

Plan Overview

A Data Management Plan created using DMPTool

Title: An Online Toolkit for Managing Shrub Encroachment

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Project abstract:

Shrub encroachment and the interventions taken to reduce shrub cover ('brush management') are critical areas of concern for land managers and producers in rangelands across the Great Plains and western US. We propose to bring together research and outreach to begin constructing a practical, user-guided, web-based 'toolkit' for private and public land managers to determine best options and opportunities for managing undesirable woody weeds. We will leverage the existing DroughtView web application in taking the first steps towards toolkit design while formulating new brush management decision-making resources. Our development process will incorporate guidance from stakeholders with past and on-going research projects that identify climate-plant-soil-treatment factors determining shrub invasion risk and options for containment. These factors will be compiled into descriptions and decision trees of management options and alternatives. An iterative, phased design and development approach will package science-based information into an online, user-friendly interface and repository to provide step-by-step guides for decision-making. Primary project goals include: (1) synthesizing known research on controls over and constraints to shrub encroachment and the efficacy of brush management; (2) compiling local and regional stakeholder knowledge and input for use in toolkit design through provided feedback; (3) broadening existing brush management online resources to build the prototypic toolkit with research/management information for open stakeholder access; and (4) developing a framework for land managers and Extension educators to guide and enhance future toolkit functionality and usability. The online toolkit will significantly expand the online presence of land grant university Extension, while promoting sustainable rangeland ecosystem management.

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An Online Toolkit for Managing Shrub Encroachment

This is an Extension project that ties scientific information with outreach to serve stakeholder needs through technology. Following a thorough review of the literature to ensure the most current understanding of shrub management strategies, the proposed project - to develop a prototype 'online toolkit' for brush management – will incorporate factors identified as influencing management decision-making into the specifications for a complete DS tool. At the same time, with the integral involvement of stakeholders in an iterative testing process, there will be results from stakeholder questionnaires and local workshops that will provide the project team with the feedback needed to ensure the toolkit is user-friendly, relevant and practical (see *Evaluation Plan* in the Narrative). To these ends, new scientific data (articles, reports and other documents) and results of stakeholder engagement in the project (questionnaires and workshop outputs) will be compiled and included in project reporting (REEport), project publications (refereed journal, Cooperative Extension bulletins, popular articles), and outreach materials (e.g. *Rangelands Partnership* 'brush management topic [web page](#) and communications outlets therein). These materials will be maintained on both the Gornish (PD) and Archer (co-PD) lab servers in the UA School of Natural Resources and the Environment and with *Rangelands Partnership* via co-PD Merrigan. All primary project data will thus be available in electronic format in Microsoft Word and Excel, HTML, and PDF files as may be appropriate.

Data will be managed through a web-based content management system (CMS) and Drupal 8 (that stores data in MySQL Relational Database). Data can be exported from the CMS in CSV, JSON, and XML-based formats. Raw database tables in MySQL will also be viewable as SQL text via a mysqldump (<https://dev.mysql.com/doc/refman/5.7/en/mysqldump.html>).

The web-based 'toolkit' and its underlining database will be maintained and hosted by the University of Arizona College of Agriculture and Life Sciences' Communications and Cyber Technologies (CCT) Unit. This Unit currently provides IT systems for the *Rangelands Partnership*, a nearly 20-year project among 19 land-grant universities (described further in the following Roles & Responsibilities section). CCT's infrastructure is built on servers housed at the University of Arizona and through Amazon Web Service Cloud services. CCT houses servers in both locations for redundancy and disaster recovery purposes. As part of the Service Level Agreement, CCT has agreed to provide services for 5 years, renewable as needed. If the proposed project is funded, the implemented Data Management Plan will be continuously monitored and updated during the award period and into the future based on technological and data storage, organization, and management improvements.

The online toolkit is a data dissemination instrument. Thus, its goal is to provide tailored recommendations and learning components for the user. Users of the toolkit do not need to provide personal identifiable information – no email or contact information is collected. Rather, the user only enters information about their environment and specifics of their land management area. The recommendations compiled from this information can be printed or retrieved later through a unique URL. The report will not contain any personal information about the user. *Google Analytics* will be used to track anonymous statistics such as number of visitors, page views, and time spent on the online tool.

The University of Arizona team is composed of highly engaged members of the College of Agriculture and Life Sciences' (CALs) School of Natural Resources and the Environment (SNRE) and Communications and Cyber Technologies (CCT) unit, as well as members of the *Rangelands Partnership* which will all be represented with co-PD Merrigan on the Advisory Committee (see proposal body). Project team members have worked together on various recent projects, with several having collaborated for more than 17 years as part of the Arizona Technical Team for the *Rangelands Partnership*. Advisory Committee members also bring an extensive and proven track-record of scientific, academic, and outreach accomplishments. This consistency coupled with a high degree of

collegiality will ensure the proposed project will be implemented successfully and will offer long-term benefits for the stakeholders they serve.

Designating the *Rangelands Partnership* as the home for the online brush management toolkit will position the project for success via its wealth of personnel and technical infrastructure. The *Rangelands Partnership*, a long-term initiative among 19 western and Great Plains land-grant universities, is a unique collaboration of rangeland specialists, librarians, and technology experts. Together they bring comprehensive and specialized collections to a diversity of audiences by maintaining a database of rangeland resources for public and private land managers, researchers, Extension professionals, educators, and the public in the U.S. and worldwide. Included are information and tools needed for the sustainable management of rangelands, informed decision-making, professional enhancement, and educational activities. Thus, through this linkage, the proposed toolkit for brush management will have a stable, well-developed sustainable home as well as a network of experts to help guide its development, maintenance, and promotion.
