Documenting and Digitizing Specimens from a Weird and Scenic Landscape

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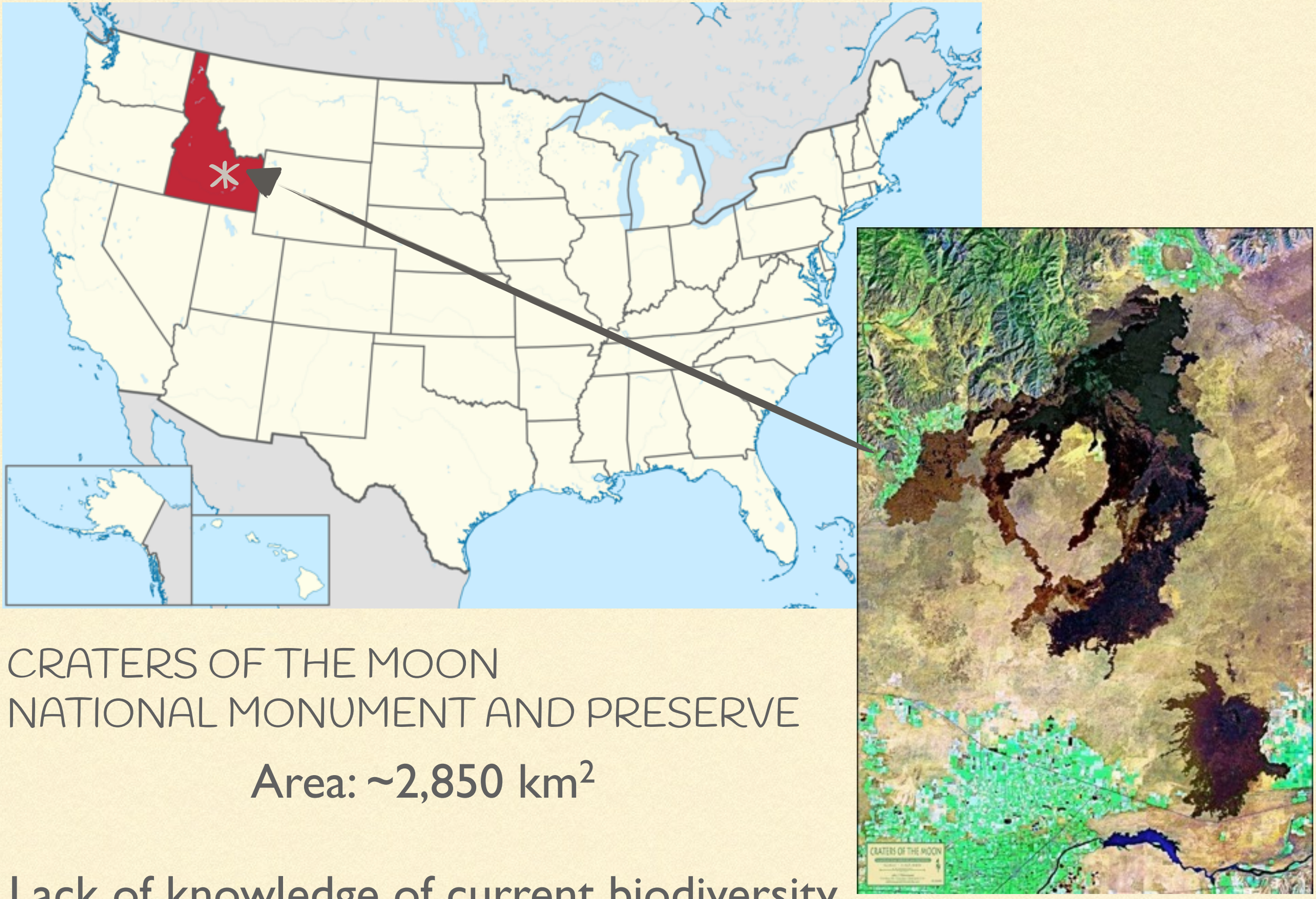
… islands within a continental context



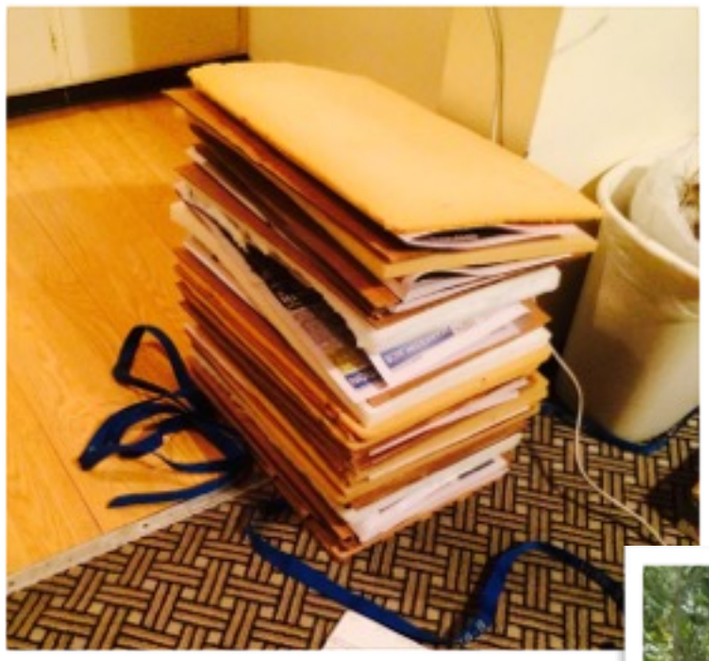
CRATERS OF THE MOON
NATIONAL MONUMENT AND PRESERVE

Area: ~2,850 km^2

Lack of knowledge of current biodiversity


60 + LAVA FLOWS


500 + KIPUKAS



~ 200 plant collections

~ 300 spider specimens

Community Assembly and Disassembly in a Volcanic National Monument in the Pacific Northwest: Island Biogeography within a Continental Context

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Background

- Theory of Island Biogeography **(TIB)** is a neutral theory to explain observed species diversity on island habitats (Figure 1).
- Study system: **Craters of the Moon National Monument and Preserve (CRMO)** consists of lava flows and vegetated kipukas.

Figure 1. Expected species diversity (Ŝ) of an island is a balance between the rates of colonization (C) and extinction (E). P is the species pool (MacArthur & Wilson 1967).

Kipuka
"window" in the lava

The Blue Dragon Lava Flow surrounds this kipuka (~2,100 yr old)

- The island habitats vary in geographic features (Table 1 and Figure 2).
- Community assembly and disassembly can be studied at CRMO focusing on these novel lava habitats and fragmented kipuka habitats.

Site Type	Abundance	Size Range (sq. ha)	Age Range (Years)
Lava Flows	60+	16–31,079	2,000 –15,000
Kipukas	500+	0.02–923	TBD

Table 1. Variation present in geographic attributes of TIB for site types at Craters of the Moon National Monument and Preserve.

✳ Aerial view of kipuka pictured above

Predictions

Diversity	Age	Area	Isolation	Plants
Plant	↑	↑	↓	N/A
Total Spider	↑	↑	↓	↑
Thomisidae (specialist)	↑	↑	↓	↑
Salticidae (generalist)	↑	↑	↓	—

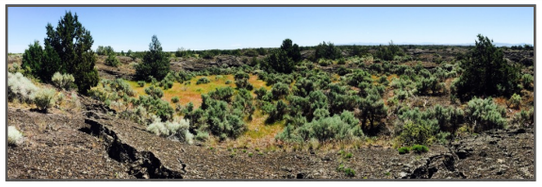
- Classical TIB predicts an equal chance of colonization but current research efforts incorporate biological attributes of taxonomic groups (e.g. Lloret *et al.* 2005).

References

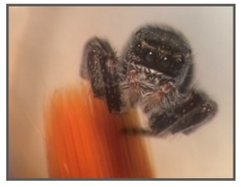
Lloret F., *et al.* (2005). Species attributes and invasion success by alien plants on Mediterranean islands. *Journal of Ecology. 93: 512-520.*

MacArthur, R. & Wilson, E.O. (1967) *The Theory of Island Biogeography.* Princeton, New Jersey: Princeton University Press.

Webb C.O., Ackerly, D.D., McPeek, M.A., & Donoghue, M.J. (2002). Phylogenies and Community Ecology. *Annu. Rev. Ecol. Syst., 33, 475-505.*



Collecting in kipukas at Craters of the Moon National Monument and Preserve



Salticidae (jumping spider)

Thomisidae (crab spider)

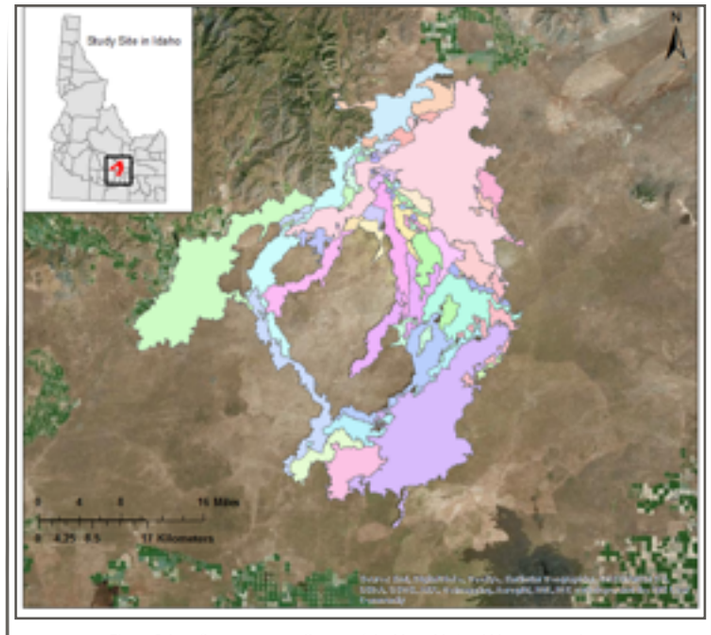


Figure 2. Lava flows present at Craters of the Moon National Monument and Preserve in the CRMO lava field.

Methods

Spider collection using beating sheet

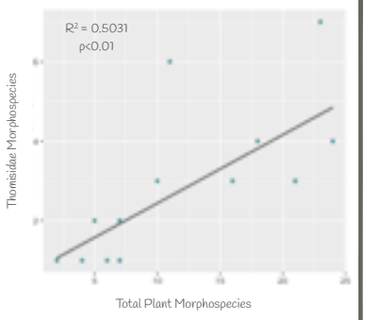
- Collection in kipukas to focus on disassembly process:
  - Thomisidae and Salticidae spiders.
  - Representatives of vegetation community.
- Identify spiders to morphospecies for preliminary analysis.
- Initial analysis using simple linear regression to investigate relationships.

Preliminary Results

- Collections in kipukas at CRMO (n=16): spiders (n=294) and plants collected (n=198).

Predictor Variable	Independent Variable	β	SE of β	t
Plant Diversity	Thomisidae Diversity**	0.17208	0.04571	3.765
log Kipuka Area	Thomisidae Diversity *	0.6078	0.2151	2.826
log Kipuka Area	Plant Diversity **	2.6641	0.8529	3.124
log Kipuka Area	Total Spider Diversity *	1.1858	0.4889	2.425

Table 2. P values for R^2 and β are indicated as follow:
* P < 0.05; ** P < 0.01.



Future Directions

- Analysis using multiple regression to investigate relationships between diversity and geographic features of kipukas at CRMO.
- Identify specimens to lowest taxonomic unit possible.
- Utilize phylogenetic approach to investigate spider and vegetation community present at CRMO (following Webb *et al.* 2002).
- DNA extraction of select spider group (e.g. *Sassacus* beetle mimics) to determine genetic structure within and between kipukas.
- Increase collection efforts to include lava flows to investigate community assembly at CRMO.
- Digitize specimens and add to existing collections and online databases at the University of Idaho.

Acknowledgements

This work would not be possible without generous support from the University of Idaho College of Science, the University of Idaho Stillinger Herbarium Expedition Funds, Todd Stefanic and the National Park Service Staff at CRMO, & Dr. Luc Leblanc at William F. Barr Entomological Collection. Many thanks to Beth Schadd, David Arnold, the Tank lab, & the Parent Lab.

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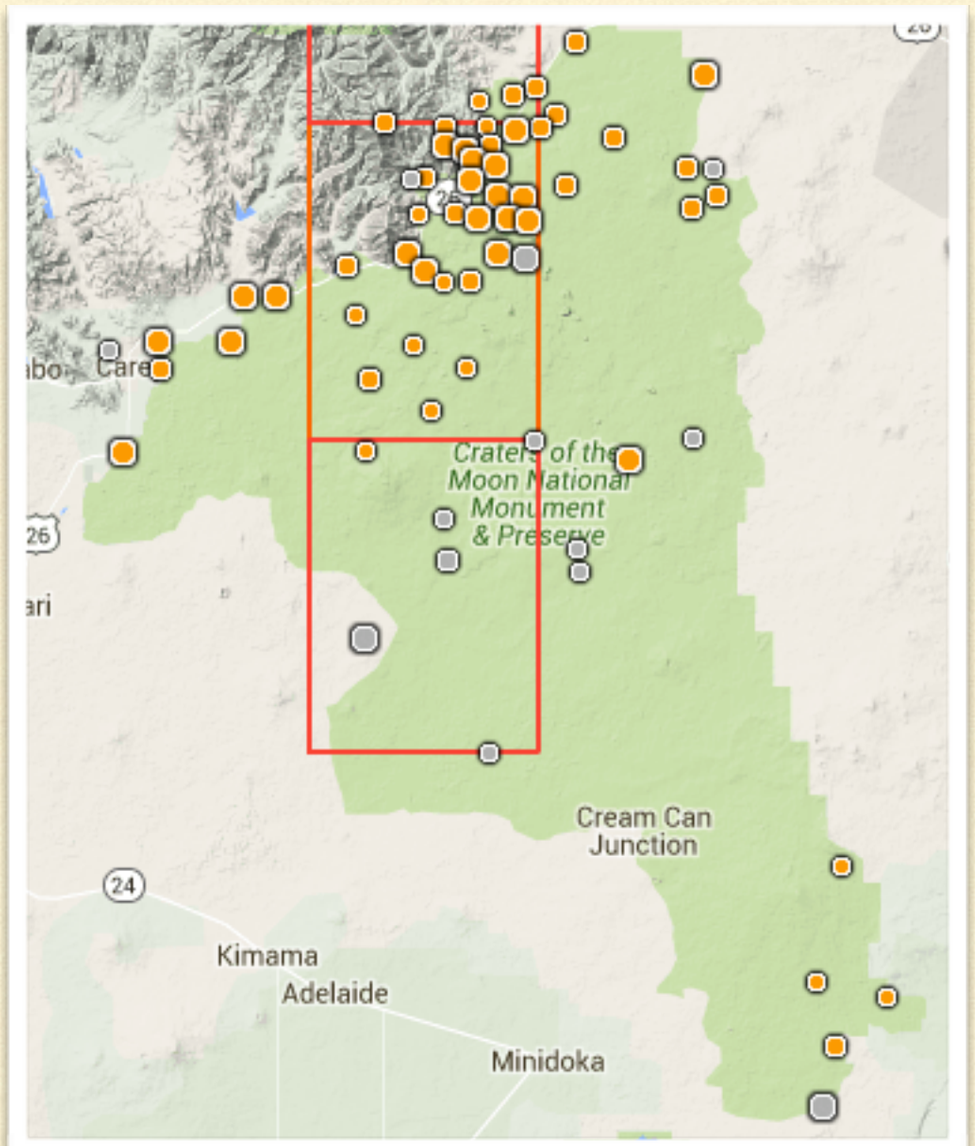
STILLINGER HERBARIUM &
CONSORTIUM OF PACIFIC NORTHWEST HERBARIA

- Established in 1892
- 200,000+ specimens
- Online and publicly available
  - www.pnwherbaria.org
  - Consortium of 36 herbaria

STILLINGER HERBARIUM & CONSORTIUM OF PACIFIC NORTHWEST HERBARIA



3. ***Eriogonum umbellatum*** Torr. **var.** ***modocense*** (Greene) S. Stokes **Polygonaceae**

= *Eriogonum umbellatum* Torr. var. *umbellatum*

U.S.A., Idaho, Butte County: In large volcanic cinder flat 400-500 m east of Inferno Cone in Craters of the Moon National Monument. Elev. 5870 ft.
43.4426° N, -113.5424° W
Datum: NAD 83. Coordinate Source: GPS.

On gentle to flat slope, growing in full sun in cinders; dominant plant with Phacelia hastata, Chaenactis douglasii, and occasional Pinus flexilis (approaching var. umbellatum). Reproductive state: Flowers.

D. Mansfield 13-222 Jul 2, 2013 **CIC 45683**
With Laura Barbour &Rachel Hamre

CIC045683.jpg

- Species lists and source pools for further phylogenetic analyses

WILLIAM F. BARR ENTOMOLOGICAL COLLECTION

- Established in 1947
- 1,000,000+ mounted specimens
- Previous CRMO insect survey
- Digitization efforts recently began
  - Lepidoptera

Education and Outreach

THANK YOU

- DR. CHRISTINE PARENT
  - COMMITTEE MEMBERS
  - PARENT LAB
- NATIONAL PARK SERVICE STAFF AT CRMO
- FIELD HELP: BETH SCHADD & DAVID ARNOLD
- DR. LUC LEBLANC

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