

Data Management Plan

Name of Contractor	University of Wyoming
Name of project	Historical Winter Weather Assessment for Snow Fence Design using a Numerical Weather Model
Project Duration	Start date : 2015 End: 2017
DMP Version	
Date Amended, if any	
Name of all authors, and ORCID number for each author	Noriaki Ohara, Ph.D., Assistant Professor (0000-0002-7829-0779)
WYDOT Project Number	RS06215
Any Digital Object Identifier (DOI), including any CROSSREF number, which has been assigned to any peer reviewed publication or data generated by this project	
Name of all peer reviewed publications which have been generated using data from this project	
URLs for all peer reviewed publications which have been generated using data from this project	
RiP RH Display ID Number	
Dataset URL, if available	

What constitutes such data will be determined by the Principle Investigator, Project Champion, and the Research Manager. In general, your plan should address final research data. This includes recorded factual material commonly accepted in the scientific community as necessary to validate research findings. Final research data do not include laboratory notebooks, partial

datasets, preliminary analyses, drafts of scientific papers, plans for future research, peer review reports, communications with colleagues, or physical objects, such as gels or laboratory specimens. As part of your research, you may also generate unique data, which are data that cannot be readily replicated. Your DMP should also address unique data that may arise from your research.

WYDOT expects the timely release and sharing of data to be no later than the acceptance for publication of the main findings from the final dataset, unless the Principle Investigator will be embargoing the data. In such a case, the data cannot be embargoed for a period longer than twelve (12) months.

1. Introduction

The purpose of this research project is to:

The need for this research is to update the existing wind and precipitation tables used in snow fence design so that the design can better reflect the current meteorological condition. The tables that are currently being used were manually generated by Dr. Ron Tabler and reflect the limited amount of data that was available in the early 1990's. This project will update the wind and precipitation data with recently available modeling technology.

2. Definitions

- a. Code or scripts include code used in the collection, manipulation, processing, analysis or visualization of data, but may also include software developed for other purposes.
- b. Copyright is a set of legal rights extended to copyright owners that govern such activities as reproducing, distributing, adapting, or exhibiting original works fixed in tangible forms.
- c. Data means the recorded factual material commonly accepted in the scientific community as necessary to validate research findings, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, communications with colleagues. Recorded material excludes physical objects (e.g. laboratory samples). Research data also does not include trade secrets, commercial information, materials necessary to be held confidential; and personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy.
- d. Data Archive is a site where machine readable materials are stored, preserved or possibly redistributed to individuals interested in the materials.
- e. Data Management Plan is a document that specifies your plans for managing your data and files for a research project.
- f. Dataset means collection of data.
- g. Metadata refers to structured data about data which helps define administrative,

technical, or structural characteristics of the digital content.

3. Data Types and Storage

The types of data and/or datasets generated and/or used in this project include ...

This is a model implementation project based on the public-domain programs and input data. Therefore, any obvious barriers, uncontrollable factors, or permission requirements for the project implementation are not identified. The computing resources (hardware and network) will be managed by the PI and the University of Wyoming (UW). Once the data is delivered to WYDOT, the data will be stored on WYDOT servers and will be made available to persons, programs, and departments as needed. The spatial data will be provided both in gridded (raster) format as well as ArcGIS shapefile format. This data will benefit all programs working with snow fence design as well as winter road maintenance.

All intermediate data will be maintained by the PI and UW. The data should be reproducible should the deliverable become corrupt. To achieve statewide coverage, a great amount of data will be analyzed and condensed to a smaller, though still large, amount of data is expected to be delivered through this project. Part of the research project is to determine how often this data will need to be updated to show changes in weather patterns. To run the GIS shapefile, a GIS program will be required, however, the data can be brought into MicroStation, Google Earth, and tables can be created. This proposal is to update the data that is currently used by WYDOT Winter Research and snow fence designers that was manually collected by Dr. Tabler in the mid 1990's and has not been updated since. Storage will be on WYDOT servers as well as the external hard drive purchased to back up the Snow Fence Inventory.

Provide a description of the data that you will be gathering in the course of your project. You should address the nature, scope, and scale of the data that will be collected. Describe the characteristics of the data, their relationship to other data, and provide sufficient detail so that reviewers will understand any disclosure risks that may apply. Discuss value of the data over the long-term. Please provide the name of all repositories where the data will be housed during the lifetime of the project.

Checklist

- o What type of data will be produced?
- o How will data be collected? In what formats?
- o How will the data collection be documented?
- o Will it be reproducible? What would happen if it got lost or became unusable later?
- o How much data will it be, and at what growth rate? How often will it change?
- o Are there tools or software needed to create/process/visualize the data?
- o Will you use pre-existing data? From where?
- o Storage and backup strategy?

3. Data Organization, Documentation and Metadata

The plan for organizing, documenting, and using descriptive metadata to assure quality control and reproducibility of these data include ...

The documentation and metadata will meet current standards for the type of data received. Naming conventions will be standard for Windows OS and ESRI ArcGIS and incorporate the project identifier.

Your DMP should describe the anticipated formats that your data and related files will use. To the maximum extent practicable, and in accordance with generally accepted practices in your field, your DMP should address how you will use platform-independent and non-proprietary formats to ensure maximum utility of the data in the future. If you are unable to use platform-independent and non-proprietary formats, you should specify the standards and formats that will be used and the rationale for using those standards and formats.

NOTE: Attach the Metadata transmittal form or URL for data generated or peer reviewed publications from this project.

Checklist

- o What standards will be used for documentation and metadata?
- o Is there good project and data documentation format/standard?
- o What directory and file naming convention will be used?
- o What project and data identifiers will be assigned?
- o Is there a community standard for metadata sharing/integration?

4. Data and/or Database Access and Intellectual Property

What access and ownership concerns are there...

The data will be available to WYDOT and potential consultants based on need. The data will be identified as a time sensitive document. All data sharing will be done in a protected format to prohibit alteration by others. Control of the final data product will be done by WYDOT Winter Research and by the PI.

Protecting research participants and guarding against the disclosure of identities and/or confidential business information is an essential norm in scientific research. Your DMP should address these issues and outline the efforts you will take to provide informed consent statements to participants, the steps you will take to protect privacy and confidentiality prior to

archiving your data, and any additional concerns. If necessary, describe any division of responsibilities for stewarding and protecting the data among Principal Investigators.

If you will not be able to deidentify the data in a manner that protects privacy and confidentiality while maintaining the utility of the dataset, you should describe the necessary restrictions on access and use. In general, in matters of human subject research, your DMP should describe how your informed consent forms will permit sharing with the research community and whether additional steps, such as an Institutional Review Board (IRB), may be used to protect privacy and confidentiality.

Checklist

- o What steps will be taken to protect privacy, security, confidentiality, intellectual property or other rights?
- o Does your data have any access concerns? Describe the process someone would take to access your data.
- o Who controls it (e.g., PI, student, lab, University, funder) ?
- o Any special privacy or security requirements (e.g., personal data, high-security data) ?
- o Any embargo periods to uphold?

5. Data Sharing and Reuse

The data will be released for sharing in the following way ...

An email will be sent to the Design Squads that new weather data for snow fence design is available. The data will be shared with other WYDOT programs when requested and stored on the Maintenance G: drive with a backup on the external snow fence inventory drive. As interest in the dataset grows, the data will be shared on the intranet viewer.

Describe who will hold the intellectual property rights for the data created by your project. Describe whether you will transfer those rights to a data archive, if appropriate. Identify whether any copyrights apply to the data, as might be the case when using copyrighted instruments. If you will be enforcing terms of use or a requirement for data citation through a license, indicate as much in your DMP. Describe any other legal requirements that might need to be addressed.

Checklist

- o If you allow others to reuse your data, how will the data be discovered and shared?
- o Any sharing requirements (e.g., funder data sharing policy) ?
- o Audience for reuse? Who will use it now? Who will use it later?
- o When will I publish it and where?
- o Tools/software needed to work with data?

6. Data Preservation and Archiving

The data will be preserved and archived in the following ways ...

The data will be stored on WYDOT servers until replaced by updated data. Access to the data will be made available to those who are in need and will be maintained by Winter Research. The data format will be in a GIS format but can be used by MicroStation or converted into .xlsx, .pdf, and .kmz file formats. Part of the project is to determine how often this dataset will need to be updated. If it is determined that this dataset should be superseded in the future, the dataset will be archived and saved until server space is needed.

Describe how you intend to archive your data and why you have chosen that particular option. You may select from a variety of options including, but not limited to:

- Use of an institutional repository
- Use of an archive or other community-accepted data storage facility
- Self-dissemination

You must describe the dataset that is being archived with a minimum amount of metadata that ensures its discoverability. Whatever archive option you choose, that archive must support the capture and provision of the US Federal Government "Common Core" metadata. In addition, the archive you choose must support the creation and maintenance of persistent identifiers and must provide for maintenance of those identifiers throughout the preservation lifecycle of the data. Your plan should address how your archiving and preservation choices meet these requirements.

Checklist

- o How will the data be archived for preservation and long-term access?
- o How long should it be retained (e.g., 3-5 years, 10-20 years, permanently) ?
- o What file formats? Are they long-lived?
- o Are there data archives that my data is appropriate for (subject-based? Or institutional)?
- o Who will maintain my data for the long-term?

NOTE:

Researchers evaluating data repositories as the option(s) for storing and preserving their data should examine evidence demonstrating that the repository:

- a. Promotes an explicit mission of digital data archiving;
- b. Ensures compliance with legal regulations, and maintains all applicable licenses covering data access and use, including, if applicable, mechanisms

- to protect privacy rights and maintain the confidentiality of respondents;
- c. Has a documented plan for long-term preservation of its holdings;
 - d. Applies documented processes and procedures in managing data storage;
 - e. Performs archiving according to explicit work flows across the data life cycle;
 - f. Enables the users to discover and use the data, and refer to them in a persistent way through proper citation;
 - g. Enables reuse of data, ensuring appropriate formats and application of metadata;
 - h. Ensures the integrity and authenticity of the data;
 - i. Is adequately funded and staffed, and has a system of governance in place to support its mission; and
 - j. Possesses a technical infrastructure that explicitly supports the tasks and functions described in internationally accepted archival standards like Open Archival Information System (OAIS).

**These guidelines are based on the Data Seal of Approval.

METADATA TRANSMITTAL FORM

Title ¹	Historical Winter Weather Assessment for Snow Fence Design using a Numerical Weather Model
Creator	Noriaki Ohara, Ph.D., Assistant Professor (0000-0002-7829-0779)
Publication Date(s)	3-2017
Description	Snow fence is an effective hazard mitigation measure for the low visibility and low friction of the road surface under winter weather condition. Prevailing wind directions and snow precipitation data prepared by Dr. R. Tabler (the Tabler data) that are necessary for snow fence design have not been updated since the 1990s. This data include new, seamless wind field and snow precipitation data under the adverse winter storm conditions during 1980-2014, using the Weather Research and Forecasting (WRF) model with North American Regional Reanalysis (NARR) data input. The simulated wind fields were successfully validated by using the observed data from airport sites and using the Tabler data. The WRF simulated precipitation data were assimilated to the observation-based PRISM data in order to obtain the accurate hourly snow precipitation data. It was verified that the existing snow fence system is effective under the winter season prevailing wind since the simulation agrees with the Tabler data. However, the historical wind statistics indicated large deviations in wind direction along I-80.
Keywords	Snow Fence, Winter Weather, Prevailing Wind Directions, Snow Precipitation, Tabler, Wind Field, Weather Research and Forecasting (WRF), North American Regional Reanalysis (NARR), observation based PRISM data, Wyoming
Subject	Historical weather data
Identifier ²	A unique identifier for the dataset
Edition	Most recent date on which the dataset was changed, updated or modified.

¹ To include alternate title; conference title; and journal title if they are different.

² To include record numbers; report numbers; NTIS number; TRIS Accession Number; OCLC Number; ISBN; ISSN; contract number; and DOI if available.

Abstract	<p>Snow fence is an effective hazard mitigation measure for the low visibility and low friction of the road surface under winter weather condition. Prevailing wind directions and snow precipitation data prepared by Dr. R. Tabler (the Tabler data) that are necessary for snow fence design have not been updated since the 1990s. This project provides new, seamless wind field and snow precipitation data under the adverse winter storm conditions during 1980-2014, using the Weather Research and Forecasting (WRF) model with North American Regional Reanalysis (NARR) data input. The simulated wind fields were successfully validated by using the observed data from airport sites and using the Tabler data. The WRF simulated precipitation data were assimilated to the observation-based PRISM data in order to obtain the accurate hourly snow precipitation data. Combining all the weather variables, the number of blowing snow events is found to be increasing despite the increasing air temperature because of the sufficiently cold winters of Wyoming. Finally, it was verified that the existing snow fence system is effective under the winter season prevailing wind since the simulation agrees with the Tabler data. However, it was also found that the simulated wind patterns during the blowing snow events can be quite different from the winter season average prevailing wind field. Moreover, the historical wind statistics indicated large deviations in wind direction along I-80.</p>
Geographic Coverage	Wyoming
Language	English
Publisher	Wyoming Department of Transportation
Contact Point	<p>Noriaki Ohara, Ph.D. University of Wyoming 1000 East University Avenue, Dept. 3295 Laramie, WY 82070</p>
Funding agency	FHWA and Wyoming Department of Transportation
Access Restrictions	Public
Intellectual Property and Other Rights	<p>This document is available through the National Transportation Library and the Wyoming State Library. Copyright ©2015-17. All rights reserved, State of Wyoming,</p>

	Wyoming Department of Transportation, and University of Wyoming. All information used which comes from the Tabler Report is copyrighted under ©1997, Ronald D. Tabler. All rights reserved.
License	Public domain
Format	GIS shapefile
Collection	N/A
Related Documents	Ohara, N. (2017) Historical Winter Weather Assessment For Snow Fence Design Using A Numerical Weather Model, Final Report, FHWA-WY-17/03, pp 51.
Data Organization	Wyoming Department of Transportation and University of Wyoming
Size of file	3 MB