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GEOCODING LOCATIONS OF HISTORIC RECLAMATION RESEARCH SITES USING GOOGLE EARTH

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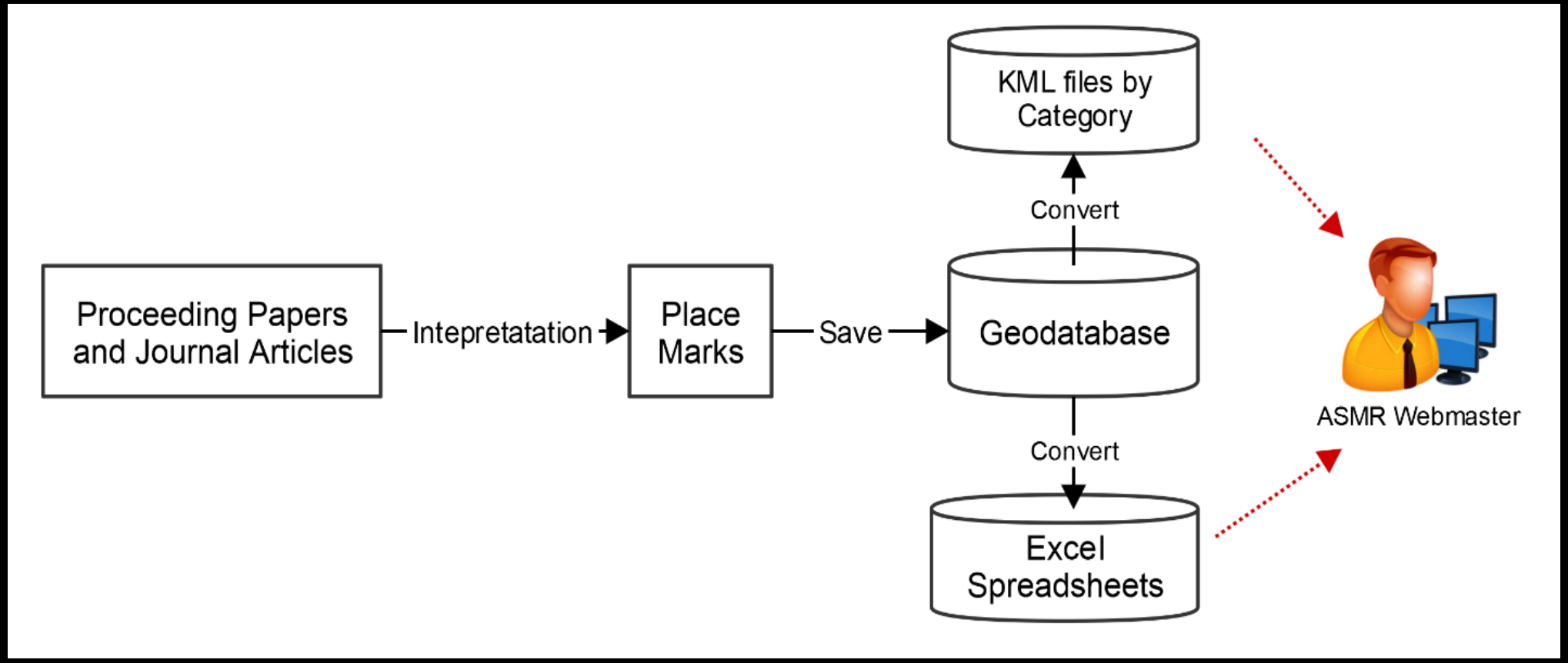
INTRODUCTION

- The American Society of Mining and Reclamation (ASMR) has been publishing annual conference proceedings and journal articles.
  - Around 30 years of collection of literature on mining reclamation
  - Many research sites were documented but were not geocoded
  - More efficient use of the ASMR resources is affected
- Google Earth can provide a platform for geographic data sharing, mashup and exploration.
  - Easy to use and freely available
  - Placemarks can be integrated into a webpage for web map display
  - The data format is widely supported

PROJECT GOALS

- To provide quality-assured geographic reference to proceeding papers published by the ASMR during 1988-1997 (1028 papers)
- To provide training opportunities of geospatial techniques for undergraduate and graduate students

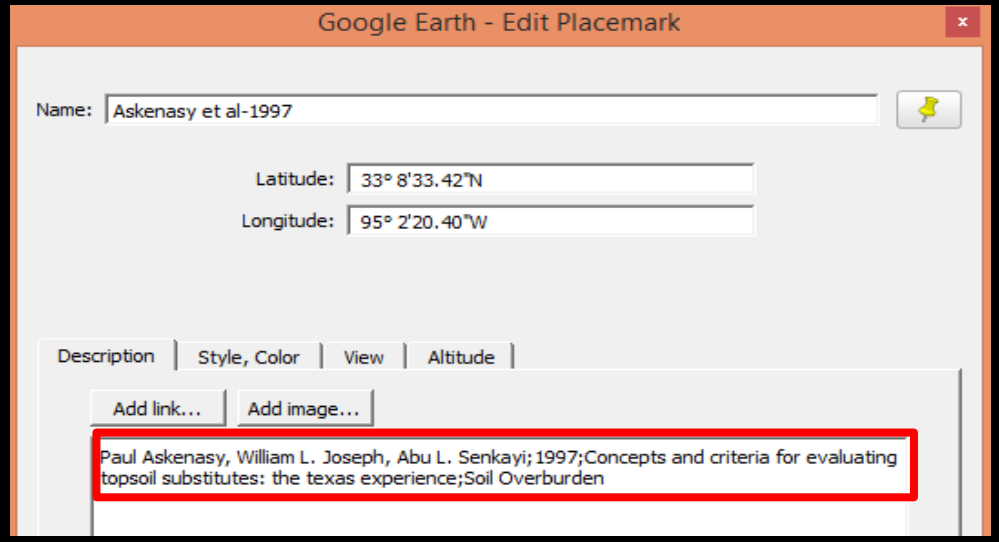
METHODOLOGY

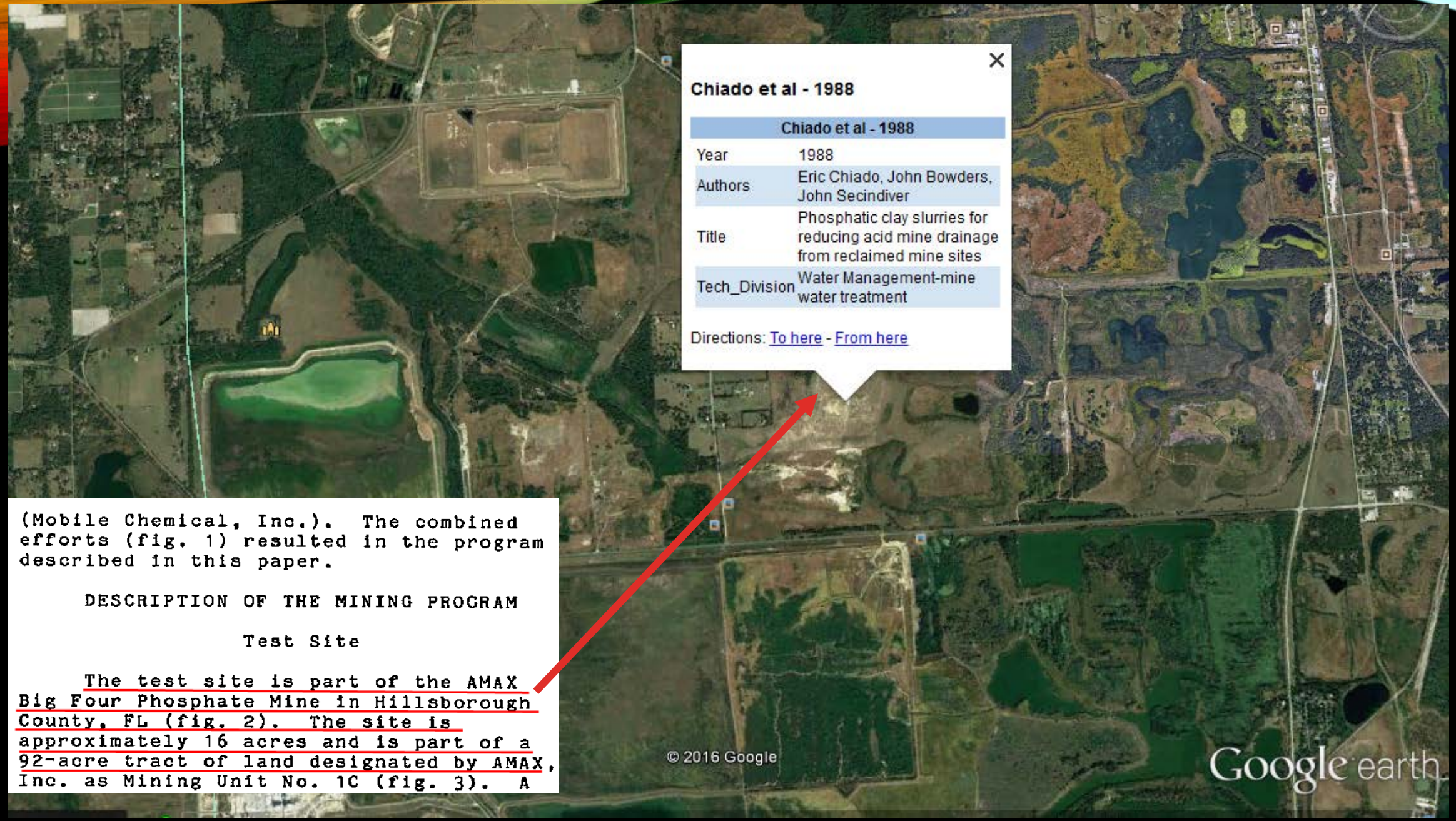


METHODOLOGY

Step 1: Manual interpretation and information inputs

- Read titles, abstracts, full texts, and make a placemark
  - Each student was assigned with two years of proceedings
  - A graduate assistant helped inspect the data quality
  - KML or KMZ data format
- Develop a project tutorial and have monthly meetings to address common issues and ensure the progress





(Mobile Chemical, Inc.). The combined efforts (fig. 1) resulted in the program described in this paper.

DESCRIPTION OF THE MINING PROGRAM

Test Site

The test site is part of the AMAX Big Four Phosphate Mine in Hillsborough County, FL (fig. 2). The site is approximately 16 acres and is part of a 92-acre tract of land designated by AMAX, Inc. as Mining Unit No. 1C (fig. 3). A

ASMR Project Tutorial

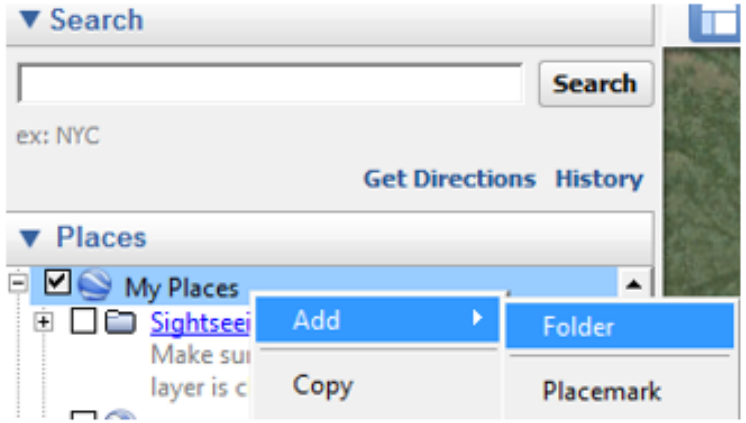
By Ruopu Li March 24, 2016

The purpose of this tutorial is to show the entire workflow that you will follow through the project.

Step1: Set up the Google Earth folder for placemarks

Install and open the Google Earth. Since 2015, Google Earth Pro has been free to the public (http://www.google.com/earth/download/gep/agree.html) and you can use this powerful version for this project. The regular version of Google Earth is fine too.

Right click on My Places on its left panel and select Add -> Folder. You should use the year of the conference to name the folder. For example, you can name is 1984 or conference1984. In this step, you essentially set up a container to hold all of future placemarks.



Step2: Read each conference proceeding papers allocated to you.

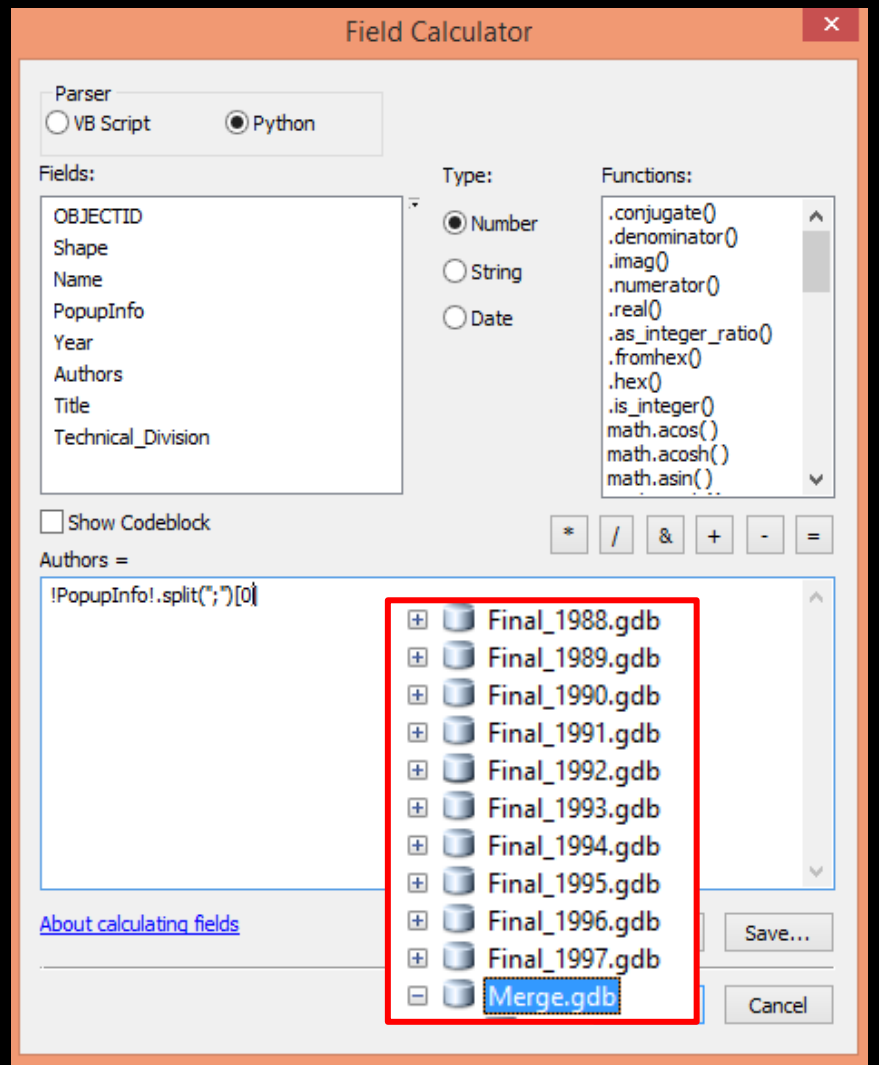
METHODOLOGY

Step 2: Load the KML/KMZ files into a geodatabase

- Using ArcGIS software
  - KML to Layer tool
- Reformat the data with multiple fields
  - ArcGIS Field calculator
- Errors checking and fixing

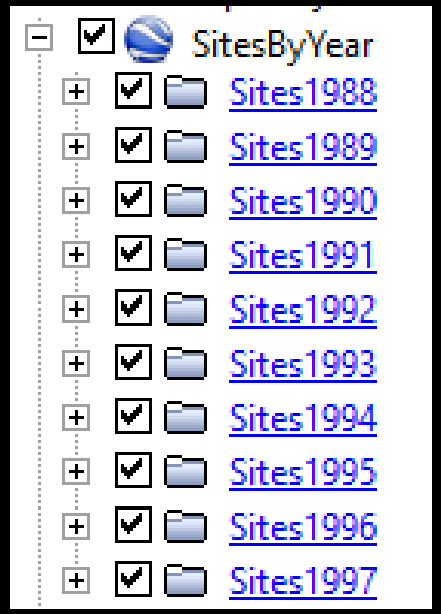
Step 3: Data organization and outputs

- KML data organized as years and technical divisions
- Excel spreadsheet required by the ASMR



RESULTS

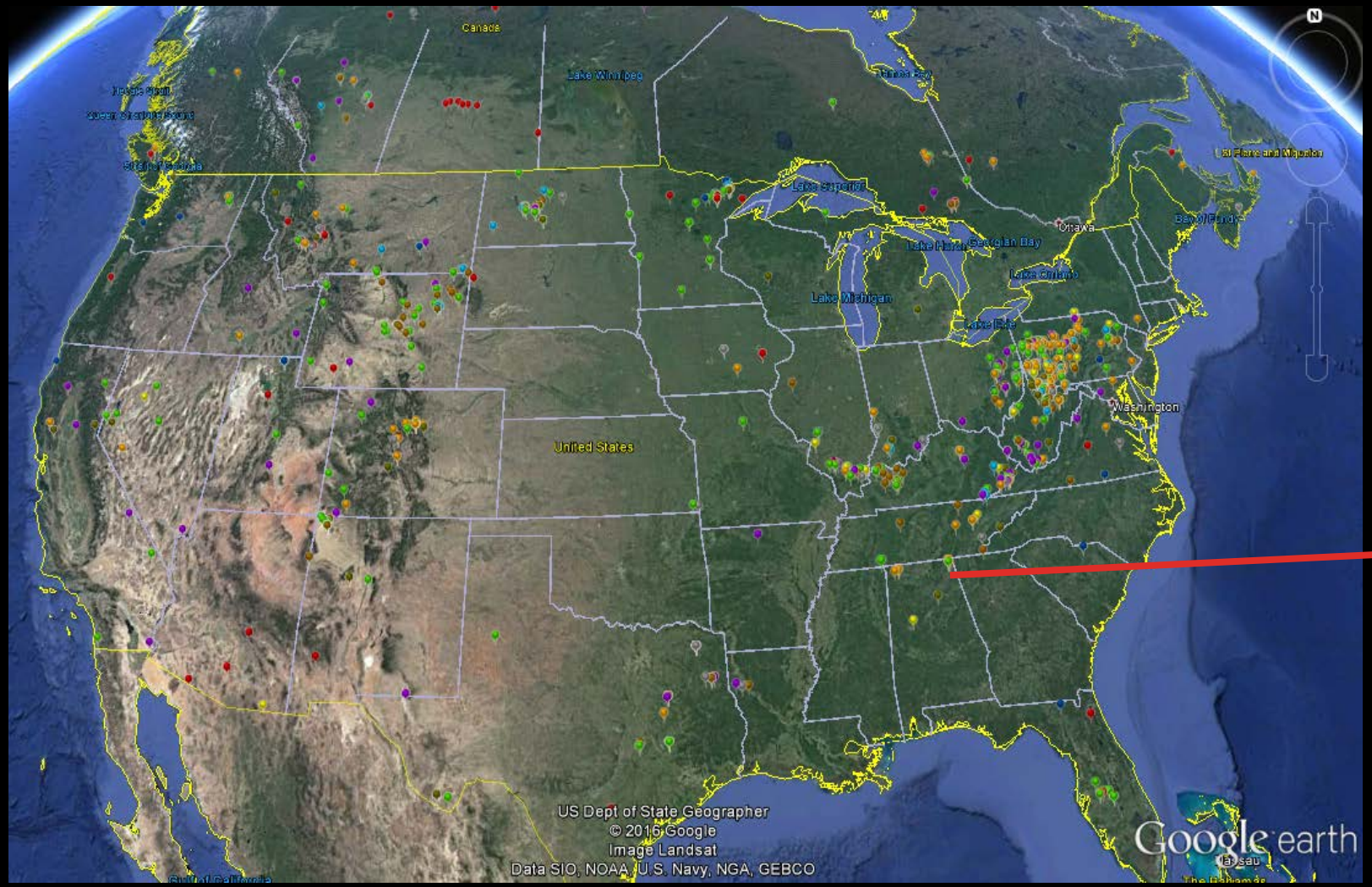
KML/KMZ Format



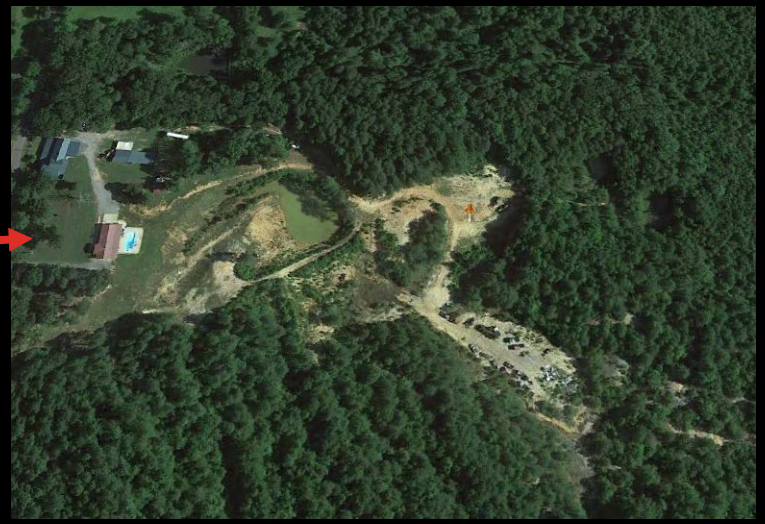
MS Excel Format

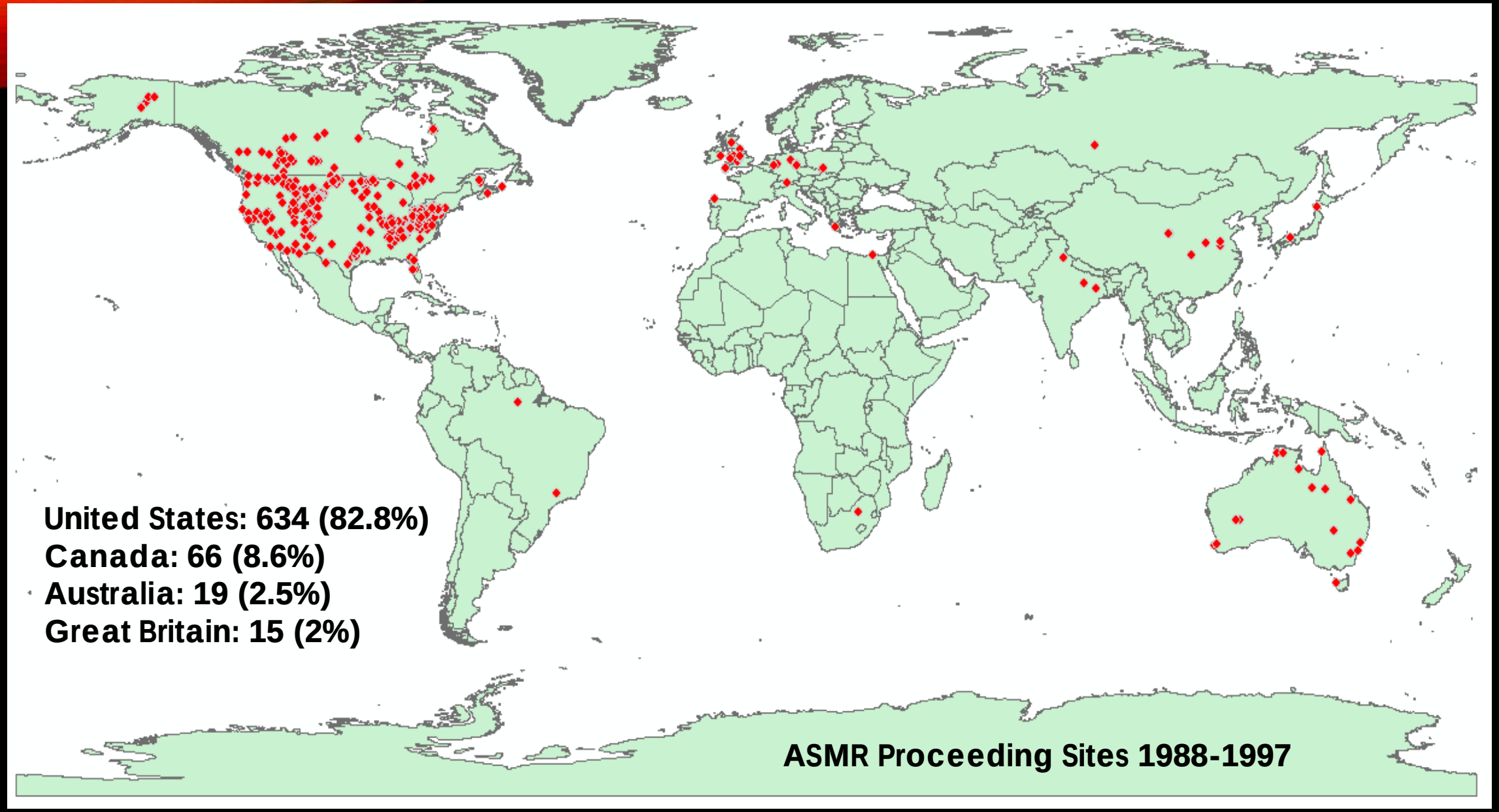
Name	Year	Authors	Title	Technical Division	Longitude	Latitude
Skousen et al - 1988	1988	J. Skousen, C. Call, R. Knight	A chronosequence of vegetation a	Ecology	-97.0605	30.5536
Boyle - 1988	1988	James Boyle	A program to mine and restore a fo	Ecology	-82.1098	28.1673
Emerson - 1988	1988	Lawrence Emerson	A substitute topsoil plan for reclan	Ecology	-81.8513	38.1120
Brodie et al - 1988	1988	Gregory Brodie, Donald Hamme	An evaluation of substrate types ir	Ecology	-85.7811	34.8063
Kepler - 1988	1988	D. Kepler	An overview of the role of algae in	Ecology	-79.6891	41.2233
Burley et al - 1988	1988	J. Burley, S. Johnson, P. Larson,	Big Stone Granite Quarry habitat d	Ecology	-96.4004	45.2594
Tackett - 1988	1988	Edward Tackett	Boissevain reclamation project: A r	Ecology	-81.3728	37.2904
Buck and Houston -	1988	John Buck, Robert Houston	Direct Revegetation of anthracite r	Ecology	-76.0096	40.9385
Skousen - 1988	1988	J. Skousen	Effects of sewage sludge applicati	Ecology	-80.0685	39.5592
Ashby et al - 1988	1988	Clark Ashby, Michael Norland, E	Establishment of trees in herbaceo	Ecology	-89.3372	37.9800
Vinikour et al - 1988	1988	William Vinikour, Kirk LaGory, E	Fate of an artificial pond receiving	Ecology	-89.8106	39.0079
Brenner and Sterne	1988	Fred Brenner, Brian Sterner	First year evaluation of mitigated v	Ecology	-80.2463	41.1259
Amrani and Samuel	1988	Cheryl Amrani, David Samuel	Habitat use by selected small mam	Ecology	-80.1233	39.1856
Hammack et al - 198	1988	Richard Hammack, Ralph Lai, Ro	Methods for determining fundame	Ecology	-108.0370	37.6938
Eger and Lapakko -	1988	Paul Eger, Kim Pamakko	Nickel and copper removal from m	Ecology	-91.8395	47.7210
Bennet et al - 1988	1988	John Bennet, John Harries, Ian F	Rehabiliation of waste rock dumps	Ecology	130.9910	-13.0013
Bhumbla et al - 198	1988	Devinder Bhumbla, Robert Kee	Selenium uptake by alfalfa and wh	Ecology	-79.9941	39.6281
Fresquez et al - 198	1988	P. Fresquez, B. Sabey, D. Klein	Soil fungal community-plant rhizos	Ecology	-108.4850	36.7223
Pulford et al - 1988	1988	I. Pulford, T. Flowers, S. Shah, T	Supply and turnover of N, P, and K	Ecology	-3.5657	55.9210
Powell et al - 1988	1988	James Powell, R. Barnhisel, C. P	The role of corn variety and popula	Ecology	-87.0096	37.3178
Stark et al - 1988	1988	Lloyd Stark, Ronald Kolbash, Ha	The SIMCO #4 Wetland: Biological	Ecology	-81.8772	40.2534
Emerick et al - 1988	1988	J. Emerick, W. Huskie, D. Coope	Treatement of discharge from a hi	Ecology	-105.8440	39.6020
Samuel et al - 1988	1988	David Samuel, John Sencindiver	Water and soil parameters affectir	Ecology	-79.9741	39.6230
LaGory et al - 1988	1988	Kirk LaGory, Edwin Pentecost, V	Reclamation success at an abondo	Education	-89.7574	39.0371
Sopper - 1988	1988	William Sopper	Reforestation of a zinc smelter sup	Forestry/Wildlife	-75.6192	40.7919
Wade and Halverso	1988	Gary Wade, Howard Halverson	Soil development under 22-year-o	Forestry/Wildlife	-83.8753	36.5924

RESULTS



A total of 765 placemarks




United States: 634 (82.8%)
Canada: 66 (8.6%)
Australia: 19 (2.5%)
Great Britain: 15 (2%)
ASMR Proceeding Sites 1988-1997

DATA QUALITY

- Quality Assurance and Quality Check (QAQC)
  - Positional accuracy, attribute accuracy, logical consistency and data completeness were checked
  - Three steps for data quality assurance
    - Student workers first checked the typos, positional correctness, formatting consistency and data completeness before their submission;
    - The graduate assistant checked the quality of the products and provided feedbacks to the student workers;
    - The project PI inspected the entire dataset and fixed any identified problems.
- The spatial accuracy of the placemarks still varies, depending on the details available in the papers.

HOW THIS PROJECT BENEFITED STUDENTS

- Involving a total of 5 undergraduate and 2 graduate students (including my RA) through the SIU GIS Club
  - 6 students reported the results to the RA bi-weekly
  - The RA reported to the project PI
  - Students received training and attended project meetings regularly
- Link classroom knowledge to the real-world problem solving
- Addressed students' financial needs
- Strengthened students' resumes to compete in the job market

SIU GIS Club

FUTURE DIRECTION

- The ASMR proceeding contributors should provide Latitude/Longitude along with their paper submission using Google Earth
- Alternatively, an easy-to-use online tool can be developed and integrated with the ASMR journal website

- Manual interpretation is valuable …But not efficient
- Optical character recognition (OCR) + Machine Learning -> automatic geocoding ??
  - Formatting issues
  - How to match more exact locations? (instead of the centroids of a town)

SUMMARY

- This project produced a total of 765 placemarks categorized by years and technical divisions using Google Earth;
- The data were produced as the KML/KMZ and MS Excel formats to meet the needs of the ASMR;
- The data were thoroughly QA/QC’ed;
- This project provided valuable educational opportunities for students.

ACKNOWLEDGMENT

- We appreciate the generous funding support from the American Society of Mining and Reclamation

- The efforts from the following SIU students were key to the completion of this project: Tarig Mohamed, Brandon Polk, Anastasia Maranto, Kaitlyn Holtsclaw, Jatoya Hale, and Elizabeth Wilson.

THANK YOU

- Questions?

- Contact:
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10 Technical Divisions

1	Water Management - mine water treatment
2	Water Management - hydrology
3	Ecology
4	Forestry/Wildlife
5	Geotechnical Engineering
6	Tailings
7	Landuse Planning and Design
8	Soil Overburden
9	Education
10	Others

10 Years of Conferences