GIS IN OIL & GAS: HISTORIC MAP DIGITIZING IN THE MARCELLUS SHALE

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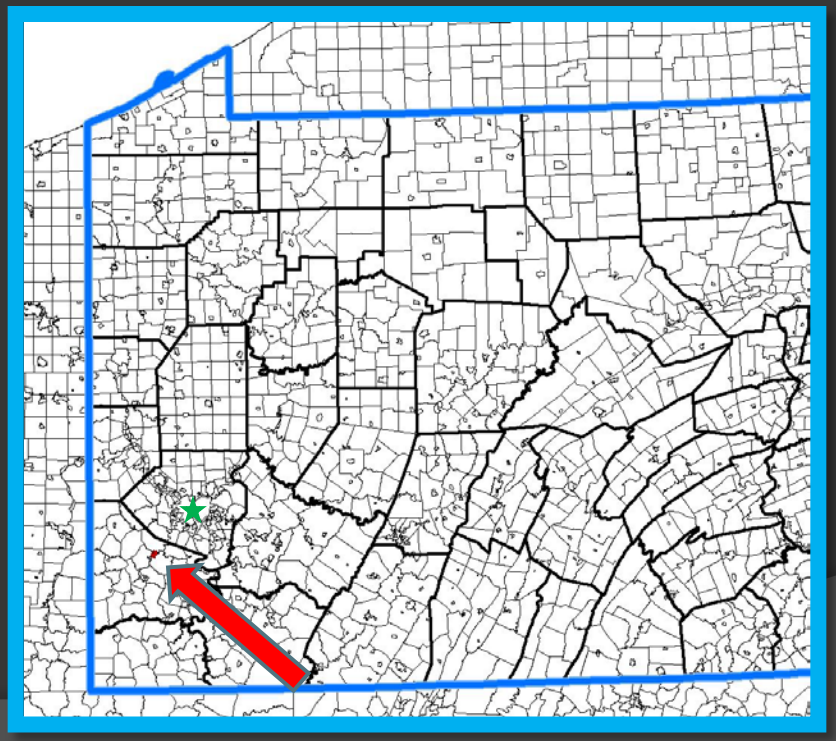
Overview

- **Topics of Today**
  - Personal Bio
  - Range Resources/Marcellus Shale Background
  - Project Background
    - Georeferencing
    - Digitizing Farmlines
    - Digitizing Historic Oil & Gas Wells
  - Results/Benefits of the Project
  - Questions

Personal Bio

- 2010 Graduate of California University of Pennsylvania
  - B.A. in Geography - Concentration in GIS & Emergency Management
- Employee at Range for 5 years
  - Canonsburg, PA office
  - 30 minutes southeast of Pittsburgh



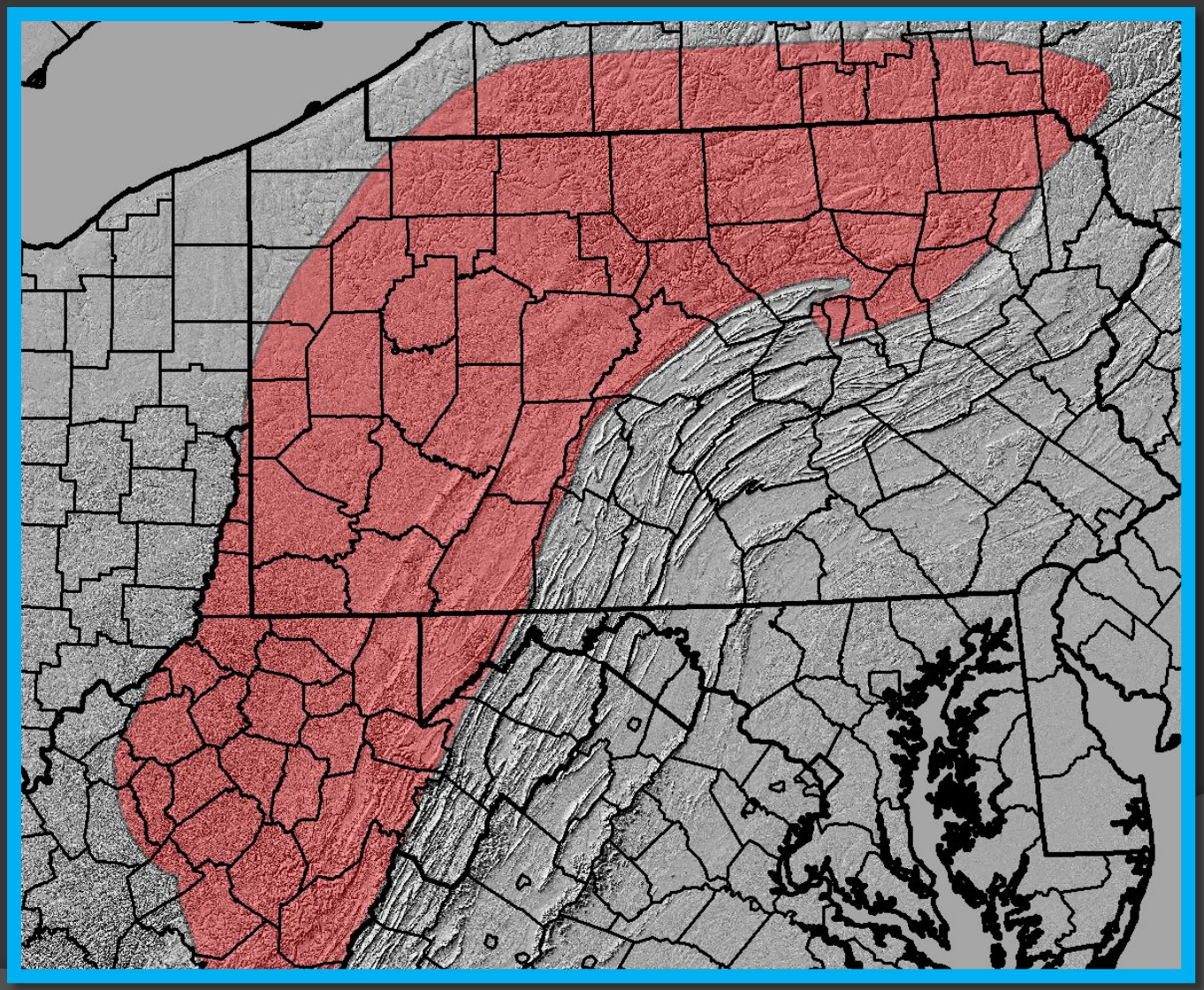
Range Resources

- Headquarters in Ft. Worth, Texas
- Offices
  - Abingdon, Virginia
  - Canonsburg, Pennsylvania
  - Field offices
- Originally formed in 1976 as Lomak Petroleum Inc.
- Became Range Resources Corporation in 1998
- First successful vertical well in the Marcellus Shale drilled in 2004 – Renz #1
- Currently have about 1,000 successful Marcellus Shale wells currently producing

Marcellus Shale

- Currently the largest natural gas field in the United States
  - Potential to be largest in the world
- Range holds almost 1 million net acres across the formation

Marcellus Shale



Project: Plan

- What were we asked to do?
  - Georeference maps from the early 1900's
  - Digitize the farm line boundaries
  - Digitize the historic wells
  - Make this data accessible

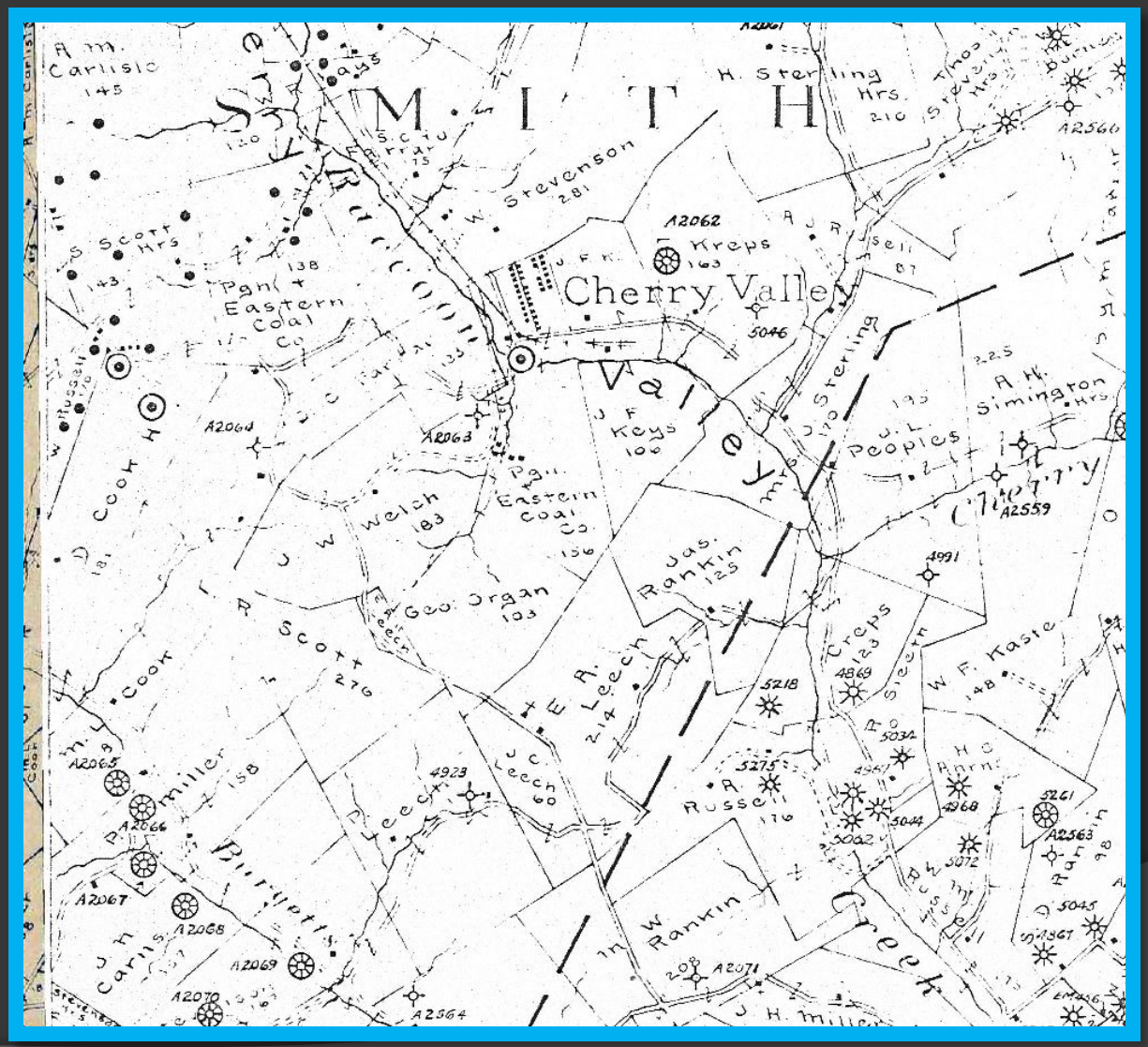
Project: Purpose

- Farmlines
  - Land Department
  - Clear Title & Validate Ownership
    - Research back to 1850's for ownership
      - Result of the Drake well being drilled in 1858
  - Save time spent searching hand drawn maps

Project: Purpose

- Historic Wells
  - Land Department
    - Production of old wells aids in leasing
    - Lets them know if a lease is HBP
  - Geology & Drilling Departments
    - Aids in the planning process of new wells

Project: Plan



Project: Step 1 – Light Table for Farmlines

- Process
  - Print out farm line map
    - Already scanned
    - Some were already georeferenced
    - Quarter quad
  - Print tax parcel map
  - Overlay on the light table

Project: Step 1 – Light Table for Farmlines

- Hand color/highlight farm boundaries

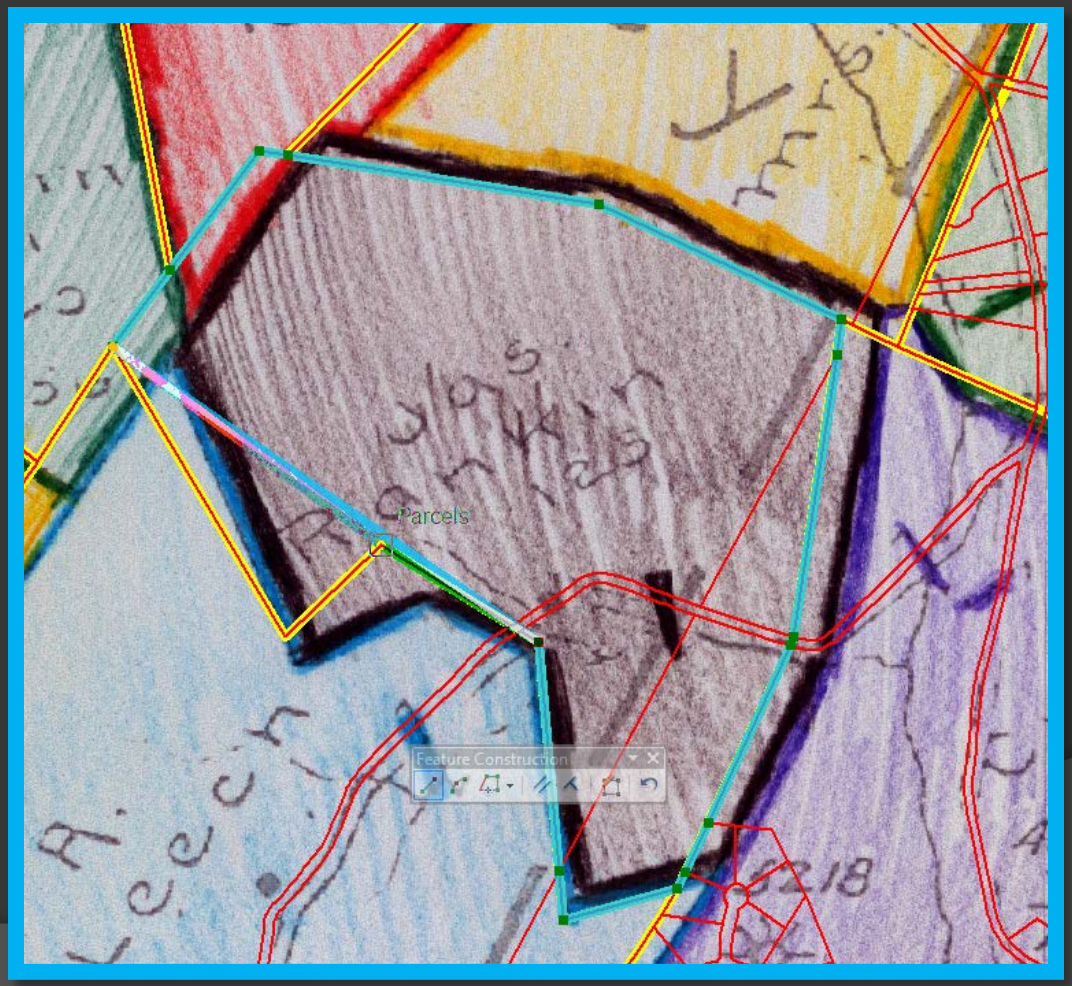
Project: Step 2 - Georeferencing

- Scan in the colored map and georeference

- Georeference by:
  - Topo Maps
  - Aerial Imagery
  - Tax Parcels

Project: Step 3 - Digitizing Farmlines

- Digitizing the Farmline – Create Polygon



Project: Step 3 - Digitizing Farmlines

- Digitizing the Farmline – By Copy/Paste

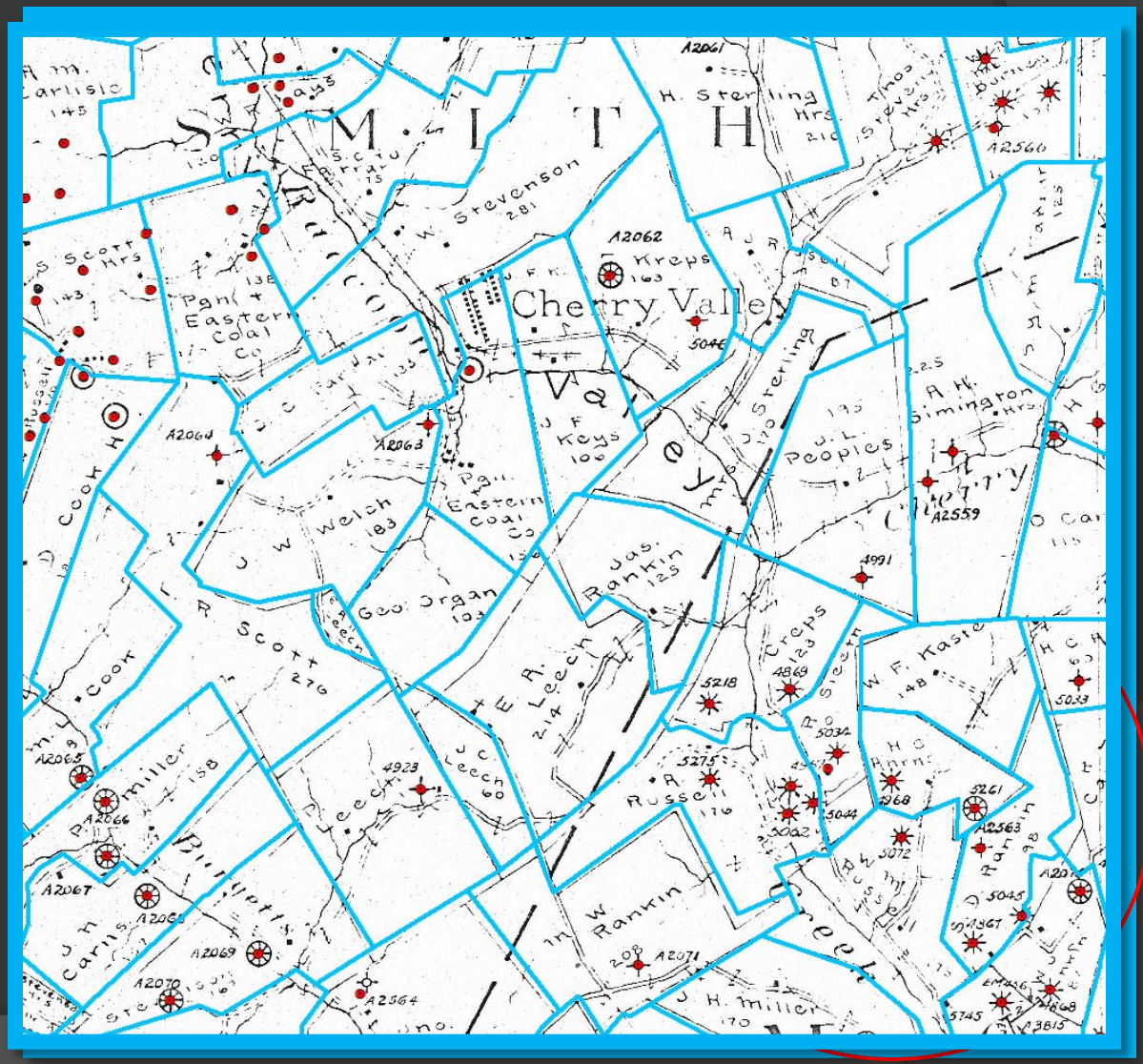
Table

1911_FarmLines2

FID	Shape *	OBJECTID	Id	OLD_NAME	OLD_ACRES	EDITOR	DATE	GIS_ACRES	QC_STATUS	Shape_area	Shape_len
23	Polygon	617	0	Jason Rankin	125	AO	2/22/2013	123.818	X	501073.827382	3194.548889

Project: Step 4 - Digitizing Historic Oil & Gas Wells

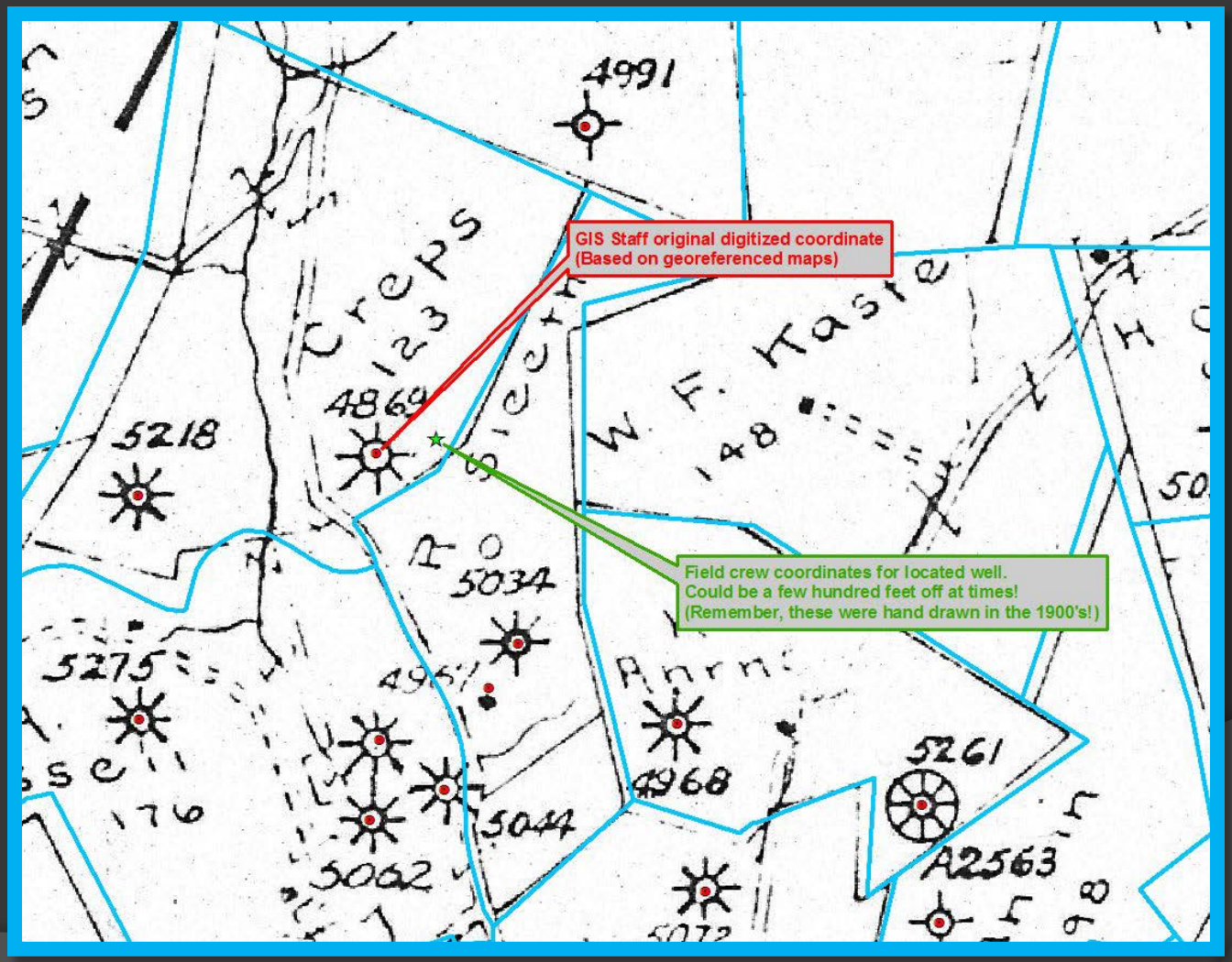
- Use the non-colored, georeferenced map
- Create point features anywhere there is a historic well
- Assign attributes such as: Well status, well code, quad, farm name & editor
- Did this for every quad in our operating area (and then some)
- Light table could be used for this as well



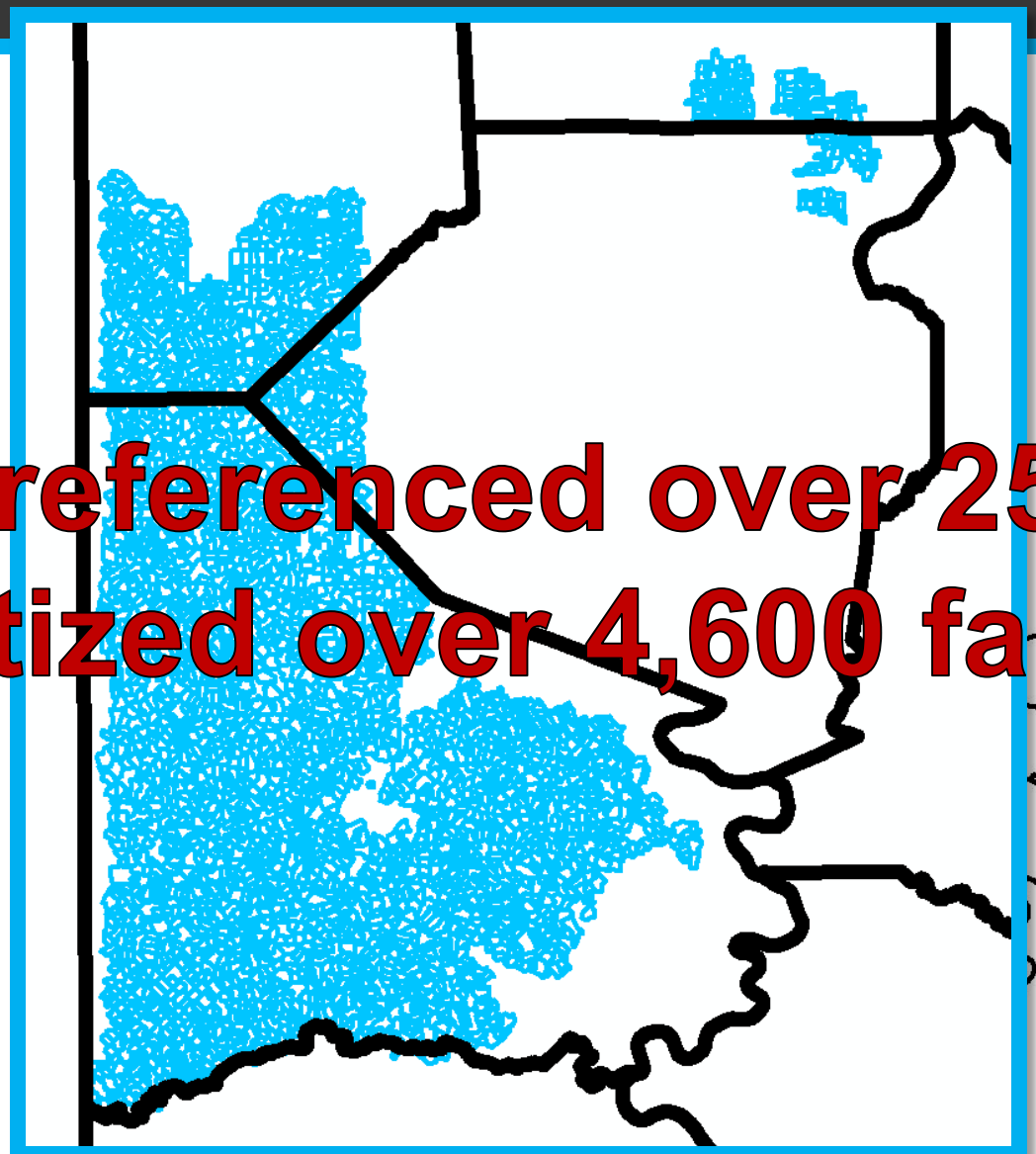
Project: Step 4 - Digitizing Historic Oil & Gas Wells

- Field Searches
  - GIS staff provides our digitized coordinates to field crew
    - Currently anything within 1000’ of a planned Marcellus Well Surface Location
      - We also provide coordinates for any wells already identified by the PA-DEP
  - Field crew performs property search on foot to locate the historic wells
    - Results can vary!
  - Field crew provides search results and any updated coordinates if a well was found
  - GIS staff then edits well spots

Project: Step 4 Digitizing Historic Oil & Gas Wells

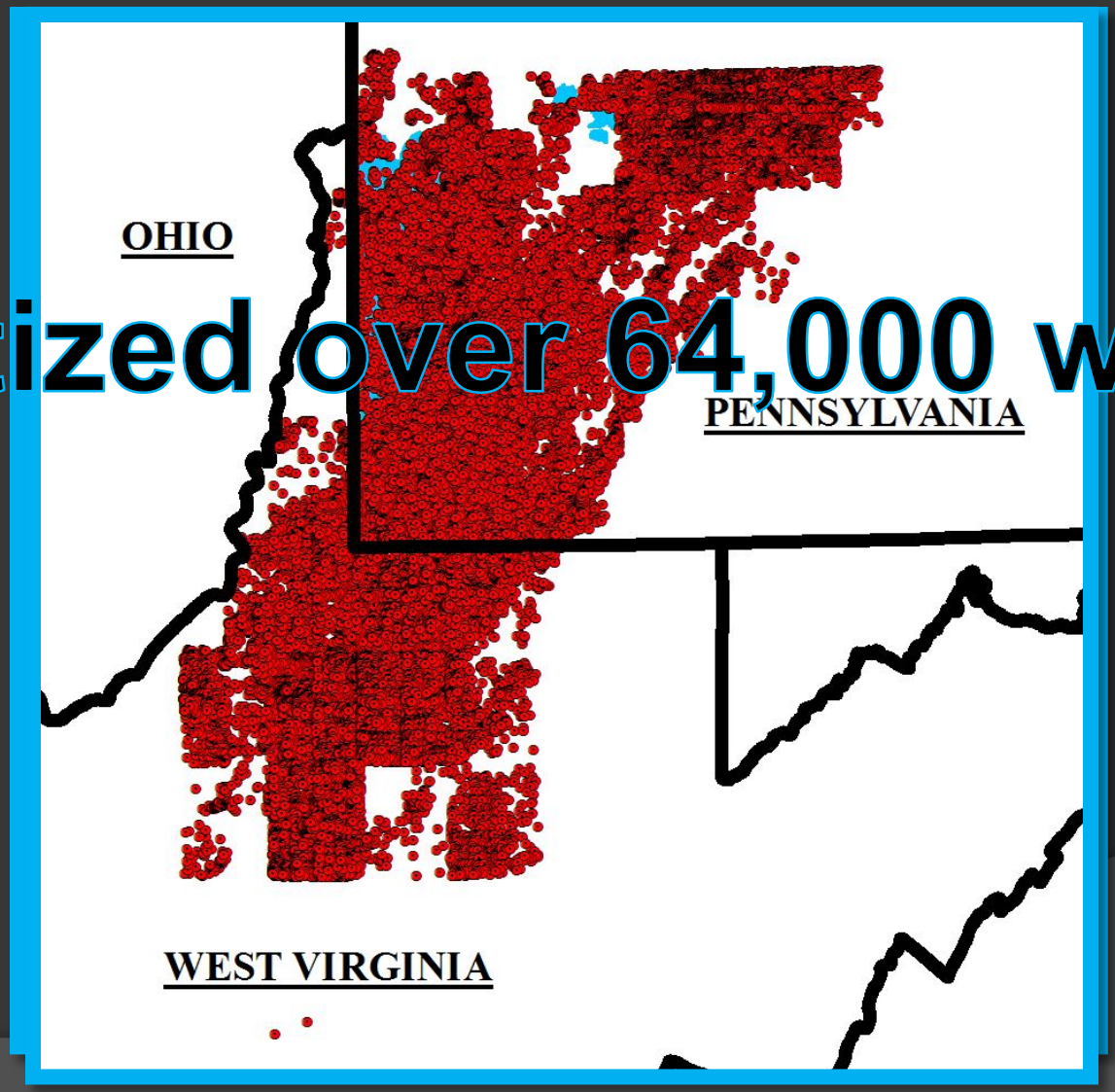


Results: Farmlines



- Georeferenced over 250 maps
- Digitized over 4,600 farms

Results: Historic Wells



Digitized over 64,000 wells

Results

- Results
  - Finished? NEVER!
    - Several map sets, from several sources
    - Digitized multiple points per well, due to multiple source maps
      - Future project is to decide which to keep/remove from our data
  - Effective digital layers for our operating area
  - Utilized by various departments via the GeoCortex Web Map Service

Benefits

- Starting point for title clearing
- Historic wells can tell production status of lease
- Easier to view than hand drawn maps
- Accessible via the web map
  - No longer have to come to GIS for simple map requests!
- Significant cost savings on title fees
- Helps a considerable amount in planning for future development

Questions?

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