use Planning in flood-prone areas
- Ability to anticipate implementation of Floodplain Development Regulations (NFIP)
- Reduces ambiguity in floodplain permitting process
- Disaster Response and emergency planning

Approximate vs. Detailed Analyses

- **Approximate Analyses**

- A flood hazard study that results in the delineation of floodplain boundaries for the 1% percent annual chance (100-year) flood, but does not include the determination of BFEs or flood depths

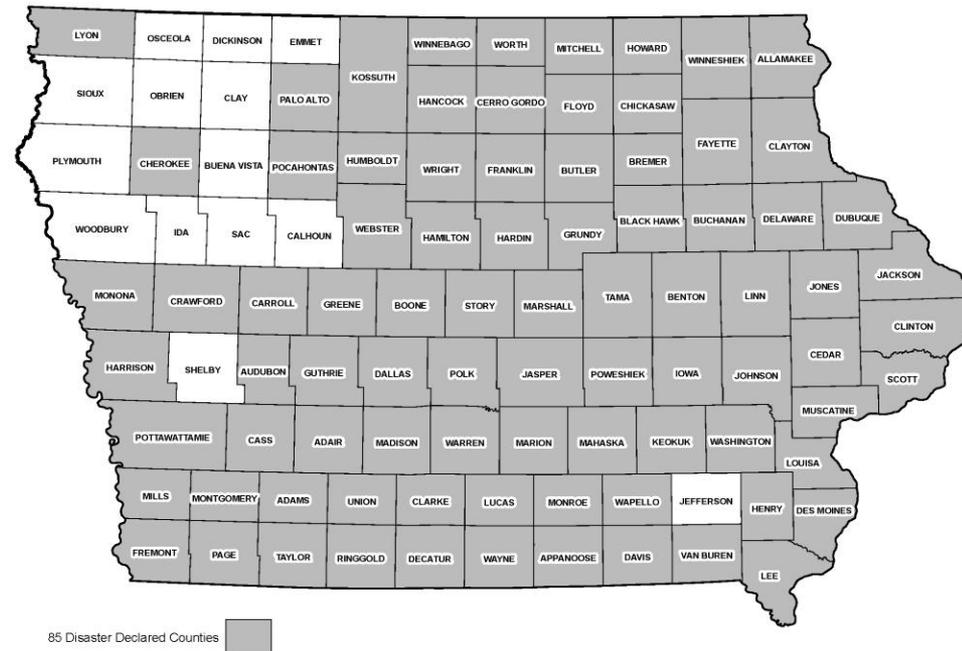
- **Detailed Analyses**

- A flood hazard study that, at a minimum, results in the delineation of floodplain boundaries for the 1% percent annual chance (100-year) flood and the determination of BFEs or flood depths
- When detailed analyses are performed, the FIRM also may show areas inundated by 0.2% annual chance (500-year) flood and regulatory floodway areas

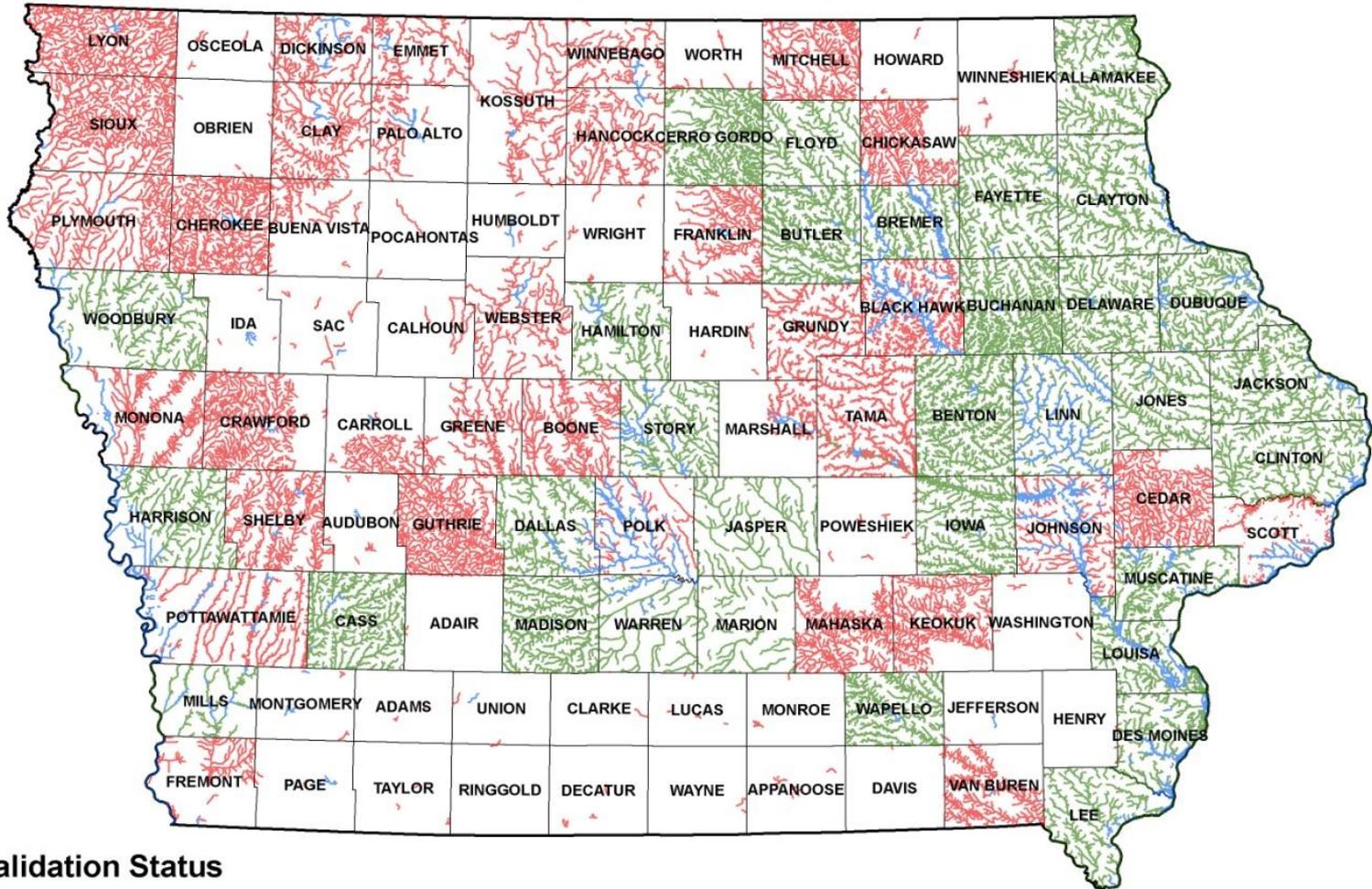
Floodplain Mapping Program Background

- \$15M HUD CDBG grant
- Administered by Iowa DED and DNR
- Supports floodplain mapping in the 85 counties declared federal disaster areas
- “...to produce floodplain maps that meet FEMA technical standards and can be published as Digital Flood Insurance Rate Maps (DFIRMs).”

Figure 1 - Federal Disaster Declaration (FEMA-1763-DR)



FEMA Flood Mapping Status



Validation Status

- VALIDATED
- NOT VALID
- REQUIRES ASSESSMENT

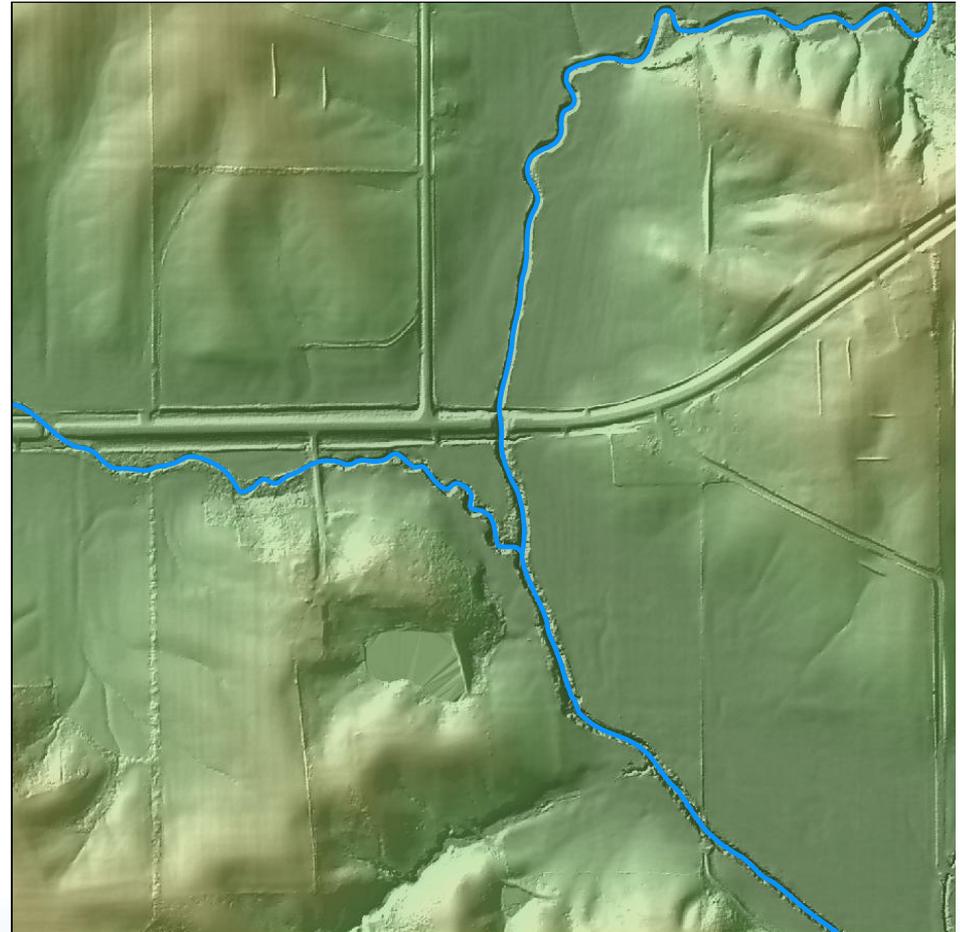
Pilot Project

- Performed by IFC under contract with DNR
- September 2009 – March 2010
- Pilot project goals
 - Refine methodologies to take advantage of the DNR statewide LiDAR dataset
 - Quantify the time and experience required to perform individual project tasks
 - Identify distribution of internal IDNR and external effort to maximize the impact of funding provided to the State
 - Produce Poweshiek County work map products for FEMA review and adoption



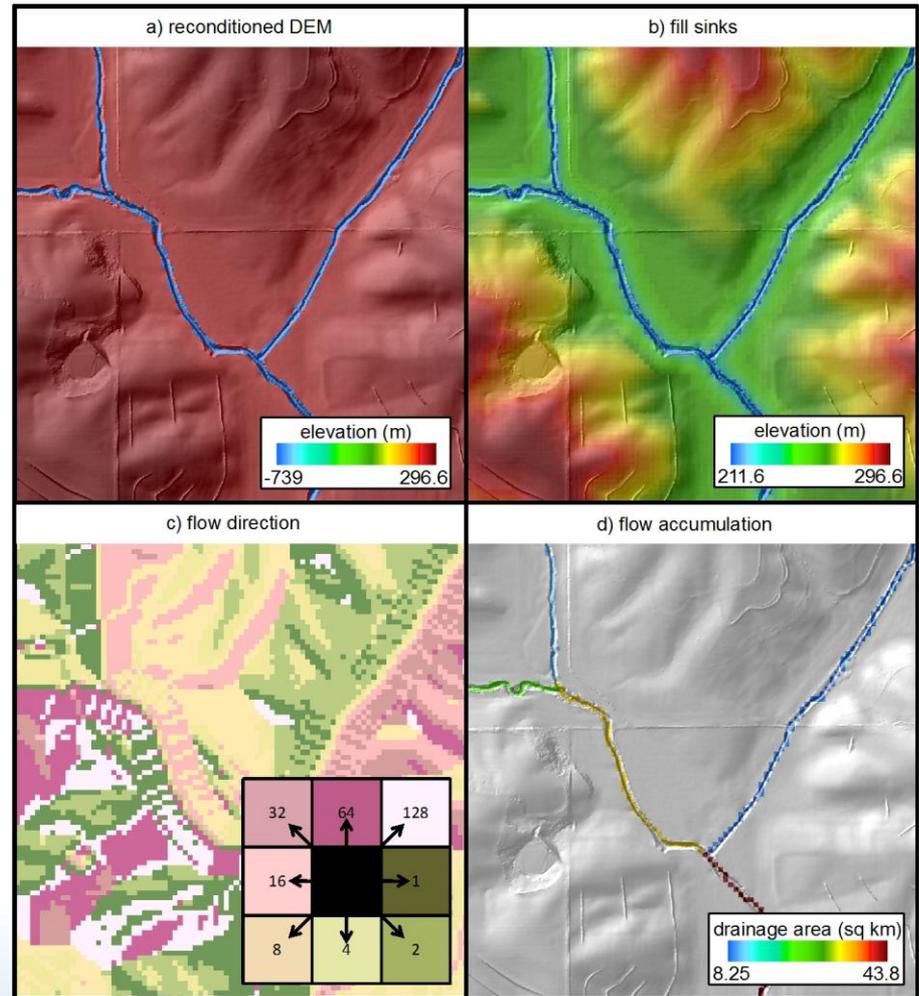
Stream Centerline Digitization

- Accurate stream centerline data consistent with LiDAR-derived DEM necessary for
 - Drainage area calculations in hydrologic analysis
 - River channel topology in hydraulic analysis
- Stream centerline digitized for all defined channels draining greater than 24 acres
- Conducted manually
 - No automated digitization process available during Pilot
 - Extremely time intensive
- Iowa Flood Center, ISU, and DNR have explored automated processing tools that are now being used



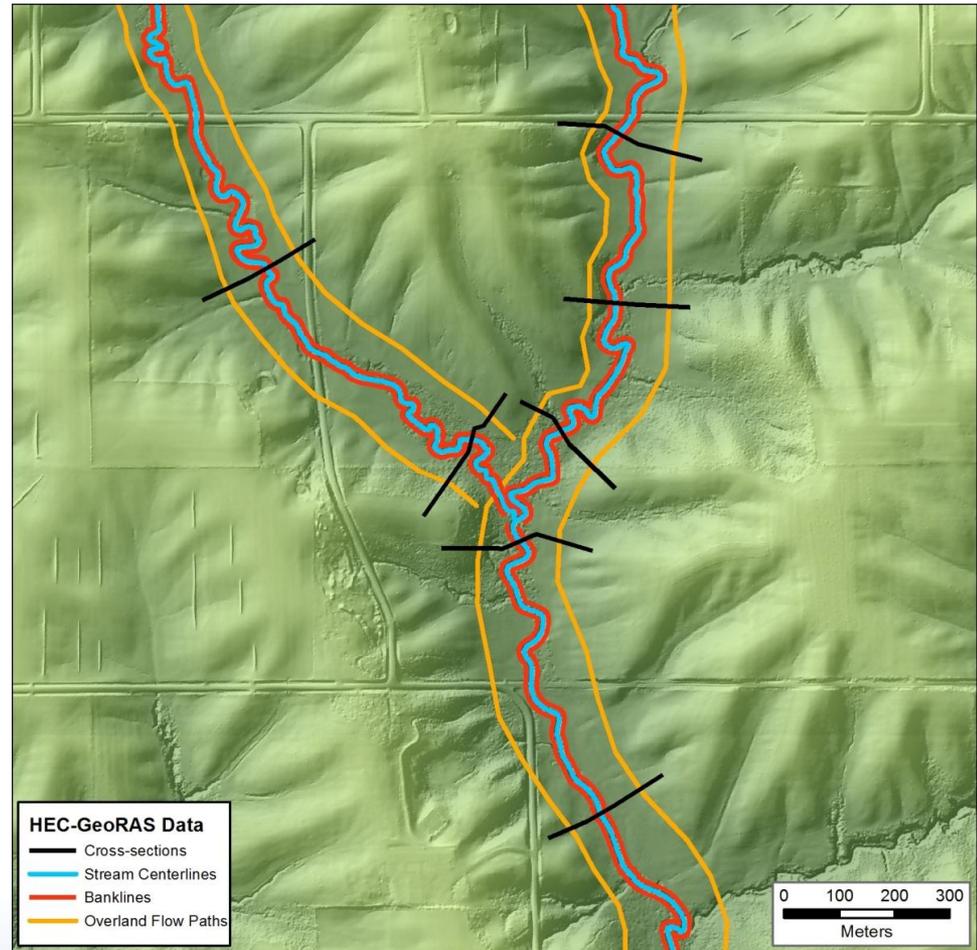
Hydrologic Analysis

- Calculate annual recurrence stream discharges
- Calculations are based upon DNR statewide LiDAR dataset
- LiDAR data are used to create a 3-meter-resolution digital elevation model (DEM)
- DEM is processed to determine flow direction and accumulation on the land surface
- Discharge Calculations
 - 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year flows
 - Based upon stream gage statistical analyses & single-parameter USGS regional regression equations



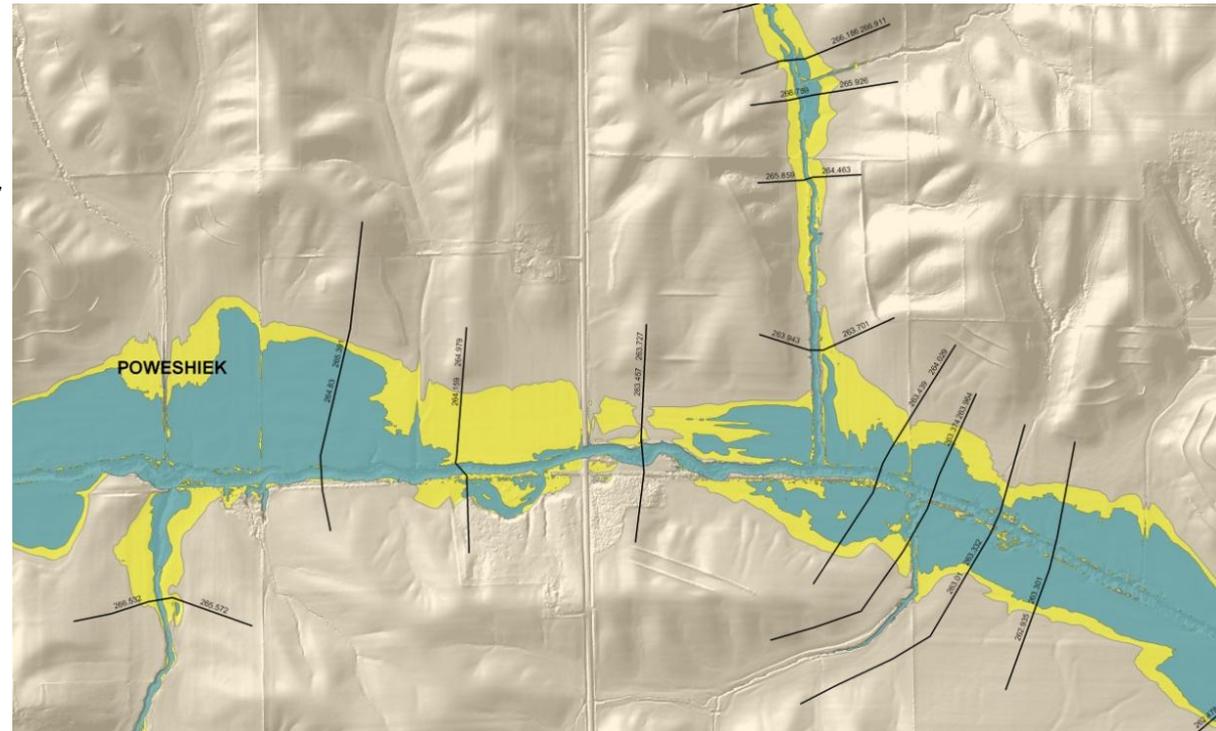
Hydraulic Analysis

- Calculate water surface elevations for flows determined from hydrologic analysis
- Based upon capacity of the channel and floodplain to convey flood waters
- HEC-RAS Hydraulic model
 - Developed using HEC-GeoRAS tools in ArcGIS software
 - 1-meter resolution DEM is used to more accurately depict channel and floodplain features measured by LiDAR



Floodplain Mapping

- Hydraulic model results are intersected with the 1-meter DEM to calculate flood depths and inundation extents
- Work maps are created in ArcGIS for submission to FEMA

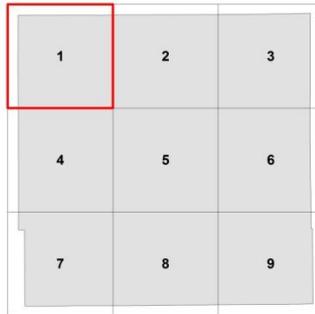
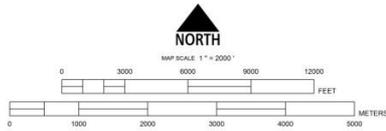


FEMA Work Map Production

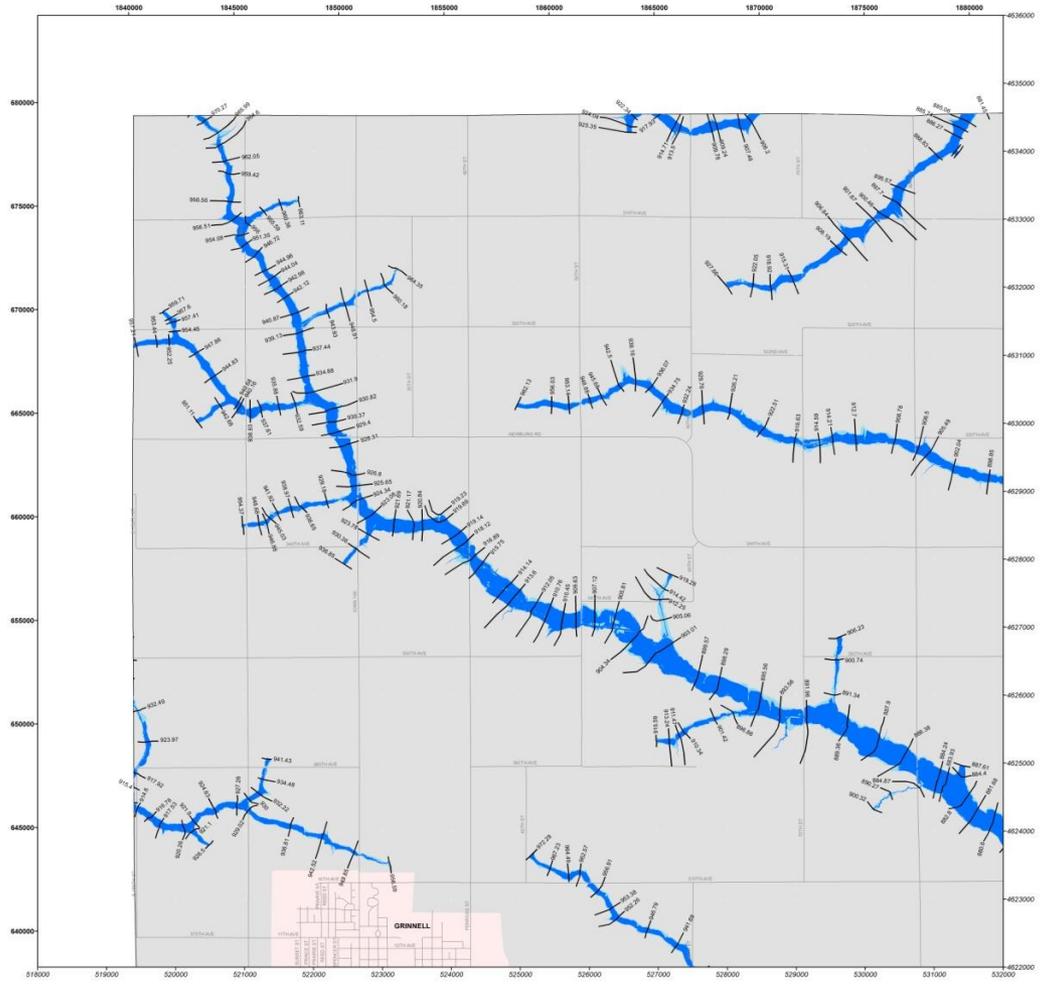
POWESHIEK COUNTY IOWA PANEL 1 OF 9

LEGEND

- 911.1 Cross-section line - Approximate cross-section and water surface elevation in feet (North American Vertical Datum of 1988)
- Areas subject to inundation by the 1% annual chance flood
- Areas subject to inundation by the 0.2% annual chance flood
- 65000 5000-foot grid ticks. Iowa State Plane coordinate system, South Zone (FIPZONE 1402), Transverse Mercator Projection
- 4629000 1000-meter Universal Transverse Mercator grid values, Zone 15 North



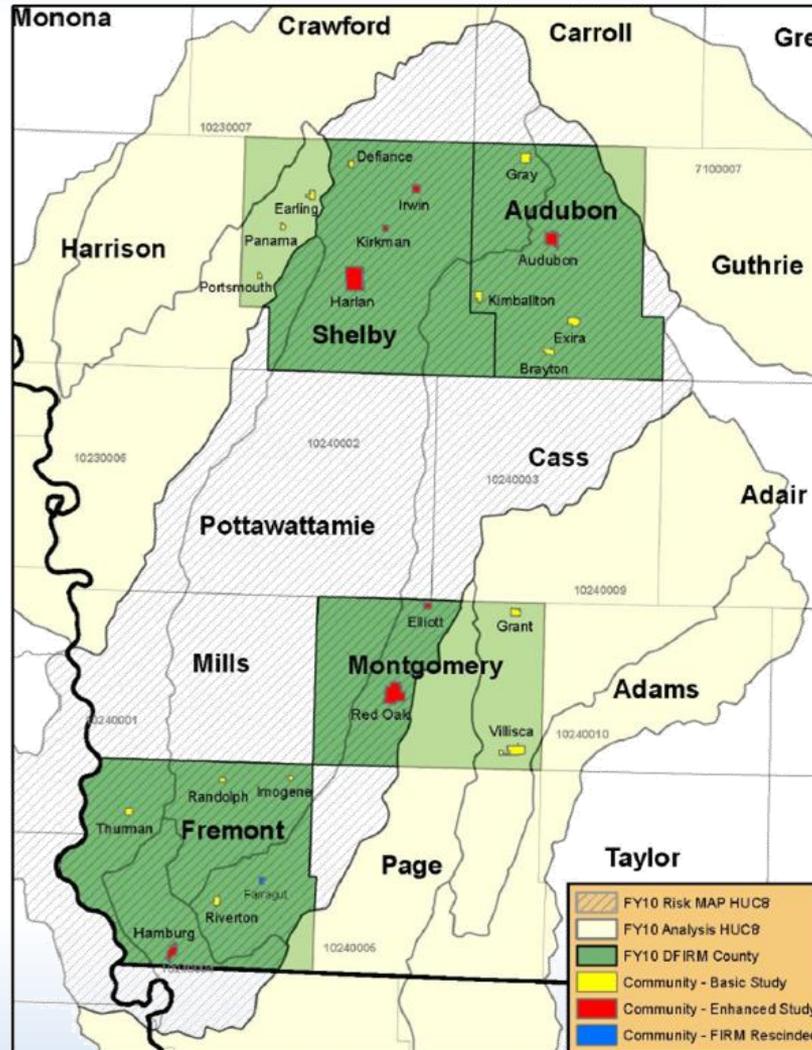
MAP INDEX



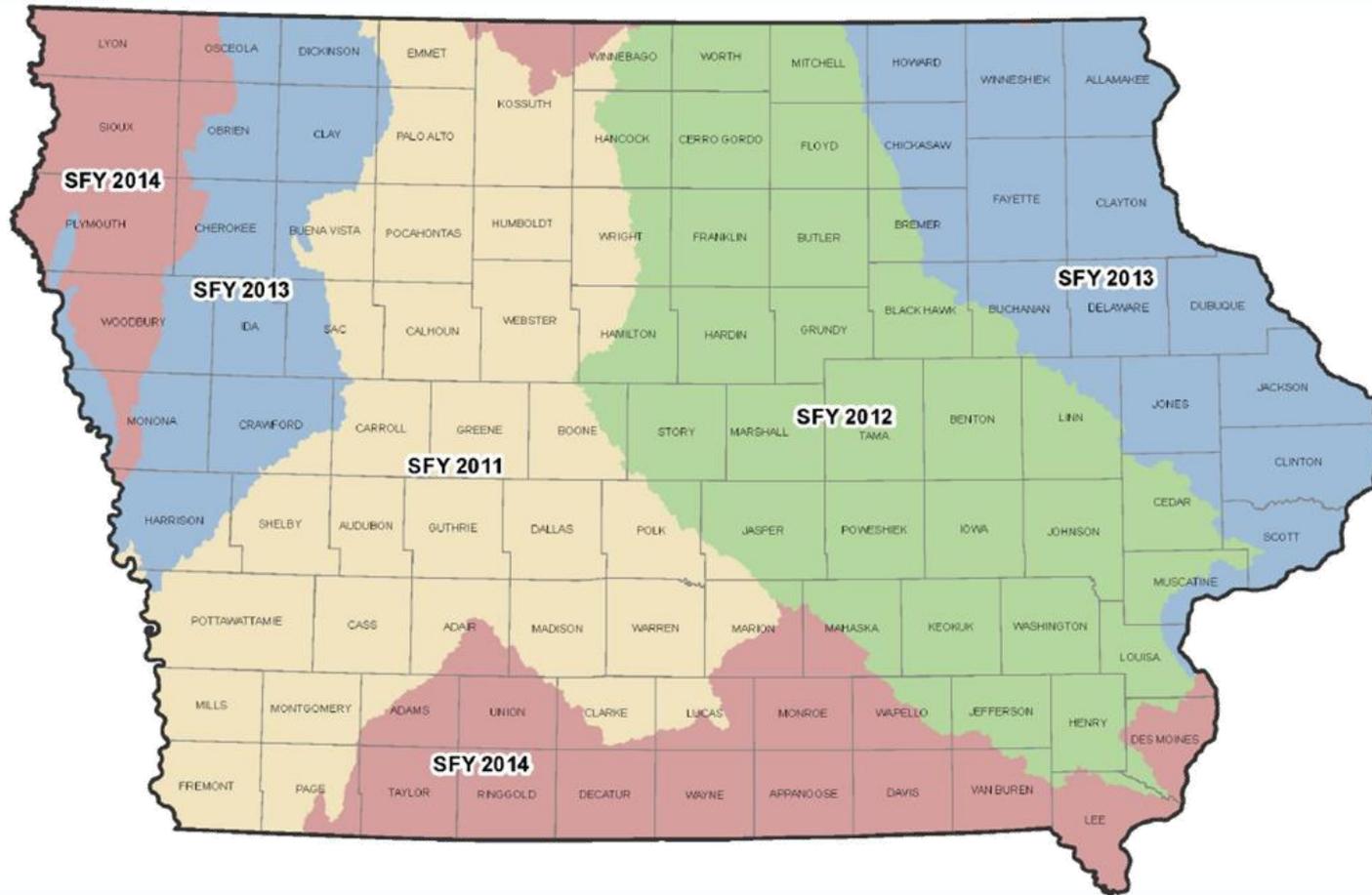
Floodplain Mapping Sequencing (Four-Year Plan)

- Criteria used to establish the floodplain mapping sequencing order included:
 - Leveraging of federal funding sources
 - Mapping efficiency
 - Relative flooding risks
 - Coordination with ongoing FEMA mapping efforts
 - Locations of non disaster-declared counties

Project Sequencing



Mapping Sequencing



Will Levees Be Addressed ?

- **Levees Currently Showing 1% Annual Chance Flood Protection on Existing FIRM Need to Be Certified**
 - For purposes of the NFIP, FEMA will only recognize those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards, per Code of Federal Regulations (CFR), Title 44, Chapter 1, Section 65.10
- **Agricultural Dikes Not Shown on Existing FIRM**
 - Will be ignored in hydraulic analyses
 - Will be considered part of the topographic features of the floodplain
- **For information on FEMA-defined levee systems and certification:**
 - http://www.fema.gov/plan/prevent/fhm/st_broomelv.shtm

Input From Public

- Intention by community/county to submit levee documentation to FEMA for certification (so levees can be accounted for in work maps)
- Engineering/Flood Studies Completed by Communities or Counties (will be leveraged with new studies)
- Content to be included on Work Maps



THANK YOU

[HTTP://WWW.IOWADNR.GOV/WATER/FLOODPLAIN/MAPPING.HTML](http://www.iowadnr.gov/water/floodplain/mapping.html)

<http://www.iowafloodcenter.org/maps/>

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