Teapot Dome
Naval Petroleum Reserve No. 3

Source: Rock Mountain Oilfield Test Center

25 December 2011   Rusty Mosley   G200901310
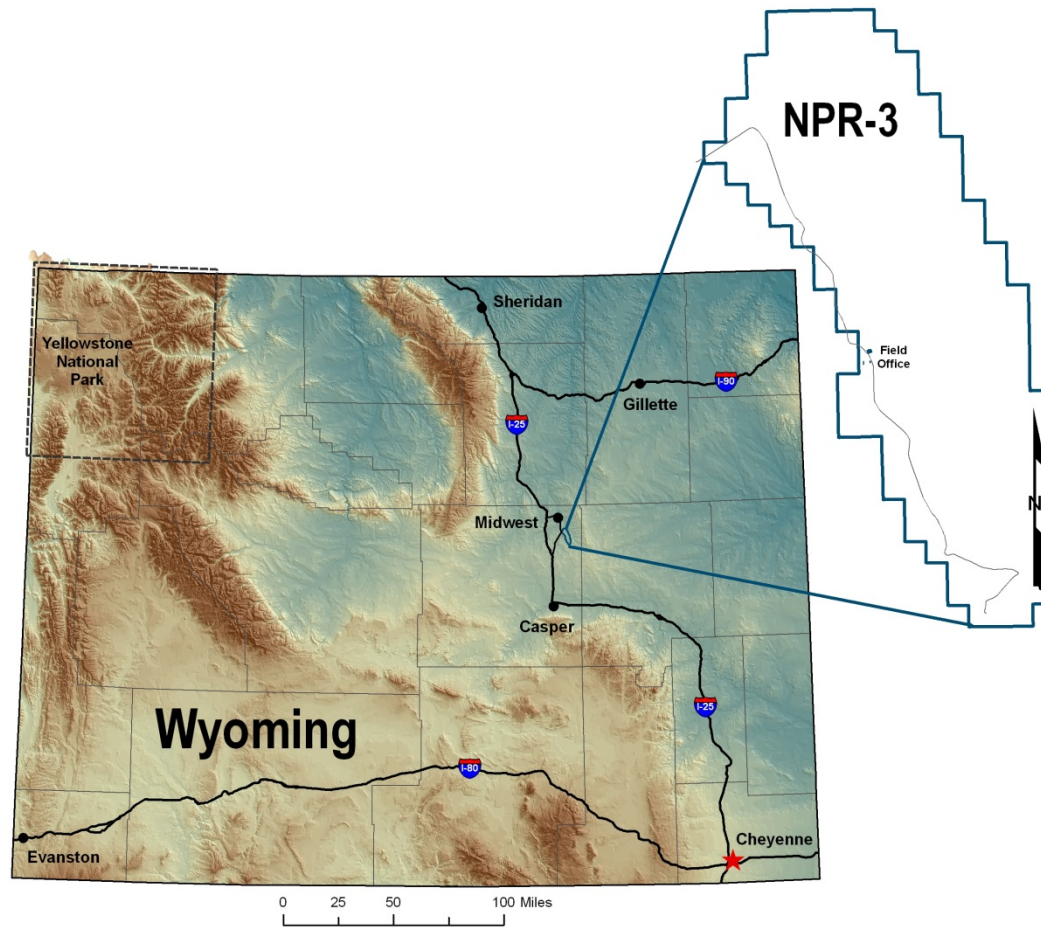
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◆ Geographic Information Systems (GIS) is widely used in the petroleum industry and is applied across planning, production, refining and distribution.

◆ GIS provides an environment to analyze oil well production data used to determine which reservoir, well depth, and geographic sections produce the most oil.

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- In 1993 the Rocky Mountain Oilfield Testing Center (RMOTC) was established as a partnership between:
  - U.S. Government's Department of Energy (DOE)
  - The petroleum industry
  - Academia

- For the purpose of studying and field testing new technologies for drilling, production, enhanced recovery, and production cost reduction.

- There are currently 300 producing wells in 9 reservoirs (RMOTC n.d.).

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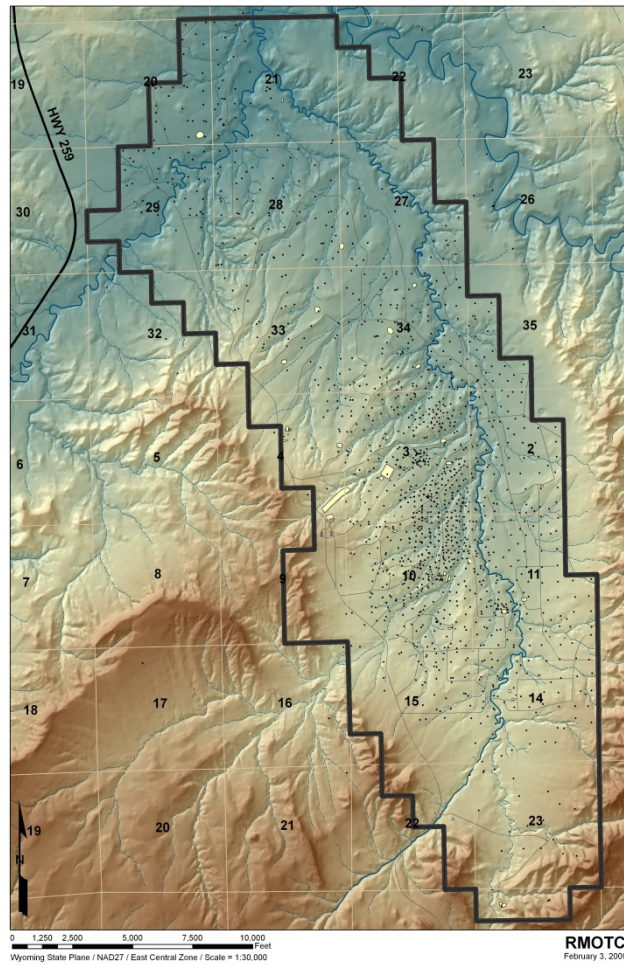
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NPR-3 BASE MAP

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Areal Photograph

Source: (USGS n.d.)

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Research Objective

◆ The objective of this study is to reduce a statistically significant dataset into graphical and tabular representations to investigate oil well production of the Teapot Dome reservoir in the Naval Petroleum Reserve No. 3.

◆ This study seeks to answer the questions of:

 – What is the overall oil production by geographic section?
 – Do deeper wells produce more oil than shallow wells?
 – Which formation is producing more oil?

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Research Methodology

◆ A detailed study was conducted comparing the production of individual wells categorized by:
  – Geographical section
  – Well depth
  – Reservoir
  – Through statistical methods in order to formulate a conclusion.

◆ The methodology used to achieve this objective is broken down into the following phases:
  – Phase I: Literature Review
  – Phase II: Data Collection and Preparation
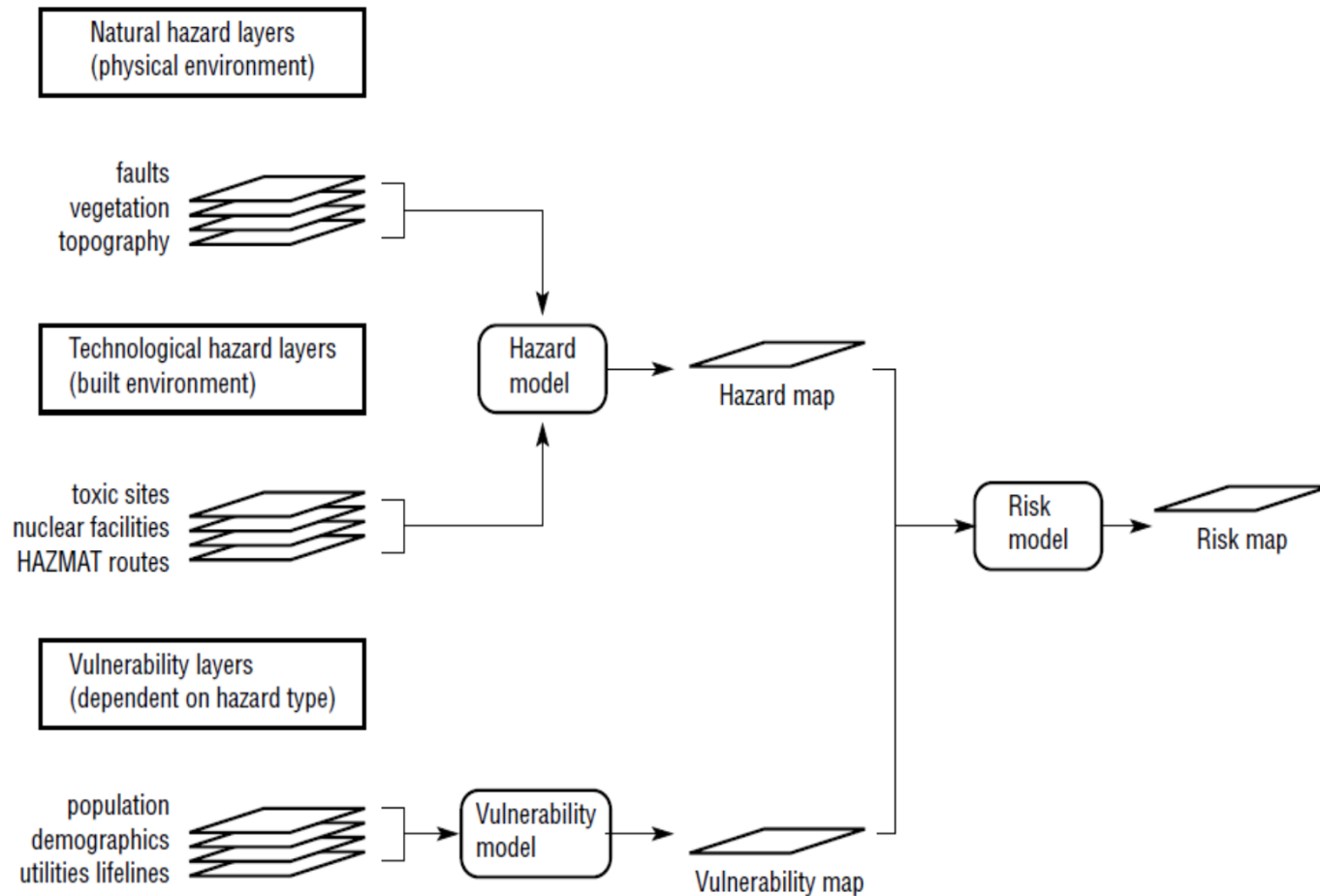 – Phase III: Data Analysis

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Related Literature

◆ **Land Acquisition**

◆ **Oil Field Development**
  – Roads & Utilities
  – Pipelines
  – Distribution Systems & Processing Facilities

◆ **Safety & Security**
  – Wind direction maps
  – Escape routes

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Source: (Cova 1996)

Related Literature (Cont.)

◆ Well Location & Reservoir Management

– GIS provides a matchless environment to analyze well production data for the purpose of locating wells and spacing for reservoir management.

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Data Collection & Analysis

◆ **Data collected from the Rock Mountain Oilfield Testing Center (RMOTC)**

◆ **2 Primary Data Sets Used**
  – Well Production – monthly production
  – Well Attributes
    ▪ Coordinates Wyoming East Central State Plane, NAD 1927

◆ **Data Description**
  – 91 Years between 1914 and 2005
  – 4 datasets combined into one 210,438 observations
  – 1,317 individual wells
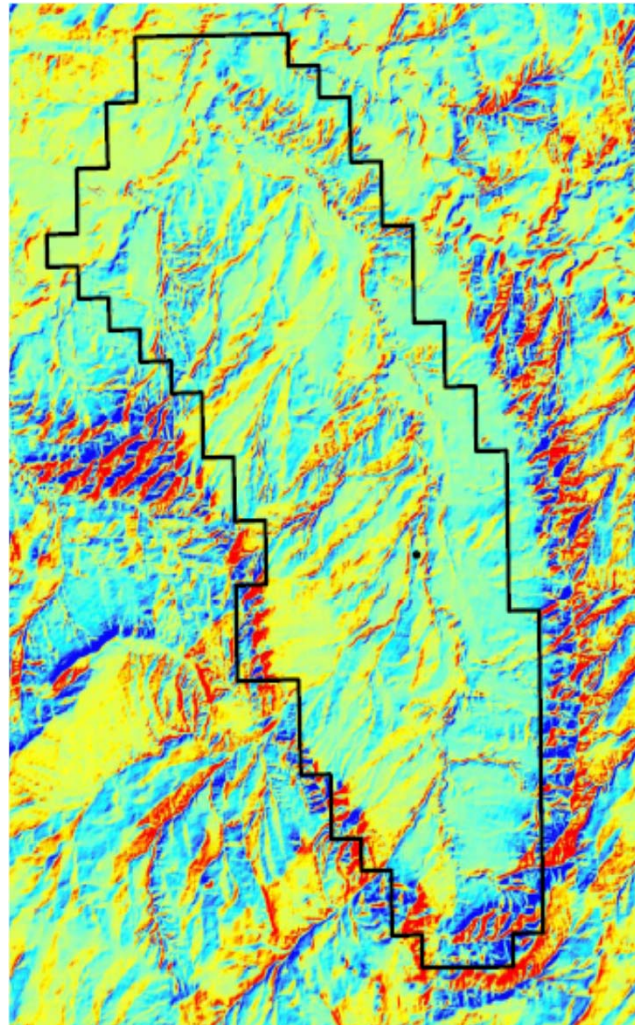
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Data Collection & Analysis

- 19 Geographic Sections
- 14 Rock Formations
- Shallowest Well = 180 feet
- Deepest Well = 6,864 feet

◆ Well Number 1-S-10
- Year 1914
- 456 feet deep
- 171 barrels of oil

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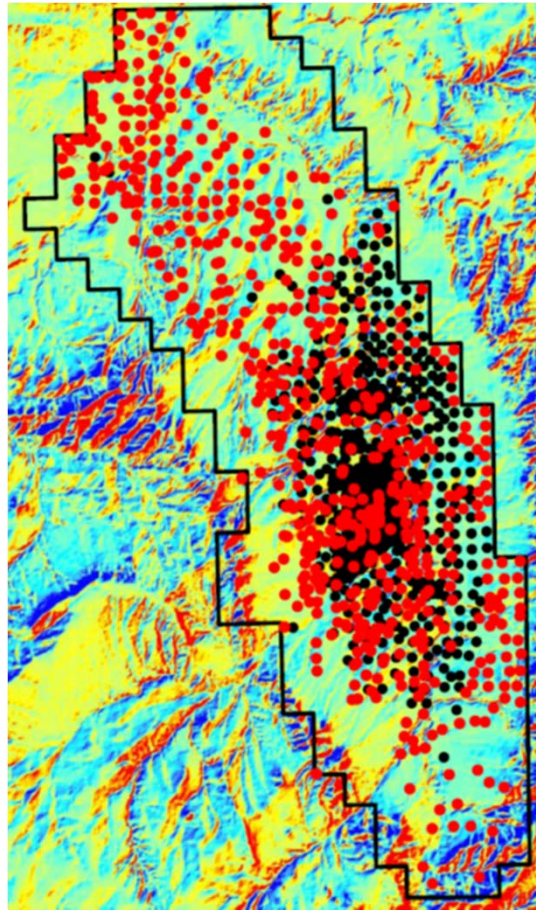
Data Collection & Analysis – Depth

◆ **Shallowest well = 180 feet**

◆ **Deepest well = 6,484 feet**

◆ **Median depth = 1,004 feet**

◆ 663 Observations – Categorized Shallow

◆ 655 Observations – Categorized Deep

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Data Collection & Analysis – Depth

◆ Deep Well Location – shown in red

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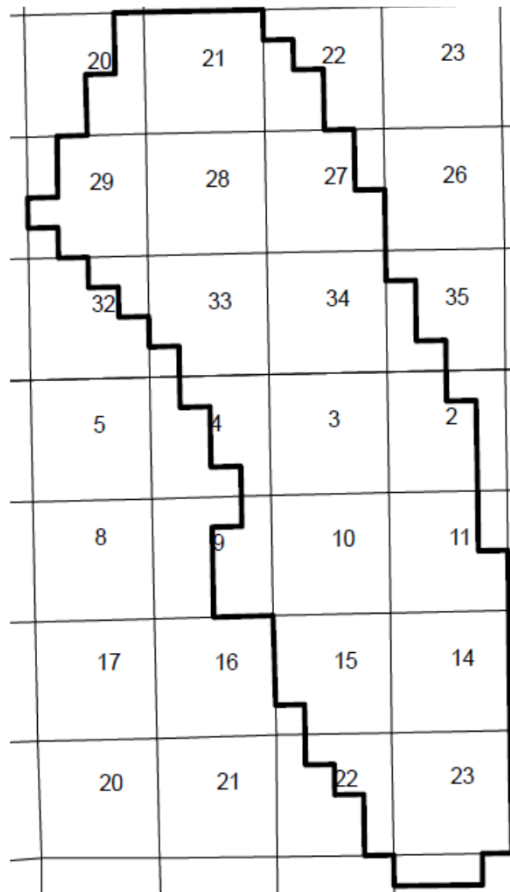
Data Collection & Analysis – Section

◆ 19 Sections

◆ Most Dense Well Populations
  – Sections 3 & 10
  – 37% population

◆ Least Dense Well Population
  – Section 22
  – 1 Well or 0.08% population

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◆ Geographic Sections

Data Collection & Analysis – Formation

◆ 14 Formations

◆ Most Dense Well Populations
  – Shannon = 50%

◆ Least Dense Well Population
  – Crow Mountain = 0.15%

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Quantitative Results - Depth

◆ Total Oilfield Production 21,755,927 barrels

◆ Shallow Wells Produced 7,760,700 barrels

◆ Deep Wells Produced 13,995,227 barrels

Depth	Mean	Median	Sum
Deep	21,367	4,209	13,995,227
Shallow	11,723	7,150	7,760,700
		Total	21,755,927

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Quantitative Results - Section

◆ Highest Producers
  - Section 3 = 14% (3,038,013 bbls)
  - Section 10 = 21% (4,635,639 bbls)
  - Section 20 = 11% (2,419,294 bbls)

◆ Lowest Producers
  - Section 22 = 0.02% (4,444 bbls)
  - Section 23 = 0.18% (39,378 bbls)
  - Section 26 = 0.06% (12,457 bbls)

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Quantitative Results - Formation

◆ Highest Producers
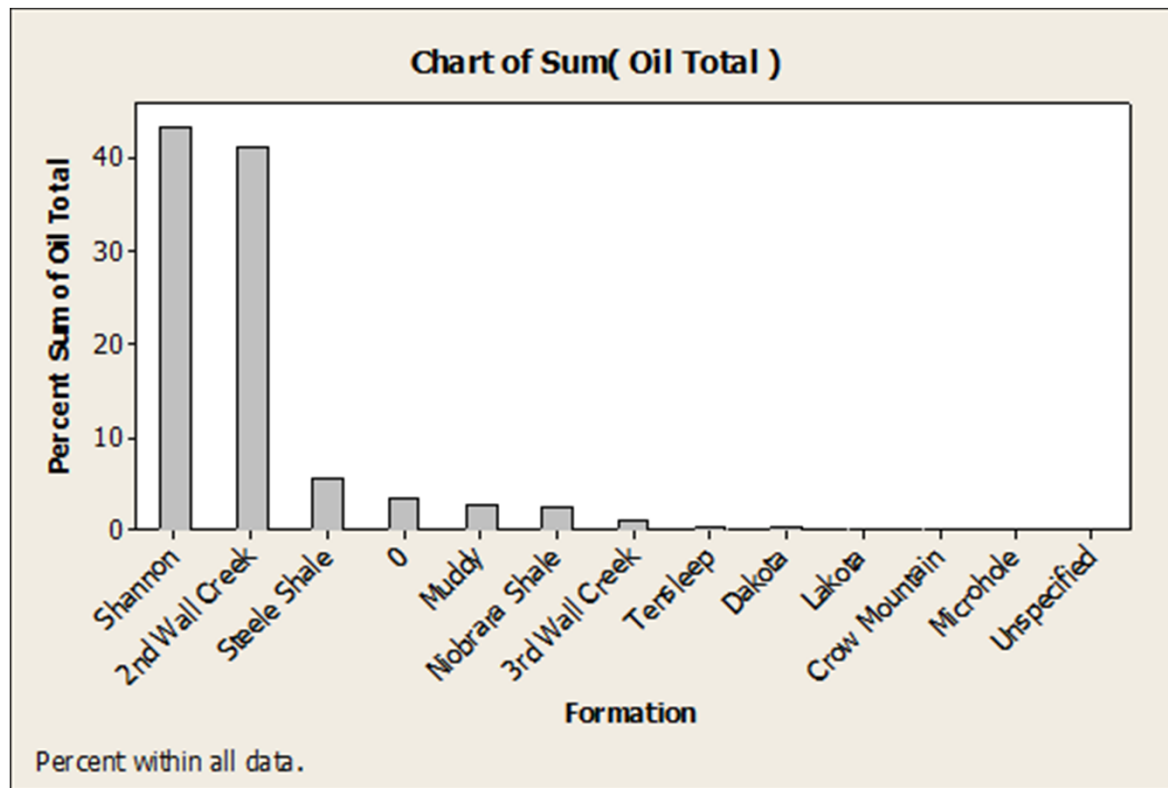 – 2nd Wall Creek   40.3% (8,770,858 bbls)
  – Shannon   39.5% (8,583,263 bbls)

◆ Lowest Producers
  – Madison   0%
  – Microhole   0%
  – Crow Mountain   0%   (10 bbls)

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Conclusions

◆ Deep wells produce more oil – double the volume of shallow wells.

◆ Section 10 produced more oil – 21% of oilfield production.

◆ Although both the Shannon and 2nd Wall Creek formations produce within 1% of each other the 2nd Wall Creek has slightly more production by 188,595 bbls.

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Acknowledgements

Data Source: U.S. Department of Energy –
Rock Mountain Oilfield Testing Center