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Agricultural Ecosystem Services: Exploring Models and Methods for Scenario Development along the Wasatch Front, Utah

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Data Management Plan

Our team will build on the infrastructure and protocols established during grant writing for the data sharing and collaborative work of this project. We will set up a shared drive (Box) and collaboration workspace (Microsoft Teams). We will also leverage existing external-facing websites (e.g. [The Resilience Hub Lab](#) and [Utah Sustainable Agricultural Systems Lab](#)) and social media (@ResiliencyPlace, and others) presence for communicating findings and recruiting graduate students. Following publication of results, or within 12 months of completion of project activities (whichever comes first), the datasets and accompanying metadata will be made publicly available using a library-based data repository such as *digitalcommons@USU*. We will create a GitHub repository for archiving code and computer programs.

Expected Data Types

We will generate data in our digital labs, through workshops, interactions with community members, and through model runs. This data will include numerical and categorical data on home values, ecosystem service values, farm management strategies, individual preferences photos, and feedback from stakeholders.

We already have significant amounts of geospatial data from a seed grant. This data includes geology (topography and soils), hydrology (water systems and rights), economics (property values and type, historical records of ownership and zoning), socio-demographic data (census), and agricultural data (soils, historical farming activities). Much of this data has already been compiled from federal, state and local sources through a seed grant. This data is stored on the project's Microsoft SQL Server. Additional spatial data will be generated through model runs.

The project will also generate some computer programs and scripts such as GIS queries, database queries, and machine learning models.

All data will be manually double checked for errors and processed using statistical software.

Data Format

Spatially explicit data will be saved in a geodatabase. Data from model runs will be exported and saved as text, tab delimited or image files and also saved in excel. Both raw and processed data will be stored to facilitate error checking.

Meta-data describing the goals of the project, location of research sites, methods or means of collection, collection dates and all appropriate units will be generated for all data type to facilitate data sharing.

Data Storage and Preservation

Data produced by the project will be stored in the cloud using Box (a cloud-based file storage system). Computer programs produced by the project will be stored on Github. All data and code will be preserved for (at least) 10 years from the end of the project. In the (highly) unlikely event that Box or Github cease to exist in that time frame, suitable alternatives will be utilized.

Output from models will be saved digitally on our Microsoft SQL Server on a daily basis. This data will be transcribed to the appropriate electronic format (e.g. excel, word, etc.) on a weekly basis.

Notebooks from stakeholder meetings and interactions will be scanned to pdf format within two days of the meeting and transcribed to the appropriate electronic format (e.g. excel, word, etc.) on a weekly basis. All notebooks will be stored in a locked lab and hard copies of surveys in

a locked cabinet. Computer data is backed up daily on Box (or other cloud-based storage system).

Reminders to double check data entry and backup data at the end of each week will be emailed to students working on the project. Students will be reminded of data quality and control procedures at monthly lab meetings.

At the end of the project, project PIs will work with USU librarians to store data and metadata in the USU long-term repository Digital Commons, which uses a metadata scheme based on Dublin Core. Data will be placed under an embargo preventing public access until the date of publication.

Data Sharing and Public Access

Once published, any raw data from non-human subjects (text, tab delimited or image files) and corresponding metadata will be made publicly available through the Utah State University Digital Commons, which provides a search interface for public access to datasets of USU researchers, and other public repositories appropriate to the published location. Any sensitive human subject's data from our survey, or stakeholder meetings will remain confidential and will not be published. Coding will be used on this data to maintain confidentiality.

All computer programs developed in the course of the project will be open source and publicly available on Github.

Data embargo periods will vary depending on the speed at which the data can be analyzed and published.

Roles and Responsibilities

All students and staff on the project are responsible for digitizing and or manually entering and backing up data on a daily basis and adhering to the data management plan.

Each PI/CoPI on the project is responsible for reminding students and staff under their direct supervision on a regular basis of the importance of maintaining the data management plan. Each PI/CoPI on the project is also responsible for double checking that the data management plan is indeed being adhered to by all students and staff.

Daniella Hirschfeld, the lead PI on this project, will be responsible for collecting data from the CoPIs and working with the USU librarians to make it available on Digital Commons and or other sources after publication.

CoPI Dyreson is responsible for maintaining the code repository on Github.

Monitoring and Reporting

The lead PI and all Co PIs will meet annually to discuss compliance with, adequacy and any necessary revisions to the data management plan.

The lead PI will be responsible for collecting annual and final progress reports from all CoPIs and submitting them to the USU Agricultural Experiment Station Director for submission to USDA NIFA.