

# Research and management applications of online collection data: a case study of prairie fen plant biodiversity

Rachel A Hackett<sup>1</sup>, ShaunAnn L Peters<sup>1</sup>, Krystal Henry<sup>1</sup>, Edward Gilbert<sup>2</sup>, Gil Nelson<sup>3</sup>, Dave Cuthrell<sup>4</sup>, Michael J Monfils<sup>4</sup>, Lillian Hendrick<sup>1</sup>, Blake C Cahill<sup>1</sup>, Michael W Belitz<sup>1</sup>, Anna K Monfils<sup>1</sup>  
<sup>1</sup>Central Michigan University, Mount Pleasant, Michigan, <sup>2</sup>Arizona State University, Global Institute Of Sustainability, Tucson, Arizona, <sup>3</sup>Florida State University, Tallahassee, Florida, <sup>4</sup>Michigan Natural Features Inventory, Lansing, Michigan

## Biodiversity Data Workflow

Prairie fen wetlands are globally vulnerable wetlands that provide habitat for over 35 state (i.e., Michigan) or federally listed species and function as headwaters for several major watersheds. These habitats are of high conservation concern and heavily managed. Since 2012, the Prairie Fen Biodiversity Project (PFBP) has been collecting plant diversity data to investigate drivers of biodiversity in these diverse systems. Managing our digital biodiversity data in support of research pipelines is a priority. Digitized plant specimen data, and annotated species lists by individual site, are now available through Consortium of Midwest Herbaria SEINet portal (<http://midwestherbaria.org>). We have integrated our research, data usage, and digitization workflows to be assessed as the project grows, eventually incorporating insect biodiversity data (Fig. 1). Species checklists facilitate communication among collaborators and foster research opportunities that use digitized biodiversity data. We anticipate that our PFBP will use the portal to add, update, or pool data in new ways as the collaboration grows and new tools become available. Online digitized data gives us unprecedented access to biodiversity and facilitates data accessibility, data updates, and a broader use of specimen and research data both within our research team and with associated partners.

To explore Checklists, visit <http://swbiodiversity.org/seinet/projects/index.php?pid=113>

## Information Sources

Data used in Online Portals can be contributed from a number of sources (e.g., professionals, citizen scientists; Fig. 2). When working with multiple partners contributing to the same Online Portal, all data are available to include in a Checklist with your design requirements (e.g., geographic site, habitat, region).

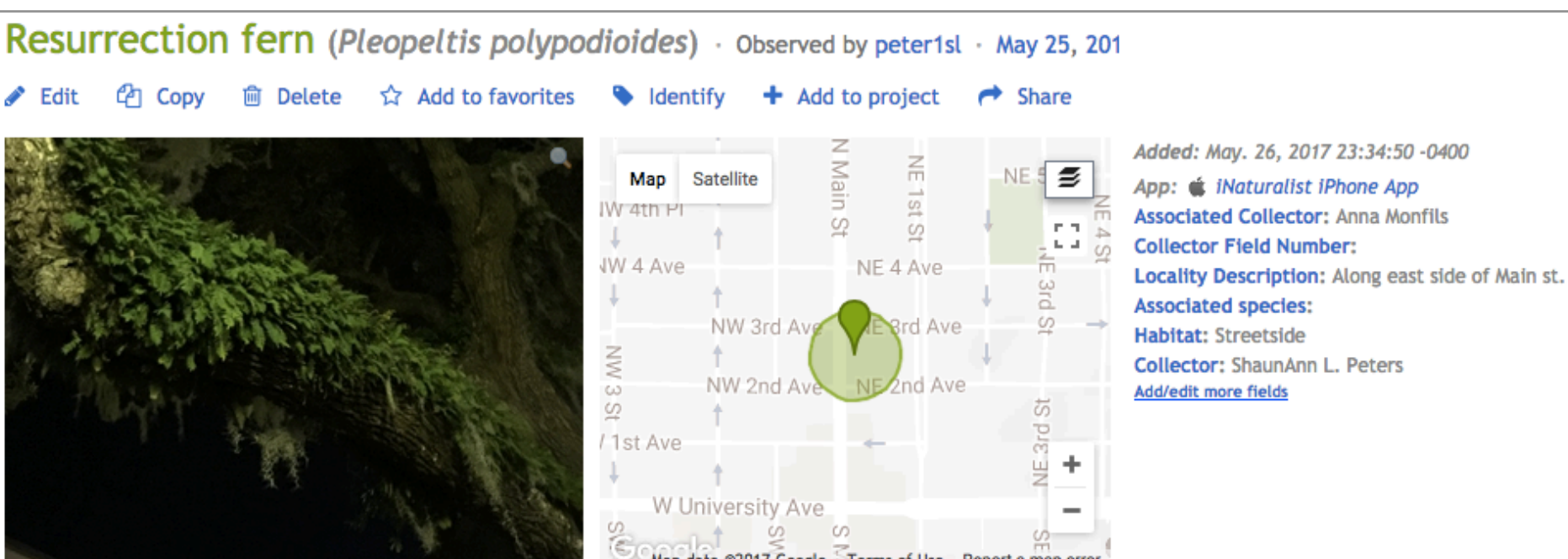


Fig. 2. A citizen science record from iNaturalist.com

## In-house Research Database

An In-house Research Database formatted with Darwin Core tables and fields is ideal for minimizing time transcribing, reducing transcription errors, and exporting customized datasheets compatible with other systems (e.g., iDigBio, BISON; Fig. 3). All data is linked by common fields (e.g., locationID, catalogNumber, eventID). Queries are made to format data into records as needed.

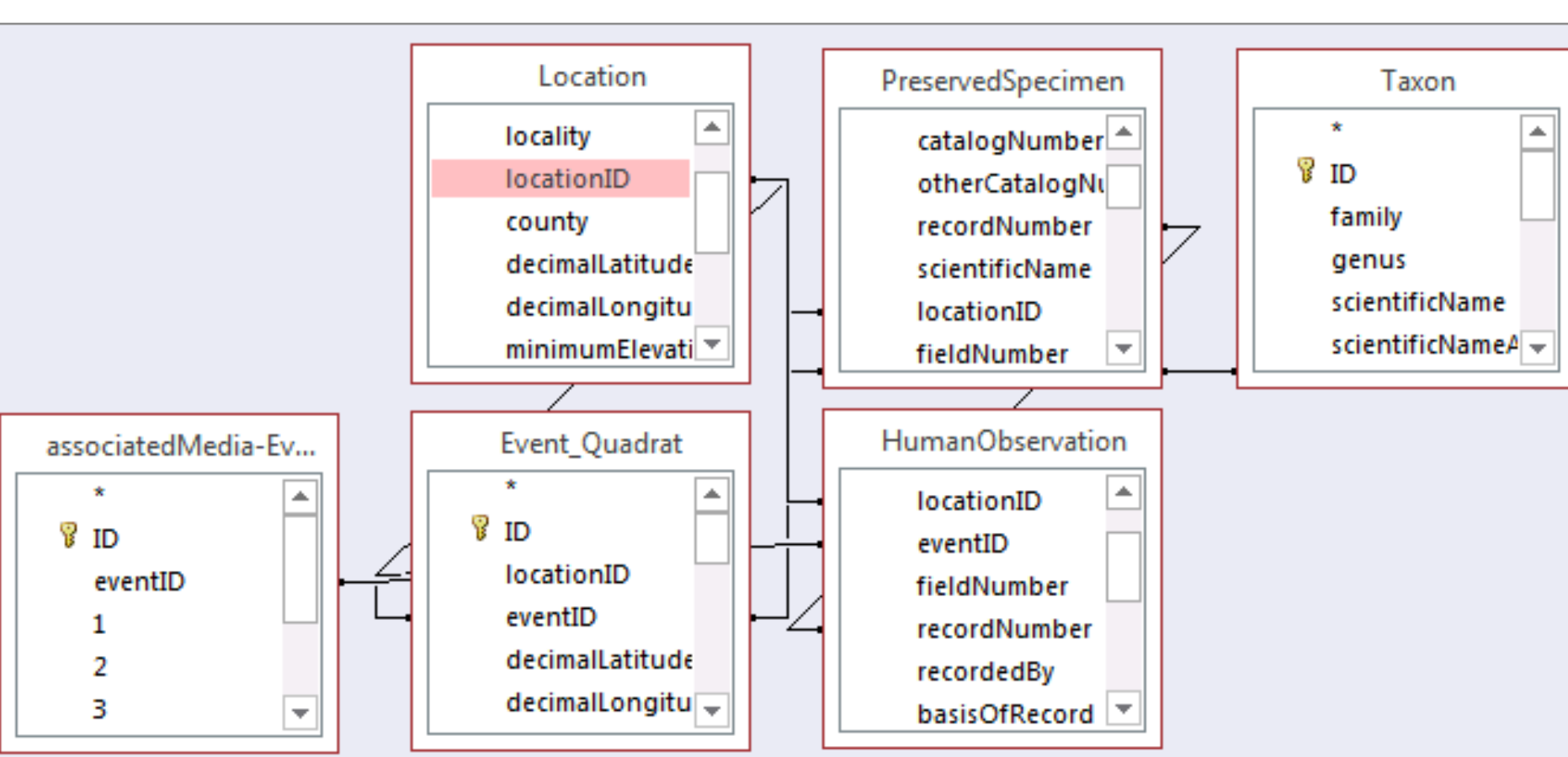


Fig. 3. Snapshot of relationships between select tables in our In-house Research Database. Black lines between tables indicate a linked/common field, but each table also has fields unique to that table

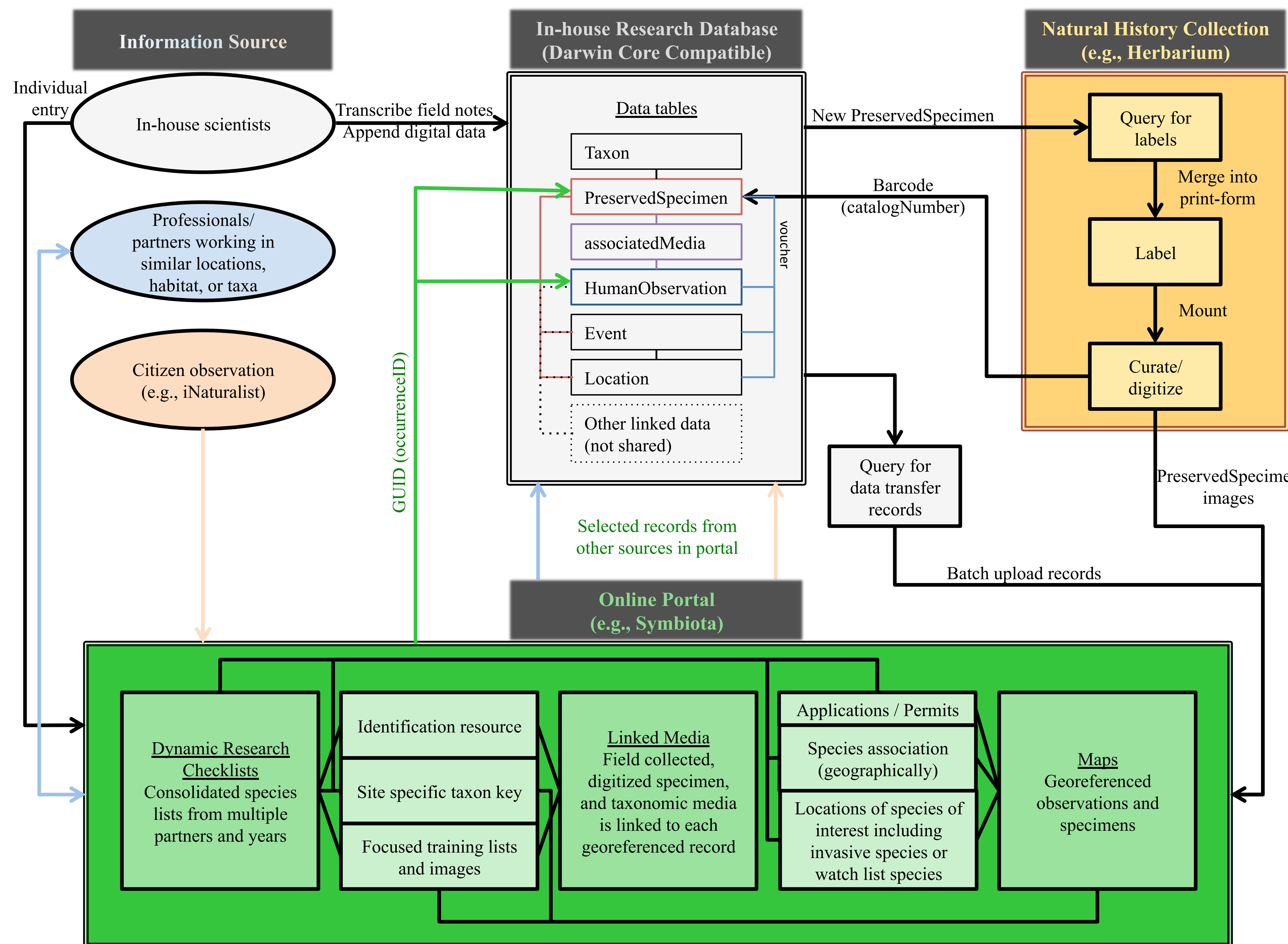


Fig. 1. Workflow describing the journey of data from Information Sources (upper-left). This data can travel direct to an Online Portal (bottom, green) or to an In-house Research Database (center-top, grey). Collection managers in Online Portals create and manage dynamic Checklists to produce maps and linked media for future uses (bottom, light green boxes). Natural History Collections (top-right, gold) can pair digitized Preserved Specimen with records in the Online Portal

Fig. 7. Examples of online tools available in the Symbiota Online Portal mentioned in the workflow above:

## Natural History Collection

Contributing vouchers to Natural History Collections add credibility to observations and validation of data for future uses. A customized query of the information in the database is used to create labels to attach to specimens (Fig. 4). These specimens can be digitized and digitally added as Preserved Specimen to the Online Portal (Fig. 5).

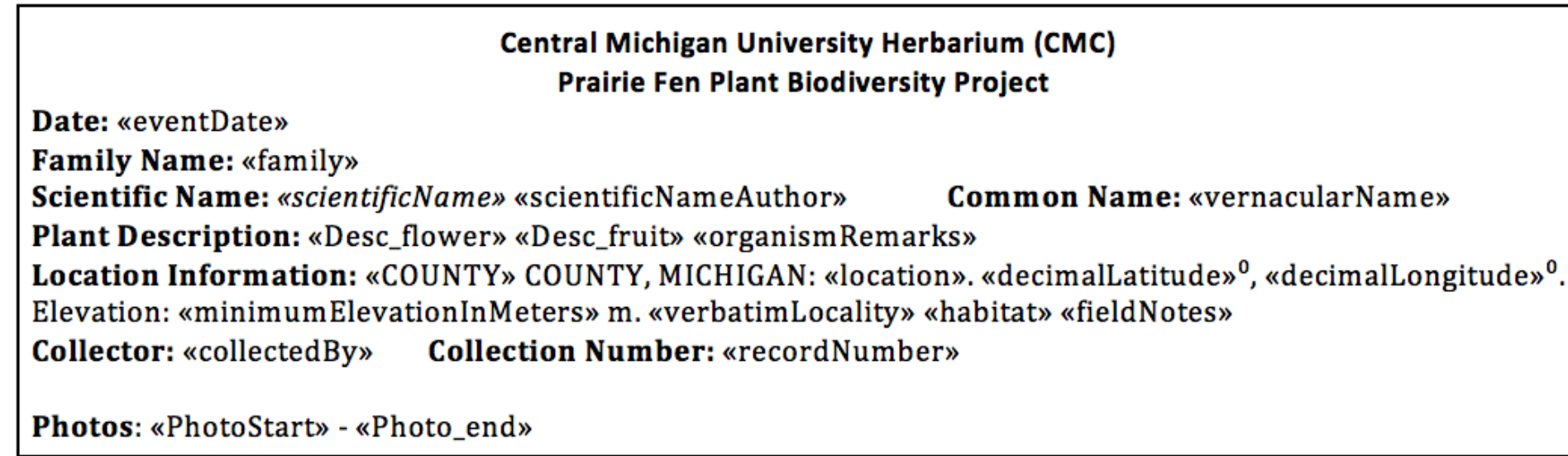


Fig. 4. MS Word template that takes the fields queried from the In-house Research Database and merges the records into Preserved Specimen labels



Fig. 5. Preserved Specimen image after curation and digitization

## Online Portal

An administrator links species directly to a record in the Online Portal by creating Checklists (Fig. 6). Both Preserved Specimen and Human Observation records can be revisited, verified, or annotated at a later time, making the Checklists dynamic, not static. Online Portals have tools created for every checklist (Fig. 7) and information can be exported in Darwin Core compatible fields.

Fig. 6. Checklist produced in the Symbiota Online Portal