THE DIGITAL CREW CHANGE. WILL YOU LEAVE DATA BEHIND WHEN THE STARSHIP TAKES OFF?

A Case Study

John Conner and Ellen West Nodwell

Marcus Sanders, Intern – Student TAMU College Station

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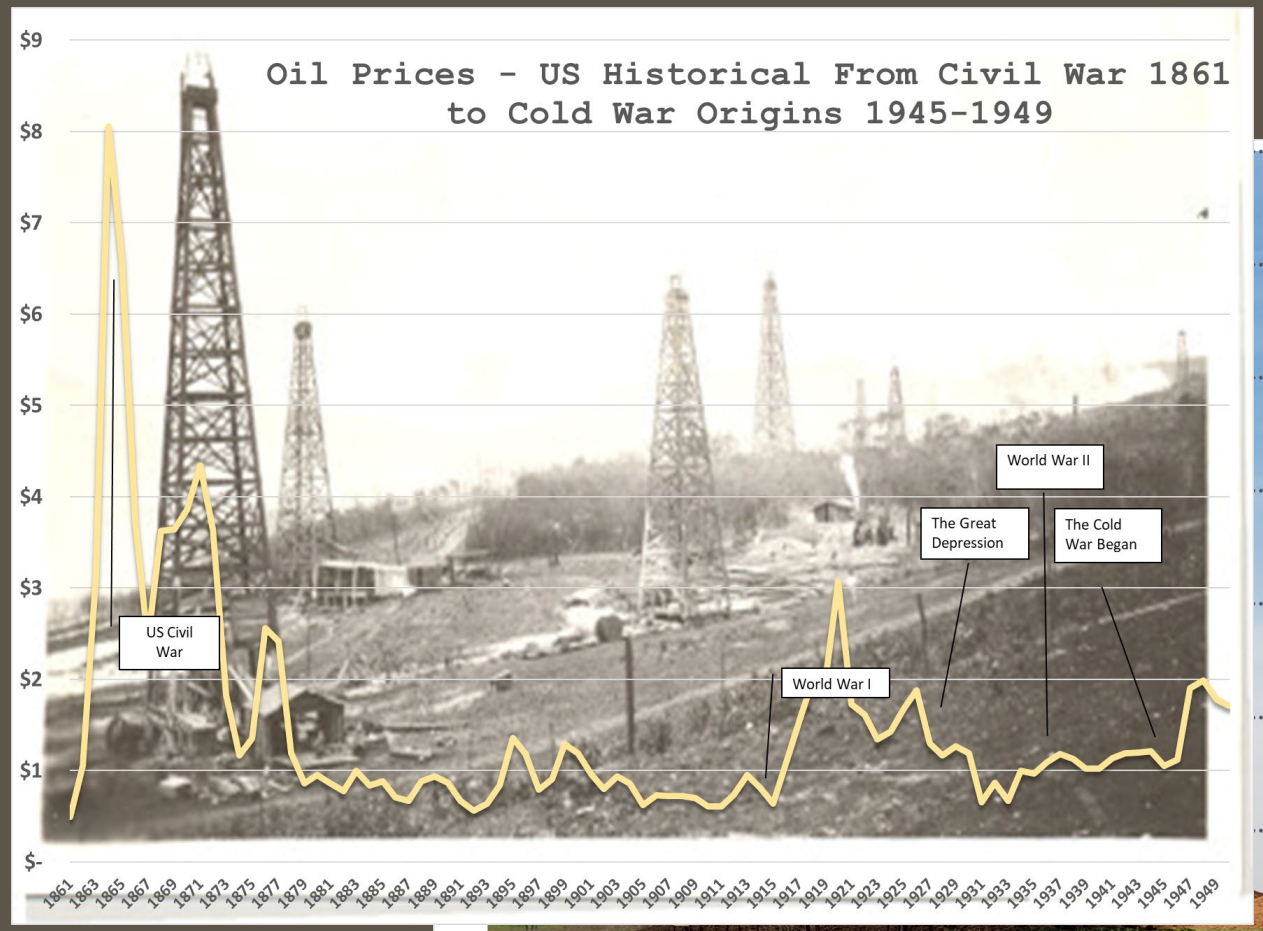
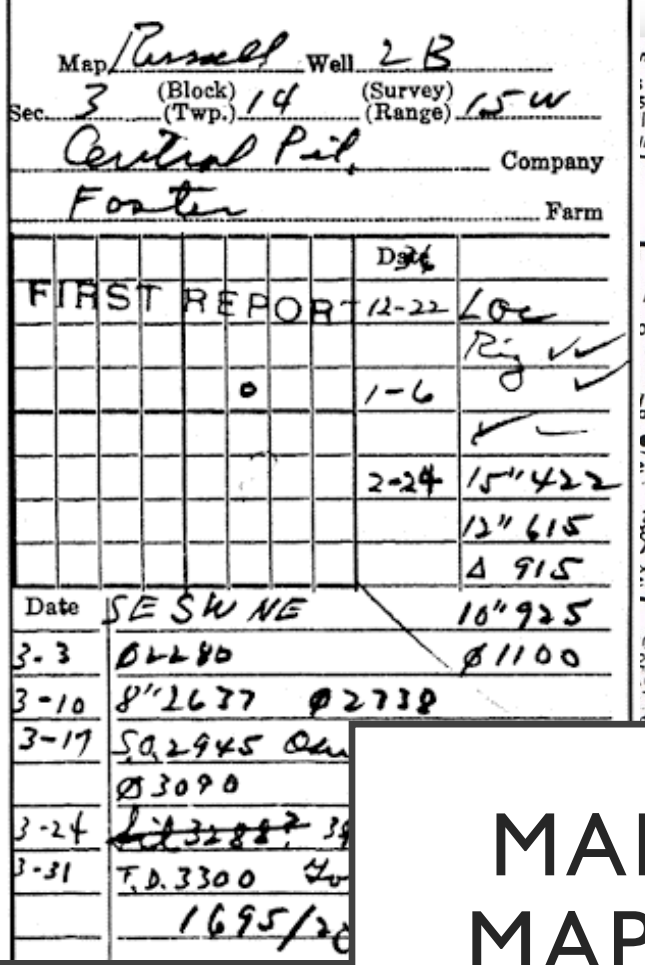
AS THE CREWS CHANGE, A NEW DIMENSION IS INTRODUCED FOR MAINTAINING OUR HISTORICAL KNOWLEDGE BASE.

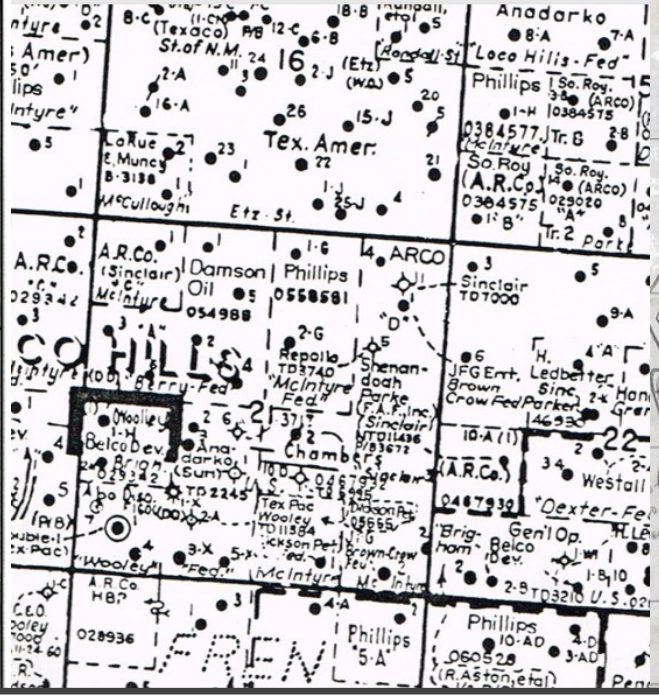
WILL OUR INDUSTRY LOSE ITS HISTORY?
MAYBE NOT.
WE CAN PREVENT THIS FROM HAPPENING WITH FOCUS AND EFFORT.

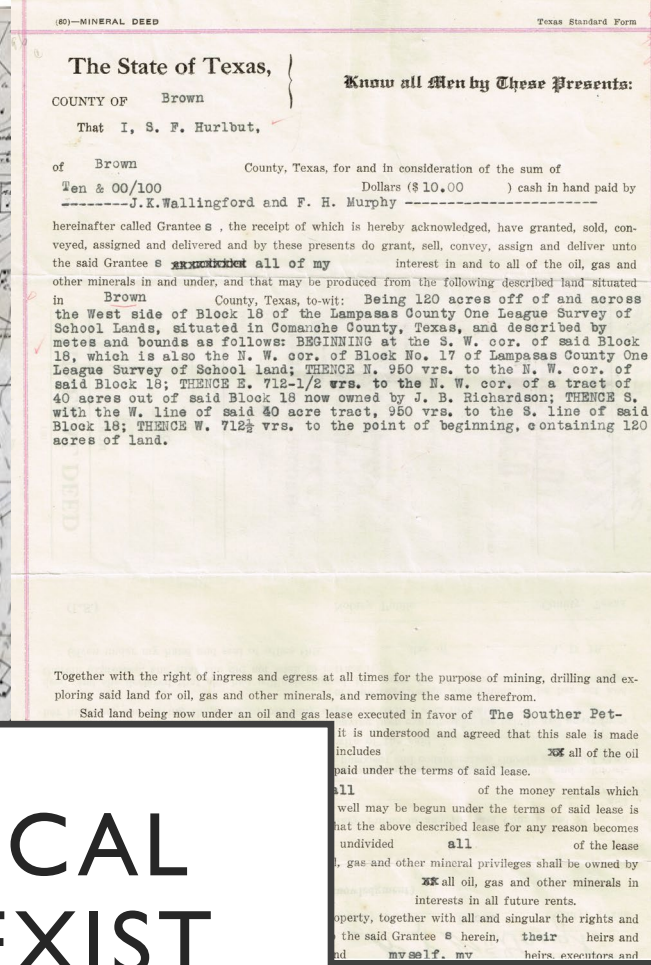
HOW MUCH KNOWLEDGE IS IN THE OLD DOCUMENTS THAT HAVE SUPPORTED THE INDUSTRY OVER THE YEARS? A LOT.



SINCE 2016 -THE STATE OF THE US OIL PRICE







(80)—MINERAL DEED — Texas Standard Form

The State of Texas, COUNTY OF Brown — Know all Men by These Presents:

That I, S. F. Hurlbut, of Brown County, Texas, for and in consideration of the sum of Ten & 00/100 Dollars ($10.00) cash in hand paid by ---------J.K.Wallingford and F. H. Murphy ----------

hereinafter called Grantee s , the receipt of which is hereby acknowledged, have granted, sold, conveyed, assigned and delivered and by these presents do grant, sell, convey, assign and deliver unto the said Grantee s ~~xxxxxxx~~ all of my interest in and to all of the oil, gas and other minerals in and under, and that may be produced from the following described land situated in Brown County, Texas, to-wit: Being 120 acres off of and across the West side of Block 18 of the Lampasas County One League Survey of School Lands, situated in Comanche County, Texas, and described by metes and bounds as follows: BEGINNING at the S. W. cor. of said Block 18, which is also the N. W. cor. of Block No. 17 of Lampasas County One League Survey of School land; THENCE N. 950 vrs. to the N. W. cor. of said Block 18; THENCE E. 712-1/2 vrs. to the N. W. cor. of a tract of 40 acres out of said Block 18 now owned by J. B. Richardson; THENCE S. with the W. line of said 40 acre tract, 950 vrs. to the S. line of said Block 18; THENCE W. 712½ vrs. to the point of beginning, containing 120 acres of land.

Together with the right of ingress and egress at all times for the purpose of mining, drilling and exploring said land for oil, gas and other minerals, and removing the same therefrom.

Said land being now under an oil and gas lease executed in favor of The Souther Pet- it is understood and agreed that this sale is made includes ~~xx~~ all of the oil paid under the terms of said lease.

all of the money rentals which well may be begun under the terms of said lease is hat the above described lease for any reason becomes undivided all of the lease , gas and other mineral privileges shall be owned by ~~xx~~ all oil, gas and other minerals in interests in all future rents.

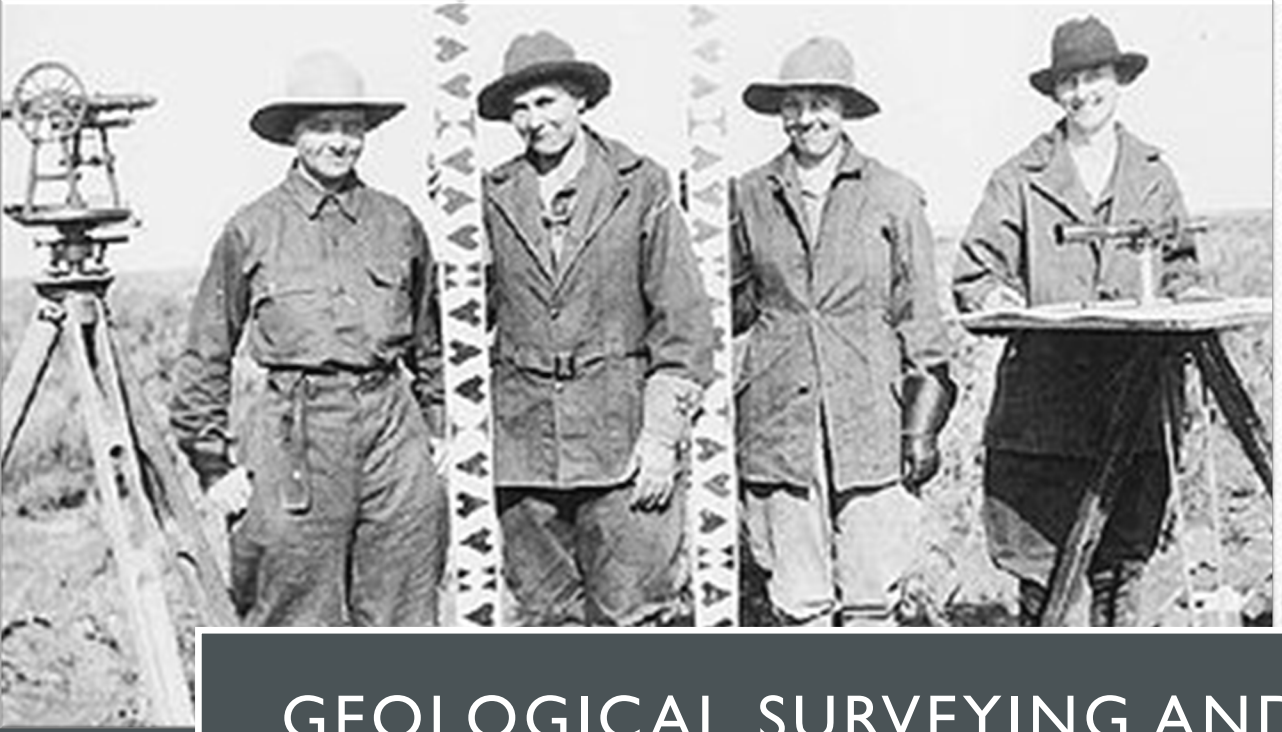
operty, together with all and singular the rights and the said Grantee s herein, their heirs and my self, my heirs, executors and

MANY UNCONVERTED HISTORICAL MAPS AND DOCUMENTS STILL EXIST

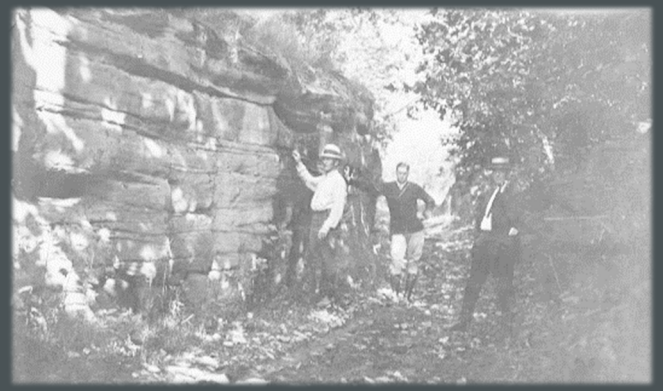
OF THESE POTENTIAL "DATA-RESOURCE RESERVES" – MANY REMAIN "YET TO BE CAPTURED"

90%

QUANTITY OF USEABLE GEOSCIENCE DATA THAT IS HISTORICAL - REMAINING FROM ORIGINAL SOURCES DATING BACK MANY DECADES



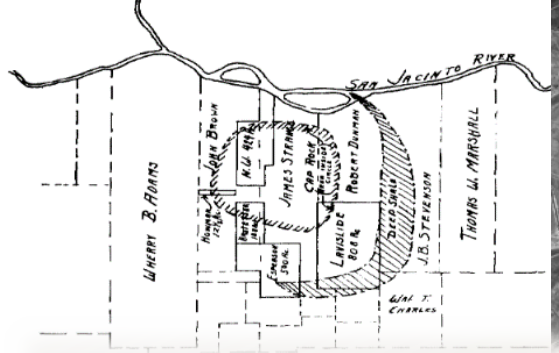
GEOLOGICAL SURVEYING AND MAPPING HAVE CHANGED

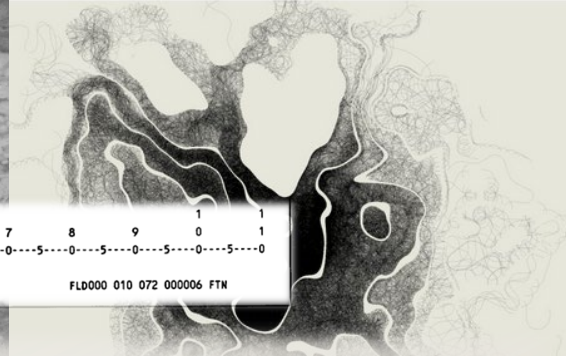


SURVEYING AND MAPPING CHANGES THROUGH TIME. ORIGINAL HISTORY STILL THE IMPORTANT BASE KNOWLEDGE TO RETAIN.

- Cost of Surveys
- Efficiency of Surveys and Mapping
- Data Accuracy
- Data Density and Size

Credits: Penn State, AAPG, USGS, TNRIS, Observablehq.com, Ellen West Nodwell Family Photography Collection





Hand made maps from geological land surveys. Aerial photo surveys emerging. 1930's – libraries created.

Post-WW2 wider commercial use of aerial photos for Interpretation

Emerging use of GPS devices for commercial surveying. Data exchange formats increasingly used to build data sets for digital mapping

More ubiquitous and integrated data driven mapping from digital sources in web interfaces

1910-1940's | **1950's** | **1960-70's** | **1980's** | **1990's** | **2000's** | **2010's** | **2020...**

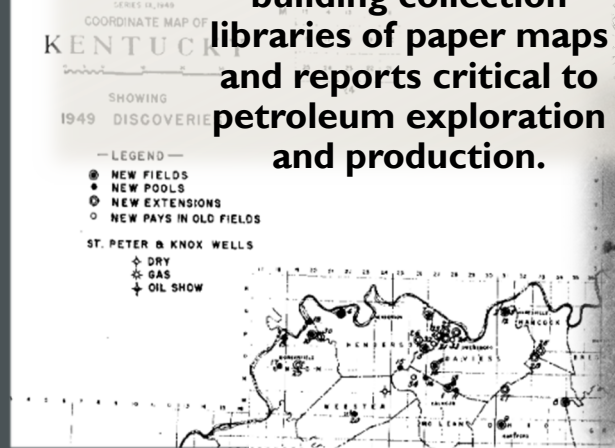
INCREASING SOPHISTICATION IN METHODS, TECHNOLOGY, AND USE OF DATA INTEGRATION

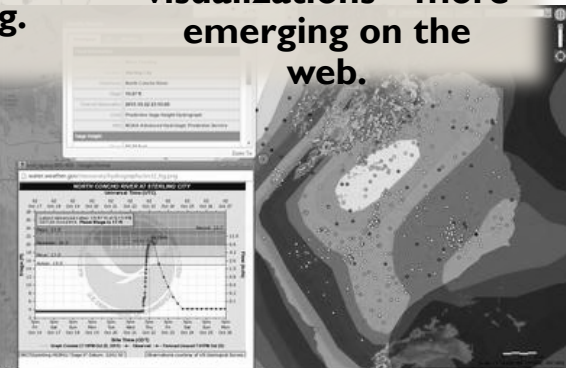
The emerging continuation of building collection libraries of paper maps and reports critical to petroleum exploration and production.

Emerging use of land-sat surveys in mapping earth features

Digital data driven mapping becomes a more standard method. 3 and 4D mapping emerging.

Data interpretation & mapping systems integrated with charts and other visualizations – more emerging on the web.

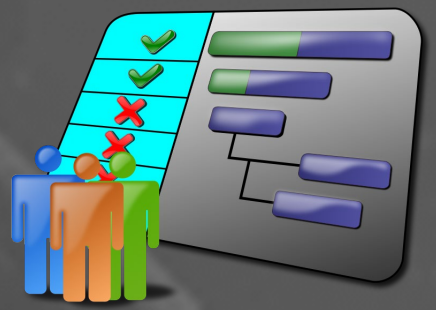




DATA VIZ – AND ALL THE "NEW DATA TECH" HAS BEEN TRENDING.

SNAZZY

COOL DATA TRICKS ARE, TOO!



BUT… " 👀 " DATA VALIDATION?
NOT SO MUCH 😐
THE TIMES, THEY ARE A CHANGIN'…

THOSE OLD PAPER MAPS?

TRASH OR TREASURE? IT DEPENDS.

DATA TECH TRENDS - DATA MINING – "AI" – "ML" – ETC.

- Appears very "automagical" - very compelling ways to extract data from a variety of "information resource-rich targets"
- Watch out for unexpected outcomes
- People doing the work - "blended experience and skillsets" are very important.
- Hold onto that thought.

1900's data miners

ARE THE OLD MAPS AND DOCUMENTS TRASH OR TREASURE? SOME CONSIDERATIONS

- 90% of all usable geoscience data is historical.
- Geodata can be cheap and EZ to create... It might "look" ok...
- But it might be worthless. THE DEVIL IS IN THE DETAILS
- Process + people with relevant experience are required
- Level of effort required? Usually a lot. It depends on if you want useable geodata...
- Initial analysis and assessment – very important!

TREASURE. ALL ABOUT REDUCING RISK AND INCREASING FUTURE VALUE – INCREASING THE RETURN ON INVESTMENTS OVER TIME

NEW POTENTIAL?

- AOI has known potential
- High risk remote location
- Limited information available
- Needs further exploration
- No data? What to do?

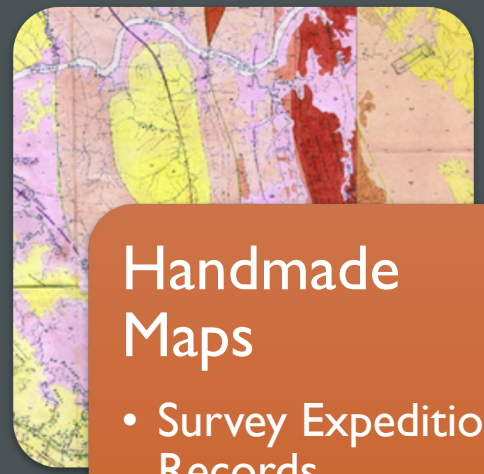
OLD MAPS + DOCUMENTS

- Discovered in file rooms, on share drives, cleaning out storage...
- "Gold nuggets?"
- Possible treasure finds!

NEW INFORMATION

- Transform old maps and docs to digital data
- Greater insight!
- New projects = new potential revenue
- Return on investment = VALUE

A NEW WAY OF LOOKING AT OLD MAPS

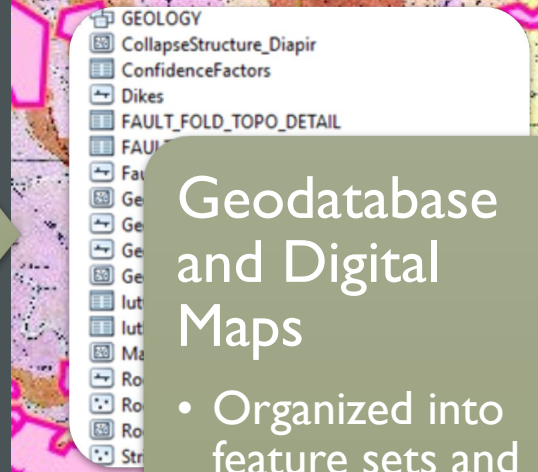


Handmade Maps

- Survey Expedition Records
- Interpretations
- Scanned maps and information
- Rich information annotations

Digitized Using GIS Tools

- Reviewed Scans
- Researched and Analyzed Original Context
- Georeferenced to a common CRS
- Captured Attributes
- Created Symbology



Geodatabase and Digital Maps

- Organized into feature sets and domains
- Fully organized utilizing templates from standard models
- Current mapping standards

PRODUCING USEFUL RICH QUALITY DIGITAL GEOINFORMATION FROM "OLD PAPER" REQUIRED SEVERAL KEY COMPONENTS OF WORK

1. ASSESSMENT OF THE ORIGINAL SOURCES BY EXPERIENCED PEOPLE
2. ANALYSIS AND TIME ESTIMATION FOR DOING THE JOB
3. DOING ANY REQUIRED HISTORICAL RESEARCH ON THE FLY
4. GEODETIC OPERATIONS (IMPORTANT AND HARD WORK!)
5. DATA MODELING BASED ON STANDARDS AND CONTENT
6. PEOPLE DIGITIZING IN CONCERT
7. DATA OPERATIONS USING LATEST TOOLS & TECH CREATIVELY
8. CROWD-WORKING VIRTUALLY WITH CONTINUOUS COLLABORATION - AGILE STYLE!
9. QUALITY ASSURANCE AS WE GO – CLEAN! CLEAN! CLEAN!
10. DELIVERY AND DOCUMENTATION TO END CLIENT.

OLD MAPS – NEW DATA – RECOGNIZED VALUE

Method

- Combined people experience and new tech methods to transform history into reusable geodata.
- "Online" crowd-source type applications – collaboration and efficiency.

Data Delivery

- The geodatabase delivers wide capabilities for integration with new data as the asset is explored and developed.
- Extensibility is virtually unlimited

Value

- Return-on-investment - value of the data is realized with the first successful project
- Each successful project <u>increases</u> data value

TRASH TO TREASURE - THE VALUE PROPOSITION

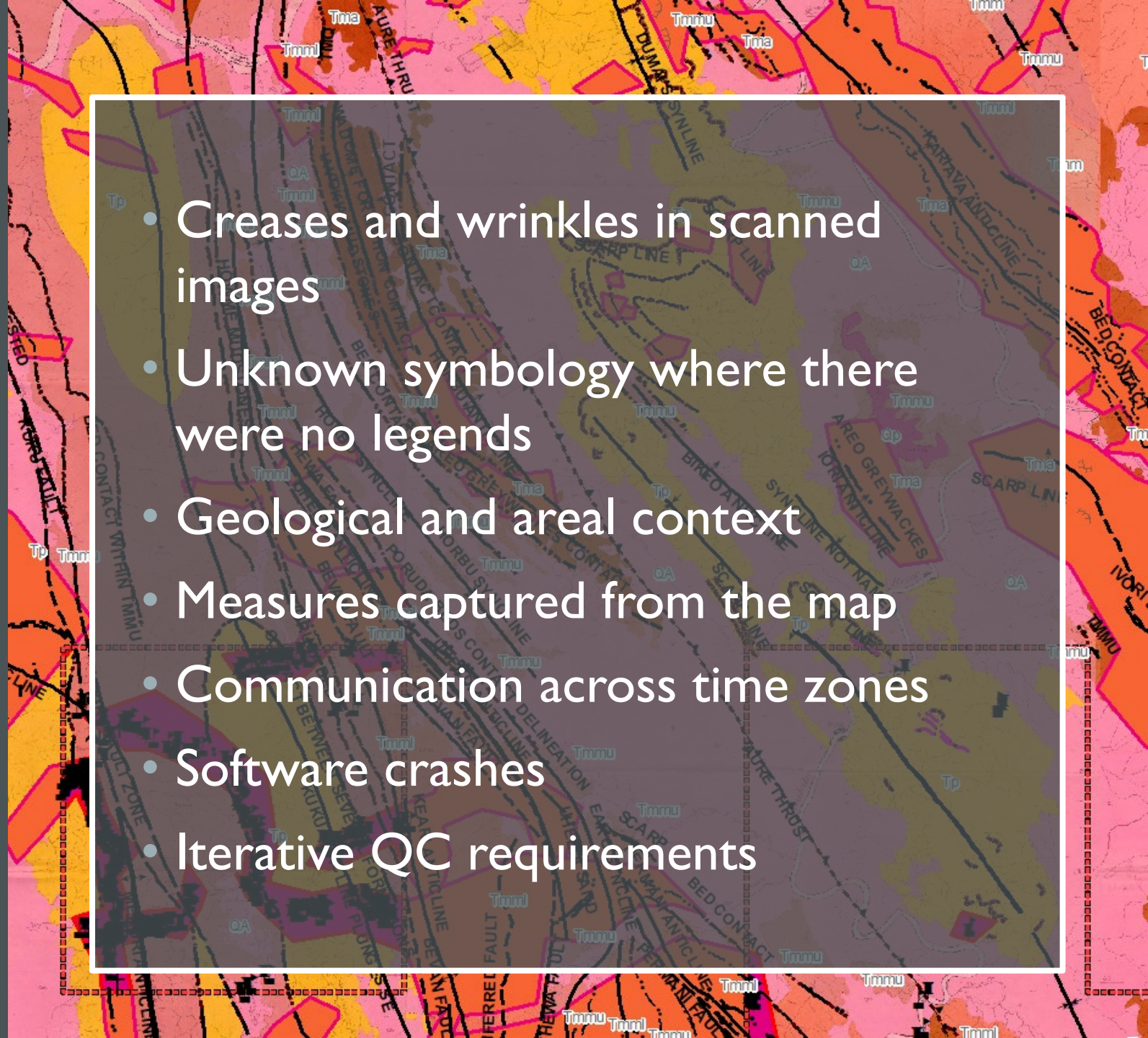
HISTORICAL KNOWLEDGE CAPTURED

- Transformed and cleaned in the process = quality assured data
- No "reinvention of the wheel"
- Important note that in our project, 1939 aerial photo surveys were used as a base for the beautiful maps we transformed in our work.

RISK MANAGEMENT

- Can't see through the trees? Can't see through clouds? A2D of old on-the-ground surveys!
- Value of digital transformation vs. new surveys in "difficult areas"? PRICELESS.
- Cultural and environmental risks mitigated as much as possible!

ISSUES ENCOUNTERED, ADDRESSED AND SOLVED!

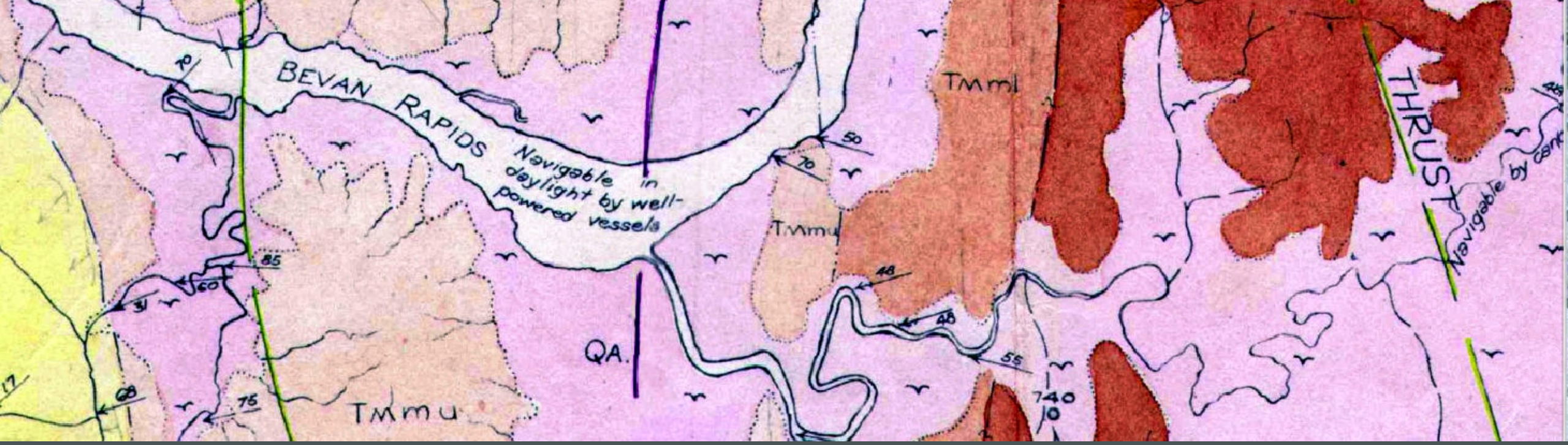


- Creases and wrinkles in scanned images
- Unknown symbology where there were no legends
- Geological and areal context
- Measures captured from the map
- Communication across time zones
- Software crashes
- Iterative QC requirements

WHAT DOES IT TAKE TO BRING OLD MAPS INTO A GEODATABASE OF VALUABLE INFORMATION?
CLEAR REQUIREMENTS * (ANALYSIS + EXPERTISE + TOOLS + VALIDATION + COLLABORATION)/PEOPLE * TIME = RESULTS AND LESSONS!

TOP TEN TAKE-AWAYS:

1. This is not a job for "sweatshop digitizers".
2. This effort requires a blend of skill-sets – with experienced people.
3. From beginning to end – analysis and troubleshooting are required throughout!
4. Coordinate reference systems can be a challenge – you need an expert!
5. Research! Research! And more research!
6. Understand temporal factors – context – location – geological mapping standards changes over time
7. The efforts to translate all data and maps – do not underestimate
8. We can adopt today's tools and adapt to this "manual" process
9. Accept the reality that tools, no matter how clever, may fall short - human intervention and manual steps are required. Expect the unexpected.
10. Necessity is the "mother of invention"



NEVER UNDERESTIMATE THE LEARNING OPPORTUNITIES FOR THE WHOLE PROJECT TEAM!

- Working with handmade artifacts such as antique maps, is a visual exploration into the past.
- The requirement to research, read about, and build a temporal understanding of the geological surveyors and explorers involved, is an opportunity to understand the challenges that they encountered and overcame without modern technology.
- For remote areas, as many of these places were and are, today, the challenges were great, but the rewards can be recognized years into the future if the knowledge is carefully translated into modern accessible, useable information.

ANY QUESTIONS?

Contacts:

John Conner, CVV Consulting - jconner@ensoco.com

Ellen West Nodwell, IntegraShare Dimensions, Incorporated – ellen.nodwell@integrashare.com

Marcus Sanders, Sanders Digital Ventures and TAMU GIST student

Thanks to Our Customers:

Jennifer Broadbent and Adam Pring - Katalyst Data Management, Australia

Amy Weiss - Oil Search, PNG

Credits:

John Conner, EIA.gov, AAPG, USGS, Penn State, TNRIS, Observablehq.com, ellenspictures-creative, Ellen West Nodwell Family Photography Collection