DATA MANAGEMENT RESOURCES AND SERVICES FOR THE NREL RESEARCHER

The following summary of NREL data management services, resources, and recommendations were developed by Nicole Kaplan and Greg Newman through activities supported by 2012 NREL Program Development Funds. Please contact Nicole or Greg for more details or questions concerning how to address NSF data management requirements, or how to incorporate good data management practices into your research program.

NREL DATA MANAGEMENT SERVICES		
GREEN LEVEL OF SERVICE	**"Do It Yourself" Plan** *(some professional consultation)*	Access to emerging standards, tools and templates to support data curation, discovery, and download capabilities for your data packages within a project website, the Digital Collections of Colorado, or other online data repository.
		Access to Centralized NREL Computing Services and current website Content Management System (CMS).
		Specific Services: Customizable WCNR directory page, customizable WCNR/NREL researcher website pages, centralized IT support for desktop PCs, printing, poster printing, copying, and license support for GIS and statistical software packages, server administration and backup for shared LAN storage, HPC computing services.
GOLD LEVEL OF SERVICE	**NREL-IBIS Team Service Plan** *(dedicated professional data management, application development, and IT infrastructure support)*	Access to dedicated informatics professionals for help writing and addressing all components of your data management plans, database(s), and data collection design; data management training for your research team; and data management coordination for large interdisciplinary projects.
		Access to the IBIS and NREL cyber-infrastructure systems to support advanced features including online tools for data entry, bulk data submission, data discovery, data downloads and access queries, data integration, synthesis and mash-ups, as well as innovative web application design and development.
		Specific Services: Data management plan development and editing, metadata documentation, data management consultation, database development, QA/QC services, data processing automation, customizable IBIS project page, customizable data entry pages, web mapping, data visualization, web application development consultation, web mapping consultation, server administration and backup services.

RECOMMENDED DATA MANAGEMENT APPROACHES
(1)	**Start Early**
(2)	**Identify requirements and/or approach** If a data management plan (DMP) is not required as a section in a proposal, consider if the research plan is complex, federated, distributed, and/if data, education, or if analysis products would be of interest to the broader community and accessible at some point during or after the project. If so, include a DMP in the research or project management description. The scope of the DMP may reflect the size or complexity of the project Leverage Cyber-infrastructure (CI) that you or your colleagues have and grow CI only when necessary
(3)	**Consult research team members, students, colleagues, CI experts, and repository curators**
(4)	**Identify and follow Best Practices in your domain**
(5)	**Keep it simple, doable, concise and clear** Have someone outside the project not familiar with your practices review it
(6)	**Keep data accessible** Have a policy for access and reuse Minimize or eliminate restrictions on use Provide a tag line or citation for attribution Choose a Creative Commons license (http://creativecommons.org/choose/)
(7)	**Review frequently with the team** Quarterly reviews, before each field season
(8)	**Note for International Collaborations:** There may be cases where data management plans are affected by formal data protocols established by large international research consortia or set forth in formal science and technology agreements signed by the United States Government and foreign counterparts. Be sure to discuss this issue with your sponsored projects office (or equivalent) and your international research partner when first planning your collaboration. (From NSF Data Management Plan Frequently Asked Questions: http://www.nsf.gov/bfa/dias/policy/dmpfaqs.jsp)

RECOMMENDED ELEMENTS OF A DATA MANAGEMENT PLAN

- **Describe Cyber-infrastructure (or computing resources and expertise)**

  ✓ describe the arrangement(s) at your institution or across institutions
  ✓ describe how you will share data with your collaborators
  ✓ name a dedicated person to be responsible for data management
  ✓ highlight person or team's data management experience
  ✓ describe off-site backup procedures

- **Describe the data and the methods used to collect or create the data**

  ✓ describe whether data will be observational, experimental, mined, derived etc.
  ✓ describe data themes (e.g. abiotic, sensor data, community diversity data etc.)
  ✓ describe data storage types (e.g. excel spreadsheet, database, images, ASCII)

- **Indicate how data will be documented throughout the research project**

  ✓ describe involvement of data management personnel in research process
  ✓ consider creating a data inventory or tracking system

- **Describe how data will be assured for quality**

  ✓ describe QAQC procedures
  ✓ describe enactment of standards or specifications

- **Detail how data will be made available for collaborators, and/or public re-use**

  ✓ describe your project website, NREL website, IBIS or other community, network or domain online repository, ftp site, etc.

- **Include plans for long-term preservation and data access**

  ✓ provide persistent URL and metadata associated with the data
  ✓ describe secure storage and backup systems (e.g. LOCKSS)
  ✓ describe how format changes and migration will be addressed
  ✓ describe your local NREL-IBIS data delivery system and value-added features
  ✓ describe enhanced data discovery and synthesis opportunities through partnerships (e.g. CitSci.org, DataONE, KNB)

- **Include a data access policy statement**

  ✓ list any exceptional arrangements that might be needed to protect sensitive species information, participant confidentiality or intellectual property

- **Report on progress in managing data in annual and final reports**

  ✓ describe system development, number of data records captured, QAQC procedures, metadata documentation efforts, data re-use scenarios, etc.