SWERI SOUTHWEST ECOLOGICAL RESTORATION INSTITUTES

Northern Arizona University | Colorado State University | New Mexico Highlands University

ReSHAPE
RESHAPING WILDFIRE AND FUELS REDUCTION INFORMATION

Scoping Document

SWERI ReSHAPE Program / Reshaping Wildfire and Fuels Reduction Information

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NAU NORTHERN ARIZONA UNIVERSITY
Ecological Restoration Institute

COLORADO FOREST RESTORATION INSTITUTE
Colorado State University

NMFWRI New Mexico Forest and Watershed Restoration Institute
New Mexico Highlands University

Document Development: This technical document presents the SWERI ReSHAPE (Reshaping wildfire and fuels reduction information) program. This program is the response to a Congressional request in the Bipartisan Infrastructure Law (BIL) (Title VII, Sec. 8003) to compile and display fuel treatment and wildfire data and explore the effects of fuels treatments on wildfire. SWERI is committed to developing a program that has a clear audience, meets the needs of that audience, and contributes pertinent information to advance strategic management and application of fuel treatment funding. This report is informed by the knowledge of key partners and advisors in the USDA Forest Service and Department of Interior, as well as input from key stakeholders. Staff from all three institutes of SWERI have been essential in forming the direction and compiling information that is included in the report, as well as document production and outreach activities.

Living Document Clause: Please note that this document is subject to change. SWERI is developing ReSHAPE to be responsive to stakeholder needs, advances in technology, and a growing understanding of how wildfire interacts with fuel treatments. Therefore, an annual review of the program progress and goals will be conducted, and changes will be made to this document as needed given developments in technology, data, and the evolution of challenges in land management. All required parties will be notified when a new version is released.

Southwest Ecological Restoration Institutes (SWERI): The Southwest Ecological Restoration Institutes include three university-based restoration institutes: the Ecological Restoration Institute in Arizona, the Colorado Forest Restoration Institute, and the New Mexico Forest and Watershed Restoration Institute. SWERI were authorized by the Southwest Forest Health and Wildfire Prevention Act of 2004 (PL108-317). As a Congressionally authorized program, the SWERI deliver actionable knowledge across a wide spectrum of affected entities to inform cross-boundary forest restoration and wildfire mitigation spanning management, ecology, policy, and research. For more info, visit www.sweri.org

Ecological Restoration Institute (ERI), Northern Arizona University: ERI is nationally recognized for mobilizing the unique assets of a university to help solve the problem of unnaturally severe wildfire and degraded forest health throughout the American West. ERI serves diverse audiences with objective science and implementation strategies that support ecological restoration and climate adaptation on western forest landscapes.

Colorado Forest Restoration Institute (CFRI), Colorado State University: CFRI is a science-based outreach and engagement organization that serves as a bridge between researchers, managers, and stakeholders working to restore and enhance the resilience of forest ecosystems to wildfires in Colorado, the Southern Rocky Mountains, and the Intermountain West. CFRI leads collaborations between researchers, managers, and stakeholders to generate and apply locally relevant, actionable knowledge to inform forest management strategies. CFRI's work informs forest condition assessments, management goals and objectives, monitoring plans, and adaptive management processes.

New Mexico Forest and Watershed Restoration Institute (NMFWRI), New Mexico Highlands University: NMFWRI collaborates with citizen stakeholders, academic institutions, NGOs, and professional natural resources managers to establish prescriptions and monitoring protocols for forest and watershed restoration. They promote ecological restoration and forest management efforts in ways that keep New Mexican homes and property safe from wildfire, lead to a more efficient recharge of New Mexican watersheds and provide local communities with employment and educational opportunities.

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EXECUTIVE SUMMARY

As a Congressionally authorized program, the Southwest Ecological Restoration Institutes (SWERI) includes three university-based restoration institutes: the New Mexico Forest and Watershed Restoration Institute (NMFWRI), the Colorado Forest Restoration Institute (CFRI), and the Ecological Restoration Institute (ERI) in Arizona. These institutes work together across the Intermountain West to develop a program of applied research and service that helps create healthy forests, prevent wildfires, sustain the resiliency of water supplies to wildfires, and create jobs.

SWERI has heard from policymakers, land management agencies, and the research community that there is a need to compile and display existing information on fuels treatment projects and wildfires at the national level, to coordinate and facilitate the use of data for assessing, planning, and monitoring fuel treatment interactions with wildfires across state boundaries, and to analyze and report on fuel treatment effects. As a result, SWERI was identified in the 2021 Infrastructure Investment and Jobs Act, commonly referred to as the "Bipartisan Infrastructure Law (BIL)," to undertake a national wildfire and treatment effects mapping and assessment project.

The resulting effort being led by SWERI is the ReSHAPE program, which will accomplish the work outlined in the BIL through:

1) The creation of a comprehensive geospatial database for national fuel treatments, referred to as ***Treatment and Wildfire and Interagency Geodatabase (TWIG)***
2) Presentation of data on an accessible, interactive web-based platform (TWIG Viewer)
3) and In-depth research on the effects of fuel treatments on wildfire behavior.

This program will lead to the production of a single geospatial platform for displaying existing data on fuel treatments and wildfires, helping to advance our understanding of fuel treatment effects and reduce the risk of catastrophic wildfire across the United States.

Within the scope of ReSHAPE, SWERI will work with existing affected entities and partners, as well as forge new partnerships, to ensure that ReSHAPE both supports and enhances ongoing efforts to display information on fuel treatments and wildfires from the Department of the Interior (DOI) and USDA Forest Service. This program will also add capacity where needed to facilitate the use and application of cross-boundary fuel treatment data to reduce the risk of catastrophic wildfires.

SWERI first worked to define a vision for the program that met the goals of the three institutes, followed by understanding the landscape of existing efforts, audience, and needs for a geospatial database, before developing a strategy and approach for ReSHAPE. SWERI affirmed that the needs of the audiences identified would determine data incorporated into a geospatial database and the structure for presenting the data. Key audiences include Congressional representatives, federal managers, state and tribal partners, and researchers, with the opportunity to explore more local applications as the program is refined.

SWERI has also actively explored the context in which the ReSHAPE program is being developed. There is an active landscape of existing federal, state, tribal, and private programs. SWERI is committed to developing a program that does not duplicate existing efforts but adds value and is useful to its audience. SWERI met with federal program leads to discuss current systems of record and the decision

support tools that use specific data. Through those discussions, SWERI was able to identify a direction for ReSHAPE that will be additive and impactful. SWERI also heard questions that could be addressed in the process of developing the program. There is a need to clarify 1) what decision support tools currently exist and what questions do they address, and 2) what data are currently being collected and what are the data gaps that will support the management decisions given a changing environment?

Through the initial scoping, SWERI has identified an iterative process for developing the ReSHAPE program, incorporating the input offered, and consistently assessing the program and its capabilities. SWERI identified sideboards and limitations for the program. SWERI will continue to engage with partners and stakeholders in the development and refinement of the ReSHAPE program.

I. INFRASTRUCTURE INVESTMENT AND JOBS ACTS

The 2021 Infrastructure Investment and Jobs Act (IIJA), Title VII National Resource-Related Infrastructure, Wildfire Management, and Ecosystem Restoration, Section 40803 (8), states the following objectives:

(A) To compile and display existing data, including geographic data, for hazardous fuel reduction or wildfire prevention treatments undertaken by the Secretary of the Interior or the Secretary of Agriculture, including treatments undertaken with funding provided under this title;
(B) To compile and display existing data, including geographic data, for large wildfires, as defined by the National Wildfire Coordinating Group, that occur in the United States;
(C) To facilitate coordination and use of existing and future interagency fuel treatment data, including geographic data, for the purpose of –
    i. Assessing and planning cross-boundary fuel treatments; and
    ii. Monitoring the effects of treatments on wildfire outcomes and ecosystem restoration services, using the data compiled under subparagraphs (A) and (B);
(D) To publish a report every 5 years showing the extent to which treatments described in subparagraph (A) and previous wildfires affect the boundaries of wildfires, categorized by –
    i. Federal land management agency;
    ii. Region of the United States; and
    iii. Treatment type; and
(E) To carry out related activities of a Southwest Ecological Restoration Institute, as authorized by the Southwest Forest Health and Wildfire Prevention Act of 2004 (16 U.S.C. 6701 et seq.);

SWERI reviewed the Act's language and identified key directions and limitations of the request to ensure each objective was met within the scope of the program. Upon this review, SWERI defined objectives, the audience, and programmatic direction. SWERI also used the direction to determine what ReSHAPE was not.

Key points of direction are:

1. SWERI will use existing data.
2. The effort must present national data.
3. Data need to incorporate a federal system of record.
4. The purpose is to present fuels treatment and wildfire data.
5. Audiences will include land management agencies.
6. SWERI will use compiled data in a geospatial database to explore effects.

Table 1. Mapping of legislative language to program scope/activities

Legislation	Specifics	Notes / Applications
Sec 40803(8) "… enter into an agreement with the Southwest Ecological Restoration Institutes established under the Southwest Forest Health and Wildfire Prevention Act of 2004 (16 U.S.C. 6701 et seq.) -		Language Signed: Nov 15, 2021 Agreement Signed: September 15, 2022
(A) To compile and display existing data, including geographic data, for hazardous fuel reduction or wildfire prevention treatments undertaken by the Secretary of the Interior or the Secretary of Agriculture, including treatments undertaken with funding provided under this title	Data: Existing data, geographic data, hazardous fuel reduction, wildfire prevention treatments Source: Funding included in act Geography: Undertaken by USDA and DOI	
(B) To compile and display existing data, including geographic data, for large wildfires, as defined by the National Wildfire Coordinating Group, that occur in the United States	Data: Existing data, geographic data, large wildfires Informed by: National Wildfire Coordinating Group Geography: In the United States	
(C)To facilitate coordination and use of existing and future interagency fuel treatment data, including geographic data, for the purposes of -	Data Types: Existing, future, interagency, fuel treatment, geographic	
(i) Assessing and planning cross-boundary fuel treatments	Geography: Cross-boundary	Purpose: Assessing fuel treatments, Planning fuel treatments
(ii) Monitoring the effects of treatments on wildfire outcomes and ecosystem restoration services, using the data compiled under subparagraphs (A) and (B)		Purpose: Effects of treatments on wildfire outcomes, effects of treatments on ecosystem restoration services
(D) To publish a report every 5 years showing the extent to which treatments described in subparagraph (A) and previous wildfires affect the boundaries of wildfires categorized by	Informed by: Summary stats for the report as defined in subsections i, ii, iii below	
(i) Federal land management agency		
(ii) Region of the United States		
(iii) Treatment type	Data: Treatment type	
(E) Carry out other activities of the Southwest Ecological Restoration Institute		Purpose: Mission/vision of SWERI

II. INTERNAL VISIONING PROCESS

SWERI engaged in an internal visioning process to align expectations and directions for ReSHAPE across the three institutes. The institutes have a history of working together on projects intermittently, and the BIL funds present one of the first opportunities for SWERI to have a project designed to be supported by the strengths of all the institutes. Key SWERI staff participated in two meetings to develop the following:

- A shared vision to address the BIL objectives, to be crafted into ReSHAPE
- Identify the programmatic purpose and objectives
- Identify key audiences and stakeholders
- Map SWERI and partner engagement
- Ensure connectivity of tasks to outcomes
- Secure alignment on tasks and deliverables
- Create and advance a shared work plan

The sections that follow detail the outcomes of this visioning process.

Program Management and Governance

This is a high-profile program, moving a lot of funds. It will be highly scrutinized by partners and other organizations with interest in using or conducting similar work. There is a need to demonstrate progress and communicate accomplishments. To do this effectively, it is important that SWERI works together with agency partners to ensure incorporation of knowledge of agency needs, prior efforts, understanding what information is available, and what learning can continue. SWERI and their partners will inform and advance the application of funds through a collective vision.

To facilitate this process, SWERI will delegate a program management team to ensure that the program is planned, executed, and delivered successfully within the defined scope, schedule, and budget. Key functions of the SWERI program management team will include:

- Developing a shared vision for the mapping and effects of fuel treatments
- Developing a strategy for meeting objectives and deliverables
- Coordinating work across the SWERI institutes as they execute the BIL project
- Establishing a process for additional partners to advise and support the development of the program
- Informing participation and expectations for completing the work and advising the BIL effort

SWERI Strengths and Weaknesses

SWERI is uniquely positioned to advance the development and utilization of a geospatial database with the intent of using social and ecological science to assess effects and inform appropriate application of fuel treatment. The three SWERI institutes are located at independent universities and include staff that are committed to critical thinking and objective evaluation. When partnered with the experience and knowledge of key representatives from the USDA Forest Service, the Department of Interior, and Forest Service Research and Development, SWERI is able to understand and incorporate the extent of current

efforts and the needs of land managers. This team allows for the development of a program that will guide land managers and communities to better apply fuel treatments on the landscape.

SWERI evaluated the gaps or opportunities for improvements. Many of the weaknesses were associated with perceptions from the outside and associated questions around why SWERI was selected, the inexperience of SWERI for working together on a large project outside of the historical geography of SWERI. These gaps stress the need to trust in our partners, develop a clear governance structure between the three SWERI institutes, and advance protocols of communication amongst SWERI and partners, and key audience members.

Table 2. Inventory of SWERI's key strengths and assets

Internal Strengths	External Strengths
Collective knowledge and capability of SWERI	Connections with Congress
Willingness / appreciation for working together	Access to partners and researchers
Can think creatively	Experience with similar projects
Innovation	Respect for SWERI
Project experience	SWERI identified as uniquely positioned
Relationships	Reputation
Collective desire to succeed	Lots of connections
Complementary skill sets	
Trust and connectivity	
Consistent staff	
Funding	

Advisors and Technical Support Team

This program is supported by a Technical Support Team comprising individuals from several partner organizations in collaboration with federal advisors.

Technical Support Team

Aaron Kimple, Program Director for SWERI ReSHAPE, aaron.kimple@nau.edu
Andrew Sanchez-Meador, Executive Director at ERI, andrew.sanchezmeador@nau.edu
Melanie Colavito, Director of Policy and Communications at ERI, melanie.colavito@nau.edu
Tony Cheng, Director at CFRI, tony.cheng@colostate.edu
Brooke Simmons, Project Coordinator at CFRI, brooke.simmons@colostate.edu
Alan Barton, Director at NMFWRI, awbarton@nmhu.edu
Patti Dappen, GIS Program Manager at NMFWRI, prdappen@nmhu.edu
Katie Withnall, GIS Specialist & Data Manager at NMFWRI, kwithnall@nmhu.edu
Dana Heusinkveld, GIS Specialist at NMFWRI, dheusinkveld@nmhu.edu

Federal Advisors to this Program

Jim Menakis, Branch Chief for Ecology (Grant Administrator) at FS WO-FAM, james.menakis@usda.gov

Jolie Pollet, Wildfire Risk Reduction Program Coordinator with Interior's Office of Wildland Fire, jolie_polletstrohmeyer@ios.doi.gov

Adam Mendonca, Deputy Director for Wildfire Risk Reduction at FS WO-FAM, adam.mendoca@usda.gov

Jens Stevens, National Program Lead, Wildland Fire & Fuels Research at FS WO, jens.stevens@usda.gov

Summary of Partners' Key Contributions to the Program

Bringing all the expertise and experience of SWERI and its partners together will help to ensure that the program is successful and results in a useful, usable, and impactful product.

SWERI offers objective, third-party assessment services that work across agencies. They specialize in assessing and incorporating recent research findings, allowing them to combine social, economic, and ecological measures in their evaluations.

The federal advisors bring valuable expertise to ReSHAPE, with their knowledge of agency processes, politics, and needs. They have a deep understanding of existing and relevant efforts within their respective domains. Additionally, their experience with prior projects gives them insights that can be applied to the current context. Furthermore, their access to information and data managers ensures the availability of valuable resources.

Tribal representation plays a crucial role by providing insights into the needs of indigenous populations. They contribute input on Traditional Ecological Knowledge, offering a perspective deeply rooted in the values and understanding of the landscape. They also possess knowledge about changes occurring in the landscape, which can be critical for decision-making processes.

Researchers bring their expertise in identifying key questions and developing methodologies for studying those questions. They possess the ability to relate research findings to management practices, bridging the gap between theory and application. Moreover, researchers have access to tools for evaluation and can provide objective analysis, ensuring a robust and unbiased assessment of the situation.

Overall, the collaboration between these various partners creates a comprehensive and multidisciplinary approach to improve interagency coordination on wildfire management. Their collective strengths allow for a more holistic understanding and decision-making process that incorporates objective assessment, agency knowledge, Indigenous perspectives, and scientific research. In the next section, the roles of these partners are elaborated in more detail.

Roles of Participating Organizations

SWERI Organizations

Bridging efforts across all the Southwest Ecological Restoration Institutes, the Program Director is coordinating the efforts of the three SWERI institutes to bring their capability and capacity to meet the expectations of Congressionally designated funds. In close collaboration with the SWERI BIL team and

program advisory team, tasks and deliverables in this workplan will be adaptively managed and adjusted as needed following development of the Action Plan in Phase 2 and annually thereafter. SWERI will bring the strengths of the different institutes to the Program and will contribute to all phases, including Scoping, Developing an Action Plan, Program Implementation, and Operations and Maintenance.

1. **Ecological Restoration Institute (ERI):** The Program Director, Aaron Kimple, works for Northern Arizona Institute. ERI is committed to advising and supporting communications and outreach for the IIJA program. The Principal Investigator and Executive Director of the Ecological Restoration Institute, Dr. Andrew Sánchez Meador will support this program along with other key personnel including the Director of Policy and Communications, Dr. Melanie Colavito, a Research Associate, one Postdoctoral Scholar, two Senior Research Coordinators, one Communications Manager, one Web Developer, one Program Manager and one Program Assistant Manager.
2. **Colorado Forest Restoration Institute (CFRI):** CFRI will participate and contribute to advise and shape overall direction and content of the prototype database to display fuel treatments and wildfires. Director Tony Cheng and CFRI staff, in collaboration with other program partners, will likely assume a leadership role to facilitate and coordinate the use of compiled data for assessing and planning cross-boundary fuel treatments, as well as monitoring effects of treatments on wildfire outcomes and ecosystem services.
3. **New Mexico Forest and Watershed Restoration Institute (NMFWRI):** In addition to supporting and advising on the overall development of this program, NMFWRI is spearheading the GIS portion of ReSHAPE that will culminate in a fuel treatment geodatabase and a public interactive web viewer. Led by Katie Withnall, and supported by Patti Dappen and Dana Heusinkveld, the NMFWRI team will actively engage with the other SWERI institutes and stakeholders to ensure an effective and data-rich geodatabase is developed and will participate in outreach and promotion of the tool to stakeholders and the general public.

External Advisors

Several partner organizations serve as external advisors on this program. These representatives work to ensure that there is coordination between SWERI and the agencies, and that the program is working to support the goals of all partners involved by developing a useful and usable product that addresses their needs.

1. **United States Department of Agriculture (USDA) Forest Service:** Jim Menakis is the business lead, representing the USDA Forest Service. Adam Mendonca will serve as an advisor. Jim and Adam will work together to advise the effort, serve as a conduit of information back and forth from USDA leadership and SWERI, serve as a check on deliverables as stated in the language.
2. **United States Department of Interior (DOI):** Jolie Pollet will be the business representative for the DOI. She will help guide and advise on the effort, serve as a conduit of information back and forth from DOI leadership and SWERI, and serve as a check on deliverables as stated in the language.
3. **USDA Forest Service Research & Development:** Jens Stevens will represent USDA Forest Service research and development serving as an advisor to the program.

Additional Advisors

Additional advisors will be brought in as necessary to offer information on a specific user or interest group or advance a specific gap in knowledge that will enhance and advance the development of the overall program. SWERI is working to bring in advisors from the Bureau of Indian Affairs and specific tribes, as available, and will continue to identify and reach out to other strategic groups for partnership during this program.

Statement of Agreement

The following statement expresses the key propositions that define our collective vision and serve as the guiding principles for our collaboration in this program.

SWERI recognizes that:

- The success of this program should serve to better inform the implementation of fuel treatments
- There is a need to document where similar efforts mapping fuel treatments are being done across the country
- There is a need to enhance decision making on where and how to apply fuel treatments on the landscape
- There is a need to improve our understanding of an effective fuel treatment
- There is a need for clear and consistent terminology regarding fuel treatments and their implementation
- There is existing expertise that needs to be incorporated into the development of this program
- There are similar programs/projects in development

Coordinators and Advisors commit to:

- Open and honest discussion
- Representing the values and concerns of their agencies
- Offering and supporting programmatic updates to key leadership
- Guidance on direction of the program
- Connecting the effort to relevant partners and information opportunities
- Programmatic adaptation when the need arises
- Work with existing efforts when appropriate

Stakeholder Analysis

SWERI recognizes that, for a geospatial database to be impactful, it needs to be constructed to the needs of those that will use it. Working with advisors and partners, SWERI worked to define the potential audiences, allowing them to better understand the questions that would be asked of the geospatial database and to inform how the tool will be engaged and what products it will be asked to use. The discussions of audiences presented several potential ways to segment the users. Different users will have different objectives for a geospatial database, different data needs, and different ways of engaging with the data.

The main stakeholders identified during these discussions are:

- Congressional staffers
- Federal land managers
- State-level land managers
- Tribal land managers
- Researchers
- County-level planners
- General public

A detailed list of these stakeholders, including anticipated data needs and feature preferences, is provided in Table A 1 (see Appendix).

User Types

The table below summarizes the expected user groups for the database and attempts to predict how each group will use the database and for what purpose(s).

Table 3. General database expected user groups

User Group	Description	Example Job Titles
Analyst	Analysts would want to take a deep dive into the data and use database to answer complex analytical questions.	Fire modelers, database managers, landscape analysts, Economists
Managers	Managers (or decision makers) are looking more for broad level evidence to inform decisions they need to make and strategies or direction how to get towards a goal/outcome.	District managers, state foresters, planners
Operations	Operations are looking for information that can inform the specific tactics or sequence of tactics that would give them reasonable success in accomplishment.	Incident command teams, Office of Emergency Management
Viewers	Viewers (or transparency) are more of the curious citizen type, generally don't need to go to deep but would like it if these groups were transparent with them on what is going on and are generally more connected to their local surface level question or looking for progress towards outcomes (often for larger geographic areas or national scale).	Congressional staff, collaborative groups, funders
Researchers	Researchers are looking to use data to answer analytical questions to either inform theory or understand mechanisms, rather than to only answer a specific practical question.	Federal Researchers, Independent Research
* Each group has different needs. Analysts, managers, and researchers may need to combine the database with other data sources to answer more complex questions (ownership, treatment prescriptions, burn severity, habitat, wildland urban interface (WUI), etc.).		
** What treatment attribute information (or complimentary datasets) do user groups need to increase the utility of this database? Is it incumbent on this effort to provide that data?		

Preferred Spatial Scales

SWERI anticipates that different user groups will be interested in using this database at different geographic scales according to their jurisdictional and analytical focus. These are summarized in the table below.

Table 4. Scales of interest

Scale	Description	Example job titles
Fine Scale	Single county, tribal trust lands, individual national forest, watershed, etc.	
Medium Scale	Landscape, state	
Broad Scale	Multistate area, region, national	
* Database may do a better job of meeting the needs of some users vs. others depending on their scale of interest.		

Preferred Data Products

SWERI further anticipates that different users will prefer to access this data through different data products/media. These are summarized in the table below.

Table 5. Preferred data product / medium per user group

Medium	Description
Online Map Viewer	Simple platform with low cost of entry, good for novice users without GIS experience
Geospatial Database	Advanced users will prefer to access the database directly to perform customized analysis
* Are there other ways to display or provide this data such as working with Landfire? WRC? etc.?	

Scoping Framework

The follow-up meeting built from a concept of success identified during the initial visioning effort. The conversation started by thinking through where and how SWERI could maximize impact and how much effort would be required to achieve this impact. The discussion revolved around what data are available, what commitments SWERI has, and how SWERI approaches incorporating a diversity of data sets.

Purpose Statement

SWERI has identified the purpose of the geospatial database to enable improved understanding of the effectiveness of treatments on the landscape. However, there are inherent challenges associated with this premise: What is the definition of effectiveness? To whom? On what scale? – This requires nuanced conversations held during the facilitation of the application of TWIG during analyses.

Use Cases

SWERI's phased approach will require that the database development involves recurring evaluation from potential users, applying input to inform additional data needs, useability and accessibility, and understanding user needs and applications. Input will help direct the following iteration of the program, which could, in turn, advance user applications. This will also help advance how the effort is scaled to

user needs. Users should be allowed to bring their own data to interact with the database to help advance it to the appropriate scale.

Table 6. Use cases per user group

User Group	Use Case
Congress	Identify funding needs
Agencies – DOI / USDA	Defining work priorities – strategic planning
Researchers	Determine effects and appropriate fuels treatment
Land managers	Reference work accomplished and plan future work
SWERI	Explore effects of fuels treatments
Sovereign Nations / Tribes	Relate/ integrate tribal work and traditional knowledge with federal work
State Governments	Planning fuels treatments and application of funds

Problem Statement

The current problem revolves around the abundance of data and multiple decision support systems, which suffer from challenges of limited accessibility, applicability, and comparability. The data are not easily accessible or readily applicable, and the existing systems of record lack the capability to be easily compared with one another.

Key Challenges

1. Data Accessibility: The data available are not easily accessible, hindering efficient retrieval and utilization.
2. Data Applicability: The existing data lack practical relevance and applicability, limiting their usefulness for decision-making processes.
3. System Comparability: The multiple decision support systems in place lack a standardized approach, making it difficult to compare and integrate data across different systems of record.

These challenges create inefficiencies, hinder effective decision-making, and limit the overall utility of the available data. Addressing these problems will require developing solutions that improve data accessibility, enhance data applicability, and enable seamless comparisons across various decision support systems.

Design Challenge

The design challenge is to develop a comprehensive tool that integrates relatable data, presents it in a user-friendly manner, and enables easy querying and downloading of information.

Success Criteria

The success of the program will be measured against the following criteria:

- Realistic expectations: Ensuring that program goals are feasible and achievable within the given timeframe and resources.

- Consistent communication: Maintaining open and transparent communication channels among team members and stakeholders throughout the program.
- Deliverables achieved: Successfully completing all planned deliverables as outlined in the program scope.
- An accessible, usable tool: Creating a user interface that is intuitive, accessible, and easy to navigate for all intended users.
- Clear audience: Identifying and defining the target audience and their specific needs and requirements.
- Defined geography: Clearly specifying the geographic scope and boundaries within which the tool will operate.
- Sustained/expanded relationships: Establishing and nurturing relationships with relevant stakeholders to ensure long-term sustainability and potential expansion of the tool.
- Application of the tool: Demonstrating the practical application and usefulness of the tool in relevant domains.
- Informs science and land management: Enabling the tool to contribute to scientific research and effective land management practices.
- Clear connection between the database and assessment of effects/decision-making: Establishing a clear linkage between the tool's database and the evaluation of its effects in informing decision-making processes.

Key Challenges and Limitations

The following points outline various limitations and challenges that should be considered for the program:

- Identifying data and attributes to include
- Availability and accessibility of data
- Associations between agencies
- Need for agreement between stakeholders
- Understanding the limitations of the program
- Perceptions
- Change associated with political winds
- Time constraints
- Geographical expectations and limitations from prior work

What the Map/Database Is Not

It is also important to clarify what the map/database/application is not in order to set appropriate expectations:

- Not a USDA or DOI program
- Not reinventing any agency wheels
- Not comprehensive of all data (ex. NRCS data exists for private land but not publicly available)
- Not new data
- Limited resolution / scale

Known Unknowns

Finally, there are certain aspects that are currently unknown but should be considered during the program:

1. Unanticipated higher impacts:
    - Cannot anticipate all of the use cases for the program
    - Will continue to learn about the user needs and applications as the program unfolds
    - Need to allow flexibility for the program to evolve and meet unanticipated needs
2. How to provide support for underserved communities:
    - The map/database/application has the opportunity to inform how and where money is applied
    - It is important to build considerations around investment into areas that may not yet have demonstrated success

Programmatic Direction

To improve interagency data applications and enhance understanding of the effects of fuel treatments on wildfires, it is necessary to compile and display existing information on fuel treatment projects and wildfires, to coordinate and facilitate the use of these data for assessing, planning, and monitoring fuel treatment interactions with wildfires across boundaries, as well as analyze and report on fuel treatment effects. This program will lead to the production of a single geospatial platform for displaying existing data on fuel treatments and wildfires, helping to advance our understanding of fuel treatment effects and reduce the risk of catastrophic wildfire across the United States.

SWERI envisions a geospatial database and online viewer that is easy to access, use, and allows for the downloading of data for purposes of:

- Providing easily developed maps and reports.
- Offering independent managers/researchers easy access to data for personal applications.
- Accessing data that can be downloaded and applied to localized situations.
- Accessing easily manipulated data for study of effects.

Note on the Definition of Fuels Treatments

There are multiple management strategies for manipulating forest vegetation that are categorized as forest treatments. These strategies can be applied to address a suite of goals or objectives (i.e., wildlife habitat, recreation, forest structure or composition). They are not restrained to the specific intent of affecting wildfire behavior.

For the purposes of the ReSHAPE program, fuels treatments are those management practices intended to reduce and/or rearrange flammable vegetation. Fuels treatments can include mechanical, manual, and prescribed and managed fire methods.

Action Items

To achieve the above objectives, the following action items have been identified:

- Compile data from existing systems of record: Gather relevant data from various existing sources and systems to form a comprehensive dataset.
- Enhance data relatability: Structure the data to ensure its relatability and coherence within the platform.
- Present data on an accessible, interactive web-based platform: Design and develop an interactive platform that presents the data in a visually appealing and user-friendly manner.
- Enable data download and usage: Implement functionality to allow users to easily download the data or access it through a hosted feature service for external applications.
- Promote platform and facilitate use: Develop strategies to promote the platform, increase awareness among the target audience, and provide necessary support for its effective utilization.
- Evaluate data needs and identify use cases: Conduct thorough analysis to determine the specific data requirements and identify relevant use cases for the platform, ensuring alignment with user needs and expectations.
- By addressing these action items, the program aims to create a robust and user-centric data integration and visualization platform that effectively serves its intended purpose.

Approach

To meet the direction of the BIL and the vision developed through outreach efforts, SWERI will (1) create a geodatabase that is a compilation of existing data sets, but limited to data that will support the questions of the identified audiences, and (2) create a web-based map viewer and portal that can be easily accessed by interested users. This geodatabase, named the ***Treatment & Wildfire Interagency Geodatabase, or TWIG,*** and its associated viewer will be two main deliverables of the ReSHAPE program. Currently there are data sets for the US Departments of Agriculture and Interior and wildfire data that are available for all 50 states. Building from the data available would allow for SWERI to develop an initial interactive map of treatments and wildfire across the country that will allow users to identify additional data needs and potential applications.

Growing from user input, the TWIG web viewer can be refined and supplemented with additional data sets to advance use and application. This conversation became formalized into an iterative approach to the geodatabase and web viewer development that is improved with stakeholder input. It will also allow SWERI to evaluate existing datasets, identify accuracy and gaps, and develop strategies for addressing data needs. In addition, the phased approach will allow SWERI to think through how to incorporate already existing efforts.

Data that are available and data attributes may differ between agencies and departments. It will take work to identify related attributes and apply them to the geodatabase. Initially, the geodatabase will be built using existing federal data sources. The data will need to be integrated and incorporation of the data into the geodatabase will need to be automated. Adding additional data sources will add complexity to integration and automation. The data sources incorporated into the geodatabase will also influence how often and when updates can be made to the program. A robust quality assurance/quality control (QA/QC) process will be necessary to ensure that users can be confident in the data and to ensure accurate results when comparing data.

III. SCOPE OF WORK

SWERI is working in partnership with an advisory team at USDA Fire and Aviation Management (FAM), Forest Service Research and Development (R&D), and the Department of Interior Office of Wildland Fire (OWF) to accomplish the ReSHAPE program. Through an iterative process, SWERI will address the directives of the BIL and work to meet the needs of the fire planning community to understand the effects of fuels treatment on wildfire.

The scope of work for this multi-year, national program includes four formal phases (Figure 1), along with a phase for building out a prototype of TWIG which is included in the Action Plan phase, each with their own deliverables.

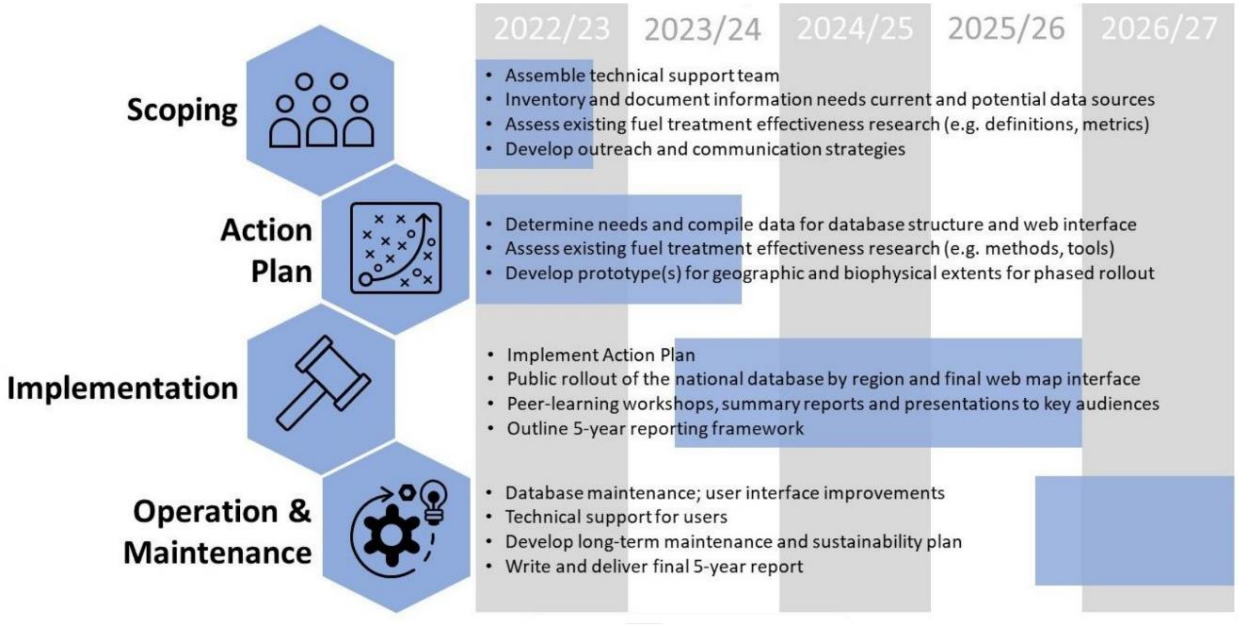

Figure 1. ReSHAPE timeline for individual phases and associated tasks

This program is committed to building TWIG to be a product that will service the needs of an audience and geography identified during the initial scoping phase. TWIG and the TWIG viewer should be accessible and applicable to answering questions relevant to the identified audience. An initial beta version will be offered to the identified audience to ensure that it meets expectations and the user needs. The development of a map of fuel treatments may allow for further refinement to support other audiences as opportunities present themselves.

Working together, staff at SWERI and representatives of the partner agencies will support the development of this BIL program as proposed in legislation, within budget and on time. Work will proceed in four phases: Scoping, Action Plan (including the prototype development), Implementation, and Operations and Maintenance.

Phase 1. Scoping

Timeline

9-10 months from receiving award.

Deliverables

1. Produce a communication plan in collaboration with the US Forest Service, Department of Interior, and other program partners.
2. Produce a report that synthesizes the information gathered during the scoping phase.

Tasks

Task 1.a. Identify and convene program advisors and a technical support team of federal, state, and tribal agency personnel – with expertise in fuel management and research on fuels planning and fuel treatment effectiveness – to assist in continuously shaping the strategic vision and help coordinate with related existing federal programs, NWCG committees, and tribal and state partners to categorize available data linked to information needs and applications.

- Form an advisory team in consultation with program advisors and determine governance structure and participants.

Task 1.b. Frame the audience, geographic project regions, and their fuel treatment information needs and uses:

- Iteratively identify and segment potential audiences at different spatial scales and decision levels (i.e., national, regional, state, and substate), and inventory and document their information needs and current and potential uses of fuel treatment and wildfire geospatial data.
- Based on the results, determine methods and geographic project regions in an Action Plan (see Phase 2) for compiling, displaying and integrating existing data (both raw and summarized) for hazardous fuel reduction or wildfire prevention treatments funded under Sec 40803, ensuring it is handled consistently and supports fuels treatment outcomes.

Task 1.c. Frame the range of methods to display fuel treatment and wildfire data and data products (40803(c)(8) Subsections (A) and (B)):

- Inventory and document potentially overlapping, parallel, and closely aligned existing federal and cross-boundary fuel treatments programs, mapping, and assessment efforts.
- Identify range of potential products, documents, and online platforms for displaying spatial and tabular data.
- Identify range of basic online viewing and search functions, and interfaces/wrappers that may meet audience needs identified in 1.a. in terms of ease of use, reporting functionality, and the like.

Task 1.d. Frame potential pathways to facilitate coordination and use of fuel treatment data and related spatial information to assess, plan, and monitor the effects of fuel treatments (40803(c)(8) Subsection (C)(a)):

- To better understand why, where, and how fuel treatments are being planned and implemented, and facilitate communication, collaboration, and coordination among management entities, conduct a baseline inventory of factors that facilitate or inhibit effective planning and implementation of fuel reduction treatments in order to track the use and effectiveness of current and future treatment planning processes, and identify other policy and program changes needed to increase effectiveness.

Task 1.e. Frame definitions and approaches for assessing fuel treatment effectiveness (40803(c)(8) Subsection (C)(b)):

- Conduct a pilot assessment of existing fuel treatment effectiveness definitions, metrics, data layers, and outcomes to ensure mapping products align with existing treatment effectiveness monitoring and research efforts.

Task 1.f. Identify the components of outreach and communication strategies for this program:

- Scope components of a communications plan with respect to key federal, state, and tribal audiences.
- Scope components of a public-facing outreach strategy to promote and track the use of interim and completed products.

Phase 2. Action Plan

Timeline

18-20 months from receiving award. (Beta version prototype within 2-4 months from completion of the scoping document.)

Deliverables

1. An Action Plan that includes detailed production schedule, budget, roles and responsibilities, and contingencies to accomplish Subsections (A), (B), and (C).
2. A prototype(s) of TWIG and viewer to display fuel treatments completed by USDA and Department of Interior, and wildfires, that meets basic information needs of the target audience.

Tasks

Task 2.a. With respect to Subsections (A) and (B): In close coordination and communication with the technical support team with expertise in geospatial, database, and web design skills for gathering and displaying fuel treatments and wildfires, the Action Plan will describe methods, production schedule, roles, responsibilities, and contingencies to develop, deploy, maintain, and adaptively manage a national geospatial database of fuel treatments carried out under Section 40803. The range of specific tasks for this component is limited to:

- Develop and maintain a list of key contacts to assist SWERI in gathering, maintaining, and refreshing data layers.
- Inventory and compile existing data sources for subsection (A) and (B), including, but not limited to Fuel Treatment Effectiveness Monitoring (FTEM), The Interagency Fuel Treatment Decision

Support System (IFTDSS), NFPORS from DOI, and FACTS from USDA. The range of additional tasks for this component is limited to:

  - Assess data quality and utility per audience information needs identified in the Scoping phase, e.g., scales, quality, attributes, relevance.
  - Iteratively identify data gaps and approaches to fill gaps.
  - Develop a metadata strategy.
  - Determine refresh interval for data consumption.
- Determine appropriate database structure in coordination with advisory team, technical experts, and agency collaborators. The range of specific tasks for this component is limited to:
  - Develop Beta version of spatial and tabular data.
  - Determine appropriate technical infrastructure and support services for a web-based geospatial data display, delivery and reporting system (i.e., the web interface and associated hardware and software, and technical support).
  - Incorporate complementary/potential important auxiliary databases that are publicly available; determine publicly available data sharing policy.
- Create a prototype(s) to pilot the geographic and biophysical extents for phased rollout on spatial and tabular delivery and effectiveness assessment and reporting.
- Determine spatial and tabular data integrity and sustainability needs.
- Develop a process for assessing and incorporating emerging technologies/needs.

Task 2.b. With respect to Subsection (C)(a): Describe methods, production schedule, roles, responsibilities and contingencies to facilitate coordination and use of the database for planning and assessing cross-boundary fuel treatments with and for different audiences. The range of specific tasks for this component is limited to:

- Inventory and document methodologies, tools, and practices used by managers to inform fuel treatment planning, design, implementation, and adaptive management.
- Develop and deploy a range of peer-learning and knowledge exchange activities to promote methods, tools, and practices that improve the effectiveness of fuel treatment planning, design, implementation and adaptive management.
- Define, monitor, report on, and adapt metrics of progress for the adoption, diffusion, utility, and adaptation of methodologies, tools, and practices in fuel treatment planning, design, implementation, and adaptive management.

Task 2.c. With respect to Subsection (C)(b): Describe methods, production schedule, roles, responsibilities, and contingencies to assess treatment effectiveness on wildfire outcomes and ecosystem restoration services utilizing the information obtained from scoping. The range of specific tasks for this component is limited to:

- Identify and assess utility of fire behavior, ecological, and human-fire interaction metrics to assess and statistically test “effectiveness.”
- Identify and assess the utility of existing monitoring and validation efforts that explore modeled/observed impacts on ecological and social attributes related to wildland fire.
- Implement phased geographic, ownership, biophysical, and treatment type rollout for effectiveness assessments.

- Identify trends in the data and potential ways to improve treatment planning and implementation effectiveness.

Task 2.d. Describe methods, production schedule, roles, responsibilities, and contingencies to develop, deploy, and iteratively adapt communications and outreach strategies for this program. The range of specific tasks for this component is limited to:

- Develop, receive back, refine, and deploy a communications plan for SWERI to engage with key audiences in national and state leadership and program management roles regarding program components, progress, and deliverables.
- Develop, receive feedback, refine, and deploy a regularly updated public-facing outreach strategy, including branding, website, videos, story maps, social media, etc.

Task 2.e. Create a prototype(s) to pilot the geographic and biophysical extents for phased rollout on spatial and tabular delivery and effectiveness assessment and reporting. Determine appropriate database structure in coordination with advisory team, technical experts, and agency collaborators. The range of specific tasks for this component is limited to:

- Develop Beta version of spatial and tabular data.
- Determine appropriate technical infrastructure and support services for a web-based geospatial data display, delivery and reporting system (i.e., the web interface and associated hardware and software, and technical support).
- Incorporate complementary/potential important auxiliary databases that are publicly available; determine publicly available data sharing policy.
- Determine spatial and tabular data integrity and sustainability needs.
- Develop a process for assessing and incorporating emerging technologies/needs.

Phase 3. Implementation

Timeline

4 years from receiving award.

Deliverables

Deliverables for this phase are defined per task below.

Tasks

Task 3.a. With respect to Subsections (A) and (B):

- Deliverable: Public rollout of TWIG that includes a national database by region and the final viewer/web map interface.

Task 3.b. With respect to Subsection (C)(a):

- Deliverable: A portfolio of peer-learning workshops, summary reports, and presentations to key audiences (i.e., national and state policymakers, and program managers and implementers of wildfire mitigation fuel treatments) regarding factors facilitating or inhibiting the coordination

and use of fuel treatment data and related spatial information to assess, plan, and monitor the effects of fuel treatments, and potential interventions to reduce inhibiting factors.

Task 3.c. With respect to Subsection (C)(b):

- Deliverable: A portfolio of peer-learning workshops, summary analysis reports, and presentations to key audiences (i.e., national and state policymakers, and program managers and implementers of wildfire mitigation fuel treatments) regarding the effectiveness of fuel treatments relative to wildland fire-related management objectives.

Task 3.d. With respect to communications and outreach strategies for this program:

- Deliverable: Continuous communication with leadership and program managers at the national and state levels. Continuous updating and feedback from public-facing outreach mechanisms. Overall, broad support for SWERI products and deliverables.

Task 3.e. With respect to Subsection (D) — Develop the 5-year report framework on the application and use of the data, and effectiveness of treatments to change wildfire boundaries and outcomes.

- Deliverable: A report framework describing the application and use of TWIG and treatment interactions with wildfires across jurisdictions, regions, and treatment types.

Phase 4. Operations and Maintenance

Timeline

5 years from receiving award.

Deliverables

1. Maintaining and updating TWIG data.
2. Operation and maintenance schedule and plan.
3. Final 5-year report describing the application and use of TWIG and treatment interactions with wildfires across jurisdictions, regions, and treatment types.

Tasks

None defined.

IV. CONTEXT OF WORK

Review of Related Efforts

A comprehensive review of related efforts was conducted in Spring 2023. The purpose of this review was to inventory both existing data sets that can be incorporated into TWIG, as well as other similar interagency data aggregation efforts to avoid duplicating efforts. The table below summarizes the authoritative national databases that were identified during the Phase 1 Scoping activities.

Table 7. Authoritative Federal data sources

Name of Effort	Agency	Primary Contact	Primary Contact Info
NFPORS Fuel Treatment Polygons	DOI: BLM, BIA, FWS, NPS, BOR, USGS	Henry Bastian	henry_bastian@ios.doi.gov
FACTS Hazardous Fuels Reduction Polygons	USFS (USDA)	Matt Tansey	matthew.tansey@usda.gov
NRCS Treatments - unavailable	NRCS (USDA)		
VMAP	BLM	Dusty Pence	dlpence@blm.gov
NPS System of Record	NPS	Mike Van Hemelryck	mike_van_hemelryck@nps.gov
FWS System of Record	FWS	Chris Marks	chris_marks@fws.gov
NextGen (NFPORS 2.0)	DOI	Henry Bastian	henry_bastian@ios.doi.gov

SWERI also documented data sources and interagency efforts that are currently being developed but not yet complete. While these cannot be incorporated into TWIG at this time, SWERI will continue to monitor progress and prepare to include them in the future, where appropriate. It should be noted that this inventory of data and interagency databases needs to be updated regularly as new sources may be developed and old sources may be depreciated.

Several sources for state level data, other interagency tools and databases, and wildfire data were also identified (see Tables A 2-A 4 in Appendix). Other data not yet identified (tribal and other) will be added in the future, where possible.

More thorough documentation of all data sources considered for use in TWIG, as well as related web applications, is provided in a separate document titled Documentation of Existing Data and Applications. SWERI will continue to develop and update this document through subsequent phases of this program.

V. USER RESEARCH AND OUTREACH

Scoping involved months of outreach to potential users and stakeholders. Events included internal SWERI meetings, meetings with federal advisors and stakeholders, presentations to Congressional staff, outreach to tribal groups, compiling survey results from users of a similar geodatabase, and publication of different reports for this program.

These events took place between October 2022 and March 2023. For a full list of events, see Table A 5 in the appendix.

During the Scoping Phase, SWERI reached out to a diverse stakeholder audience for feedback, including managers of existing programs and databases, researchers, users of existing geospatial databases, and Congressional representatives and staffers. Input was solicited through a combination of on-line surveys, in-person interviews, and workshops.

Conversations with potential users were structured around the following set of questions:

- What are the needs for a geospatial database?
- What information would a geospatial database help convey and to whom?
- What management decisions would be supported?
- Are there management questions that are not currently being addressed?
- What would help address gaps in decision space?
- What spatial information would advance management decisions about fuel treatments and wildfire?
- What helps improve accessibility and use of a geospatial database?
- What outputs are needed from a geospatial database?

Synthesis of Prospective User Feedback

This section summarizes the results of the outreach activities described above. Results are organized by stakeholder group.

Congressional Representatives

Between 2020 and 2022, Congress committed a historic amount of funding to forest fuel treatment. In discussions with staffers for Congressional representatives, several key questions emerged. Most questions concerned the application of funds, with a specific focus on the states or districts that individuals represent. Congress wants to know:

- Where funds are being applied on the landscape?
- How much is being committed to their represented region?
- What work is being accomplished (including acres treated)?
- Where are specific federal programs (i.e. CFLRPs, Joint Chiefs, CWDGs) being applied?

The intent of these questions is to report out to constituents and Congress about what is happening on the landscape, promote the work being accomplished, and justify funding.

Geospatial Database Users

The New Mexico Forest and Watershed Restoration Institute developed the NM Vegetation Treatment Geodatabase and has developed a deep user base. NMFWRI surveyed the users about the database, their needs, and what would make a geospatial database more accessible and useable. 120 users responded to the survey. The findings of these surveys have been analyzed for trends to inform TWIG and the overall ReSHAPE program (Figure 2).

Existing Programs

SWERI participated in a workshop where they were presented with the current state of official systems of record for the USDA and DOI, existing decision support tools, existing efforts to expand information outside of federal programs, as well as the identification of information and decision support needs and recommendations for ReSHAPE. The workshop was held from March 6-8, 2023, the purpose of which was to define one or more approaches (or frameworks) for ReSHAPE.

Considerations from the Boise Meeting

On March 21, 2023, SWERI met with its partners and stakeholders to define and prioritize potential actions for this program. From this exercise, the following were identified as actions SWERI must take to achieve success in this program:

- Define effectiveness
- Define disturbance
- Pilot landscapes for effectiveness
- Incorporate user feedback
- Provide program updates to the USDA Forest Service reporting at least 1x per month

Additionally, the following items were recommended as actions SWERI *should* take:

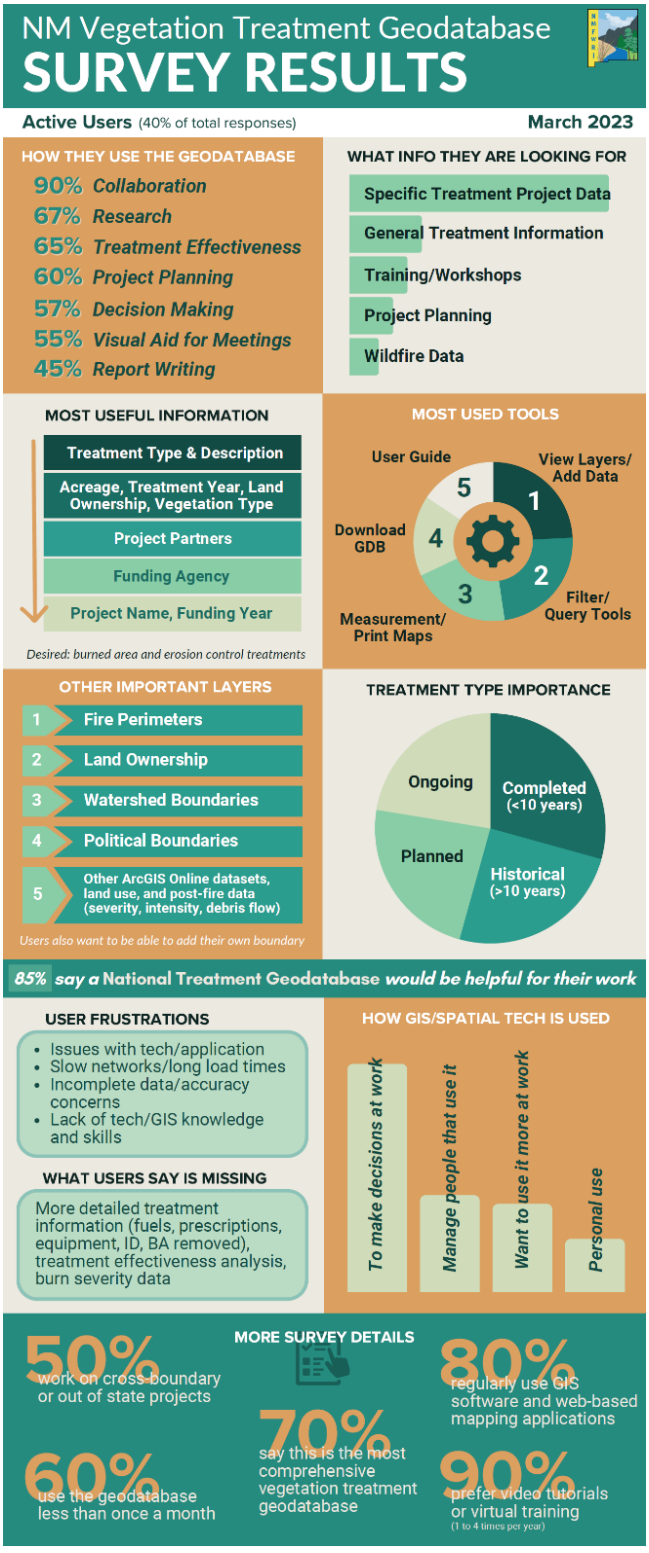

Figure 2. NM Vegetation Treatment Geodatabase Survey Results infographic

- Make the research applicable / actionable
- Identify what questions managers are not asking
- Consider the size and location
- Consider how to educate silviculturist and managers
- Identify which treatments are out of date
- Explore if there is a need to design treatments differently
- Consider what people expect to see from treatments
- Prepare for post-fire conditions
- Develop performance metrics for the risk profile to tell the story
- Try to have a more multi-temporal and holistic view on the process that isn't tied to budget years

Desired Access and Platforms

In line with the success of the New Mexico Vegetation Treatment geodatabase and the repeated message from potential users, stakeholders, and advisors to ReSHAPE, the Treatment & Wildfire Interagency Geodatabase (TWIG) platform (including the TWIG viewer) will be developed as part of ReSHAPE and will be publicly available, easy to use, open-access (no sign-in required), and contain open data available to all via download and/or hosted feature service.

In order to ensure its long-term viability and success, the web platform will be built using Esri products. Esri products are the GIS standard globally ensuring that the platform will be up-to-date and adaptable to new technologies as they are developed. Additionally, the geodatabase and platform will be able to be maintained by any number of potential contractors in the future as well as SWERI staff, eliminating the reliance on any specific custom developer.

Desired Data and Attributes

After completing the review of existing authoritative data, SWERI has identified FACTS, NFPORS, and NASF state data as the key datasets to integrate into TWIG. Other agency datasets such as the BLM, FWS, and NPS systems are also highly desirable. Tribal datasets will be incorporated, where possible, with proper regard for privacy and tribal data sovereignty considerations. The ability for data from smaller agencies or organizations (NGOs, collaboratives, soil and water conservation districts, etc.) to be contributed to TWIG via an upload tool may also be incorporated.

A review of attributes in source databases was completed, focusing mainly on the FACTS and NFPORS databases, as they are the principal datasets for TWIG. A wish list of additional attributes was also created containing both attributes known to exist as well as attributes that may not exist for most data. Ultimately, the platform is constrained by what data and attributes actually exist, although SWERI may make recommendations to agencies for desired attributes in future data collection. In order to avoid cross-walking the hundreds of attributes in FACTS and NFPORS, TWIG's attribute list will be kept as simple as possible and include unique identifiers (primary keys) that users can relate back to the source data for the full attribute information.

Data Glossary

The different systems of record reflect a diversity of definitions for data and attributes. SWERI will develop a strategy for aligning definitions from the different records and will cross-reference comparable data into a combined data set. This will involve the development of a glossary for data that bridges the datasets. This process will also allow SWERI to remove data that do not help address questions identified during the scoping period. Datasets may be expanded if additional data are deemed necessary to answer questions that align with the goals of the program.

VI. ACTION PLAN

Through an iterative process SWERI will address the directives of the BIL and work to meet the needs of the management community to understand the effects of fuel treatments on wildfire. It will do this through the following key actions:

- Stakeholder Outreach
- Database and Platform (TWIG and TWIG viewer) Development
- Compiling, Displaying, and Integrating Data
- Providing Metadata Guidance
- Identifying pathways for facilitation and Use
- Program Evaluation
- Conducting a Pilot Assessment
- Communication and Outreach
- Establishing a Community of Practice

Stakeholder Outreach

Below is a list of planned events, meetings, and publication dates for internal and external stakeholder outreach.

Table 8. Stakeholder outreach methods

Projected Timeline	Outreach Event (OSEC Lead)	Participants	Materials / Outcomes
Action Plan			
September 2023	National Association of State Foresters	State Foresters	Poster, briefing paper, scope of work, survey
September 2023	Society of American Foresters	Foresters	Poster, briefing paper, scope of work, survey
October 2023	Re-convene participants of Boise meeting to update on progress and present alpha prototype		
October, 2023	Cohesive Strategy Workshop		
December 2023	Association for Fire Ecology – Fire Congress	Researchers	Briefing paper, scope of work, Action Plan, paper on decision support tools
December 2023	Meet with USDA Forest Service Associate Chief		
October, 2023	Cohesive Strategy Workshop		
March 10, 2024	Quarterly Report	Advisors	Regular update to funders and advisors
March, 2024	Release of Beta Version	Potential users, advisors, federal partners, state partners	Beta version, surveys
March 2024	Release white paper on existing decision support fools		
March 2024	Release white paper on data comparability and gaps		

March 2024	Visit with representatives in DC	Elected officials, appropriations, federal fund managers	Beta version
March 2024	Present Action Plan		
2024	User workshops	Federal partners, potential users, state partners	
April 2024	Research workshop	Research interested in effects	
May 2024	Collaborative partners		Case study concepts
June 10, 2024	Quarterly Report	Advisors	Regular update to funders and advisors
October 2024	Re-convene participants of Boise meeting to update on progress and present pre-Beta prototype		
October 10, 2024	Quarterly Report	Advisors	Regular update to funders and advisors
January 10, 2024	Quarterly Report	Advisors	Regular update to funders and advisors
Implementation			
Spring 2024	User workshops and program assessment	Federal partners, additional users, collaborative groups	
Fall 2024	Assessment of program and uses		
Winter 2024	Present case studies on effects of fuels treatment and wildfire		
October 2025	Re-convene participants of Boise meeting to update on progress and present pre-Beta prototype		

Database and Platform (TWIG and TWIG viewer) Development

The ReSHAPE program will follow an iterative process, starting with the development of a basic map viewer to spatially depict fuel treatments and wildfire. SWERI will accomplish this by:

- Utilizing existing data and engaging existing efforts
- Systematically addressing expectations and needs
- Cross-referencing comparable data and aligning definitions

Future advancements for ReSHAPE will incorporate additional existing data to facilitate an assessment of the effects of fuel treatment interactions with wildfire. The future stages of ReSHAPE will:

- Advance stakeholder engagement
- Further refine attributes and linkages between data systems
- Relate fuel treatments to effects
- Present case studies on interactions between treatments, wildfire, and values

SWERI will also undertake continuous assessment and evaluation of the ReSHAPE outputs and application to systematically evaluate and inform the program's potential by better understanding the needs of end users and partners. This component of the ReSHAPE program will allow SWERI to:

- Identify questions that data currently do not address

- Identify data gaps and information needs

This program will be developed over four stages, seen in the graphic below and detailed in the following pages.

Stage 1: Initial Viewer

Overview

Building from existing data sources, SWERI will put together a map and a viewer for TWIG that will allow users to determine where fuel treatments and wildfire occurred on the landscape. This will offer an initial map that allows users to click on polygons, determine what work occurred, why and by whom. SWERI will work to integrate databases, attributes, and develop a dictionary explaining the attributes. Additionally, SWERI will develop a communications and outreach plan that will advance the iterative evolution of the program.

Intent

Gather existing data, make it available to identified audiences and facilitate input on what needs to be included in future versions.

Audiences

- Existing data and data analysis programs
- Congressional representatives
- Federal agencies

Questions

- Where are federally funded fuels treatments occurring?
- How many acres have been treated?
- Where are large wildfires occurring on the landscape?
- How many acres are burned?
- Are wildfires interacting with fuels treatments?

Data Sources

- NFPORS
- FACTS

Deliverables

- Data dictionary
- Integrated attribute table

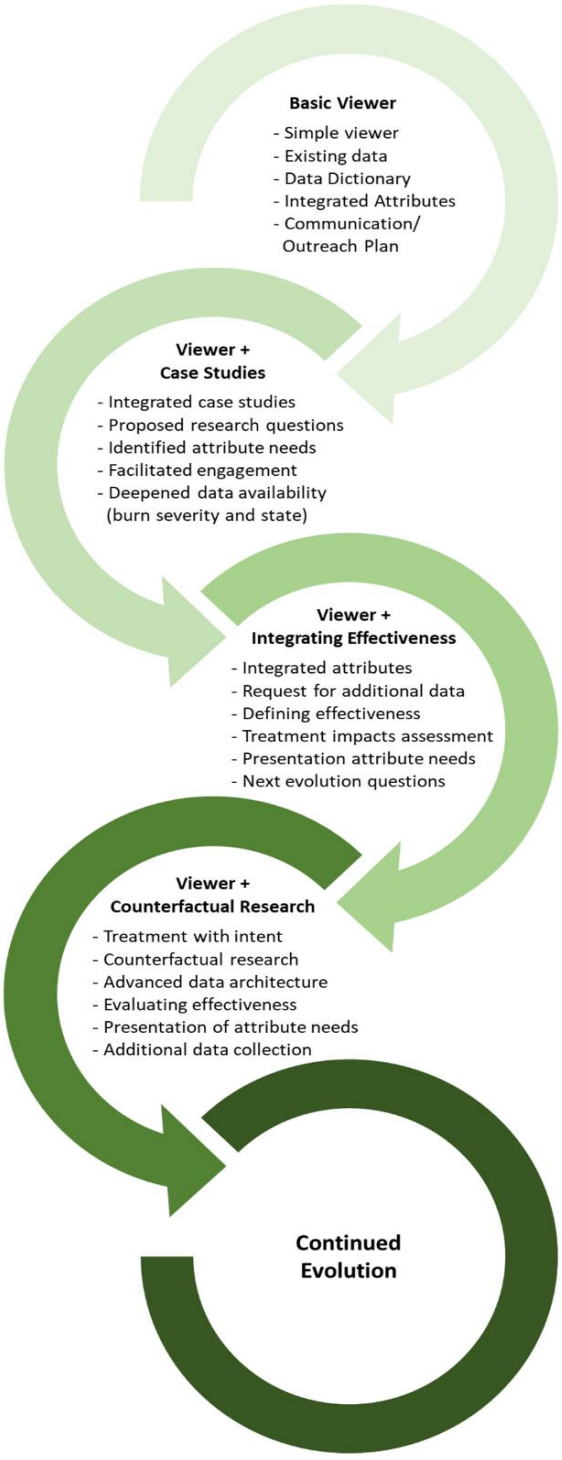

Figure 3. Development flow chart

- TWIG basic viewer
- Communications plan
- Data gaps and information needs

Stage 2: Viewer with Case Studies

Overview

Once the initial version of the TWIG viewer is made available, SWERI will present it to the users for review and input. SWERI will solicit input on use, additional data needs, and opportunities for increasing interactivity capabilities. This version will also incorporate case studies of wildfire that have interacted with treatment on the landscape, how they influenced behavior and management. In this second effort, SWERI will offer insights into perceptions of effective fuel treatments, informing the further evaluation of fuel treatments on the ground.

Intent

Advance TWIG to help understand how wildfire has interacted with existing fuel treatments and advance the assessment of fuel treatment effects.

Audiences

- Existing data and data analysis programs
- Congressional representatives
- Federal agencies
- Researchers
- Localized decision makers

Questions

- How are wildfires interacting with fuels treatments?
- How are fuel treatments being used by fire managers?
- How are fuel treatments coordinated across boundaries?
- How do users define fuel treatment effectiveness?
- Do fuel treatments impact burn severity?

Data Sources

- User interviews
- Burn severity
- State data

Deliverables

- Definitions of effectiveness
- Interactive, geospatially referenced case-studies
- Identified data gaps
- Expanded attributes table
- Increased interactivity
- Facilitated engagement with users

Stage 3: Viewer integrating effects

Overview

SWERI will continue to solicit input on use, additional data needs, and opportunities for increasing interactivity capabilities with TWIG and the web-based viewer. SWERI will engage with stakeholders to advance an understanding of what determines whether or not a fuel treatment is effective. This version will work to incorporate what is learned and inform behavior and management, advancing evaluation of fuel treatments on the ground. It will expand the inclusion of cross-boundary data, incorporating state data. SWERI will expand outreach to more local groups, identify questions of interest, and further refine data and attribute gap analyses. Gaps identified throughout the effort will be presented to database managers and decision makers.

Intent

Expand the capability of TWIG to promote treating with intent and measuring the effectiveness of fuel treatments. Grow the ability of the program to inform management decisions.

Audiences

- Existing data and data analysis programs
- Congressional representatives
- Federal agencies
- Researchers
- Localized decision makers
- Regional land managers
- State managers

Questions

- Are treatments protecting values of risk?
- Assessing fuel treatments effects on wildfire?
- What is an effective treatment?
- At what scale are fuel treatments effective?

Data Sources

- User interviews
- State data

Deliverables

- Incorporation of effectiveness into treatment assessment
- Expanded documentation of data gaps
- Expanded attributes table
- Increased interactivity
- Communications and outreach strategies

Stage 4: Viewer with Counterfactual Research

Overview

SWERI will continue to solicit input on use, additional data needs, and opportunities for increasing interactivity capabilities. SWERI will engage with stakeholders to advance an understanding of what

determines whether or not a fuel treatment is effective. This version will work to incorporate what is learned and inform behavior and management, advancing evaluation of fuel treatments on the ground. It will expand the inclusion of cross-boundary data, incorporating state data. SWERI will advance inclusion of counterfactual research and propose attributes that will support new research. This will require advancement of a new data architecture.

Intent

The intent is to advance TWIG so that it will inform programmatic management and research needs designed to advance a platform of resilient communities that live with, are prepared for, wildfire and post-wildfire.

Audiences

- Congressional representatives
- Federal agencies
- Researchers
- Localized decision makers
- Regional land managers
- State managers
- Community leaders

Questions

- Are values at risk more resilient?
- How would wildfire behave if there were no fuel treatments?
- Are communities more resilient to wildfire and post-wildfire?
- Where should fuel treatments be applied on the landscape?

Data Sources

- Tribal data
- Proposed advancement of data collected in federal programs

Deliverables

- Incorporation of effectiveness into treatment planning
- Recommended data attributes
- Initial results on effectiveness research
- Increased interactivity
- Assessment of program, application, next steps

Key Deliverables

- White Paper: What decision support tools currently exist? What questions do they address?
- White Paper: What data are available? Is there alignment across data sets?
- Query-able data viewer with open-source data (TWIG)

Compiling, Displaying, and Integrating Data

SWERI will compile existing data from established systems of records, primarily FACTS and NFPORS. The National Association of State Foresters is advancing an effort to collect data from 50 states and 9 territories. Once these data are available, they will be incorporated. SWERI will work to process and

QA/QC the data and ensure that like data are being compared and cross-referenced. The data sets will be narrowed to key information necessary for understanding the effects of fuel treatments on wildfire behavior. The particulars of this effort will be refined and presented in the action plan.

Metadata Guidance

Consistency in geospatial metadata publishing and management practices, in addition to strict adherence to data naming and storage conventions, leads to improved discovery and maintenance of geospatial assets. To support this goal, SWERI will establish standard file naming conventions, data categories, and other guidance for populating metadata for TWIG. The purpose of these standards is to establish procedures, requirements, and responsibilities to implement a data life cycle for all geospatial metadata used by SWERI and its partners. Metadata formats will be informed by the Federal Geographic Data Committee (FGDC) endorsed ISO 19115: Geographic information – Metadata standard. Once metadata is complete, all data must be placed in its corresponding category in its corresponding enterprise geodatabase and be accompanied by the complete metadata.

Pathways to Facilitation and Use

It is important to SWERI that the ReSHAPE program actively informs management strategies. SWERI have heard from all of its partners that it is important to promote and support the use of TWIG and the TWIG viewer. Furthermore, facilitating use and application of the best available science and technology is one of the key elements of the SWERI Act (PL 108-317) and something that sets SWERI apart as a partner. SWERI has a lot of relationships within the Four Corners Region and will launch initial outreach and application efforts in the region. SWERI can also build from relationships and partnerships that extend beyond the region. Working with The Nature Conservancy's Fire Learning Network will help broaden outreach. SWERI plans to present at conferences, work within existing networks, host webinars, and present to collaboratives. In addition, SWERI will develop video tutorials that will be available on a centralized website. SWERI will reach out to the identified key audiences, namely: 1) Congressional representatives, 2) Federal partners, and 3) Researchers.

Some key outreach actions will include:

- Annual visit to Washington, D.C.
- In-person meetings with representatives
- Annual update to federal partners, managers of systems of record and decision support tools
- Engagement with research work groups
- Presentations at key conferences
- Working with researchers at the USFS R&D and home universities

Application of Geodatabase to Studying Effects

SWERI has been actively engaged with partners exploring concepts of effectiveness and metrics for gauging effects of forest treatments on wildfire behavior. SWERI and its partners have a paper that is currently being reviewed for publication in the Journal of Forestry (Vorster et al., forthcoming). The paper draws from experience and research associated with the Cameron Peak Fire that burned in northern Colorado in 2020. The paper presents a framework of metrics to evaluate effects and considerations and recommendations for evaluating effects.

For the ReSHAPE program, SWERI has been careful to focus on the concept of effects rather than effectiveness. SWERI is approaching the concept of effectiveness with a recognition that it can be defined in a lot of ways depending on interests and values. Initially SWERI will approach the concept of effects by exploring situations where wildfire interacted with fuel treatments and exploring changes in wildfire behavior. This is in part a recognition that past work on the ground was completed without being designed to research effectiveness, therefore limiting the capability to assess effects, as well as the recognition that there is little to no capability to determine when or how a wildfire will engage with fuel treatments. Effectiveness presents a human based measure of impact relative to values while effects are objective measures of the influence of fuel treatments on wildfire parameters.

Not all fuel treatments will be burned during a fire, though increases in fire size increase the likelihood of interactions. SWERI intends to initiate discussions on success by compiling case studies in situations where wildfire did interact with fuel treatments. It will allow SWERI to explore:

- Did wildfire burn differently when it interacted with fuel treatments?
- Did fuel treatments influence burn severity?
- Did fuel treatments influence suppression activities?
- Were there community identified values in proximity of the fuels treatment?
- Did the fuel treatments influence the impact of the wildfire on values?
- Did the fuel treatments influence post-fire impact on values?

Effects of wildfire not only occur during the fire, but post-fire as well. Examples of important questions that will need to be answered during a fire include:

- Was wildfire hazard reduced?
- Does wildfire in extreme weather events behave differently?
- Do fuel treatments influence wildfire response or suppression?
- Did fuel treatments protect community identified values?
- Was the loss of homes and lives reduced?
- Did fuel treatment support evacuations?
- Did fuel treatment influence tree retention?
- Did fuel treatments influence severity of wildfire?
- Did fuel treatments alter the rate of spread of wildfire?
- What was the cost of suppression?

Post-fire, other questions that will become important include:

- Did fuel pre-treatments reduce post-fire impacts to water resources?
- Were families re-established within homes more quickly post-fire?
- Were debris flows and damage reduced?
- Did communities retain access to key resources?
- Were there differences in regeneration in areas that were treated?
- Did fuel treatments meet objectives?
- Were valued forest characteristics maintained?
- Were lives and infrastructure restored? How quickly?
- What was the cost of recovery?

- To what extent did wildfire impact soil conditions?

Pilot Assessment

SWERI aims to collaborate with partners to identify specific locations where wildfires have interacted with fuel treatments. This collaborative effort will involve the development of a targeted set of interview questions, which will be transformed into a survey format for the local community. Through this survey, SWERI intends to gather valuable insights regarding the impact of fire on the surrounding environment, the influence of fire on response efforts, and any associated changes in fire behavior, including severity, resulting from these interactions.

The collected data from these case studies will play a crucial role in refining the measures of effects caused by these interactions. SWERI will leverage this information to enhance TWIG and subsequently communicate these findings to the public. By incorporating the perspectives and experiences of the local community, SWERI aims to provide a more comprehensive understanding of the impacts of fire and fuel treatments on the ground. This collaborative approach will ensure that the public has access to accurate and relevant information regarding these interactions through the platform.

Communication and Outreach

SWERI is committed to maintaining open and transparent communication channels among team members and stakeholders throughout the program. To support this goal, SWERI will develop a detailed Communication and Outreach Plan in collaboration with the USDA Forest Service, DOI, and other program partners. An initial draft will be submitted as a deliverable for the Phase 1 scoping activities, along with a final version of this document. A current version of the draft Communication Plan is included in the deliverables under the name ReSHAPE Communication Plan Template 0423_wout Contacts. SWERI will continue to iteratively develop the Communications and Outreach Plan through Phase 2 of this program (see Task 2.4 above).

Community of Practice

SWERI acknowledges that there are a lot of partners working in this space, helping to understand treatment effectiveness and advance management practices to better support the resilience of values on the landscape. SWERI will engage with those partners, promote mutual recognition of the work that is being done, and support a community of practice that will help local, regional, and national efforts to better apply fuel treatments on the landscape.

There are numerous efforts to aggregate wildfire and fuel treatment data to address similar questions and concerns for different regions and scales of application. There is a need to learn from one another to share knowledge and other resources to advance management strategies. To address this need, SWERI will establish a community of practice that helps support ongoing learning around:

- Existing data
- Data gaps and needs
- Facilitation and application
- Understanding effects and effectiveness

VII. SUMMARY, NEXT STEPS, AND CONTACT INFORMATION

Summary

SWERI has heard from policymakers, land management agencies and the research community that there is a need to compile and display existing information on fuel treatment projects and wildfires at the national level, to coordinate and facilitate the use of these data for assessing planning and monitoring fuel treatment interactions with wildfires across boundaries and to analyze and report on fuel treatment effects.

As a result, SWERI was identified in the 2021 Infrastructure Investment and Jobs Act, commonly referred to as the Bipartisan Infrastructure Law (BIL), to undertake a national wildfire and treatment effects mapping and assessment project. The resulting effort being led by SWERI to accomplish the work outlined in the BIL is the ReSHAPE program which will consist of the creation of the Treatment & Wildfire Interagency Geodatabase (TWIG) and interactive web viewer, and in-depth research on fuel treatments effects on wildfire behavior.

Within the scope of ReSHAPE, SWERI will work with existing affected entities and partners, as well as forge new partnerships, to ensure that the ReSHAPE program both supports and enhances ongoing efforts to display information on fuel treatments and wildfires from the Department of Interior and the USDA Forest Service, as well as add capacity, where needed, to facilitate the use and application of cross-boundary fuel treatment data to reduce the risk of catastrophic wildfire in the United States.

Next Steps

At the delivery of this document, the next steps for the SWERI team supporting the ReSHAPE program are to confirm and enact the action plan, begin research and development on the alpha/beta versions of TWIG and the TWIG viewer, and continue outreach to solicit input from users of similar products and researchers in the field of fuel treatments and wildfire behavior.

Contact Information

For questions or concerns regarding this document, please contact the SWERI ReSHAPE Program Director, Aaron Kimple at aaron.kimple@nau.edu.

SWERI ReSHAPE Website: https://sweri.org/reshape-project/

QR Code:

VIII. APPENDIX

Table A 1. Stakeholder profiles

Stakeholder	Details	Delivery method	Required attributes	Additional data needed (not likely included in SWERI IIJA database)
Congressional staffer	No GIS experience, wants to know how many federal treatments have occurred in a Congressional district within a set time period	Dashboard viewer	Polygon, acres	
State-level land manager	Fluent GIS user, wants to analyze cross - projects in state of interest (Federal and State projects) in the last 10 years	Database	Polygon, acres, date, treatment type	State treatment data
Researcher (multiple questions)	GIS fluent user, analyzing fuel treatment effectiveness related to: [burn severity, HRV, Silvi Rx, wildfire interactions, Shared Stewardship, WUI, social vulnerability, etc.]	Database	Polygon, acres, date, treatment type, wildfire perimeters	MTBS burn severity data, forest structure, event lines, land ownership, WUI polygons, SVI
Researcher B	Fluent GIS user, analyzing fuel treatment effectiveness related to forest HRV	Database	Polygon, acres, date, treatment type, wildfire perimeters	Silvi prescriptions
Researcher C	Fluent GIS user, wants to assess how treatment prescriptions influenced wildfire interactions	Database	Polygon, acres, date, treatment type, wildfire perimeters	Treatment prescriptions, MTBS burn severity data
Researcher D	Fluent GIS user, wants to assess acres treated vs acres burned in wildfire	Database	Polygon, acres, date, treatment type, wildfire perimeters	Treatment prescriptions, MTBS burn severity data
Researcher E	Fluent GIS user, wants to assess the degree to which cross-boundary shared stewardship treatments occur in advantaged vs. disadvantaged communities	Database	Polygon, acres, date, treatment type	State treatment data, land ownership, social vulnerability index

County-Level WUI Planner A	No GIS experience, wants to look at historical treatments in 3 county area to use for CWPP planning	Dashboard viewer	Polygon, acres, date, treatment type	State treatment data
County-Level WUI Planner B	Fluent GIS user, wants to look at historical treatments in 3 county area to use for CWPP planning	Database	Polygon, acres, date, treatment type	State treatment data
County-Level WUI Planner C	Fluent GIS user, wants to conduct county-scale wildfire risk assessment	Database	Polygon, acres, date, treatment type	State treatment data, fire modeling
General Public	Wants to see if the federal government is doing anything about the wildfire problem	Dashboard viewer	Polygons, wildfires	N/A

Tables A 2-A 4 provide summaries of state-level data, other interagency tools and databases, and wildfire data that were identified during the review of related efforts (see Context of Work section above). More thorough documentation of all data sources considered for use in the project, as well as related web applications, is provided in a separate document titled Documentation of Existing Data and Applications. SWERI will continue to develop and update this document through subsequent phases of this program.

Table A 2. Authoritative state data sources

Agency	Geographic Area	Website / Feature Service	Primary Agency Contact	Primary Contact Info	Comment
Alaska Dept of Natural Resources	Alaska	https://services1.arcgis.com/7HDiw78fcUiM2BWn/arcgis/rest/services/Fuel_Treatments_Public_View/FeatureServer/0			
Colorado State Forest Service	Colorado	not available online, have one contact, need to find a central contact			
NM State Forestry Division	New Mexico	sometimes available through Shared Stewardship Portal but best to contact directly	Randall Fowler, GIS Coordinator	randall.fowler@emnrd.nm.gov	

Wisconsin Dept Natural Resources	Wisconsin	https://dnr.wisconsin.gov/topic/forestmanagement/data			
Florida Bureau of Land Resources	Florida		Ali Simpson, Land Resource Specialist	asimpson@sjrwmd.com	
NASF	All 59 US states and territories	N/A	Keith Smith	kjsmith@blm.gov	Collecting all state data + 9 territories as part of SWARM project

Table A 3. Existing authoritative wildfire data (national scale)

Data set	Agency	Website	Data Type(s)	Comments
NIFC Wildfire History Perimeters	National Interagency Fire Center (NIFC), The Wildland Fire Interagency Geospatial Services (WFIGS)	https://data-nifc.opendata.arcgis.com/pages/new_firehistory_services	Polygon / Public	All reported fires categorized as a valid Wildfire (WF), Prescribed Fire (RX), or Incident Complex (CX).
Interagency Fire Perimeter History (All Years)	NIFC / RD & A Authoritative	https://data-nifc.opendata.arcgis.com/	Polygon / Public	Includes prescribed burns. Includes Alaska Fire History - Bureau of Indian Affairs.
WFIGS - Wildland Fire Locations Full History	NIFC / WFIGS	https://data-nifc.opendata.arcgis.com/	Point / Public	All reported fires categorized as a valid Wildfire (WF), Prescribed Fire (RX), or Incident Complex (CX). Largest number of records.
WFIGS - 2022 Wildland Fire Perimeters to Date	NIFC / WFIGS	https://data-nifc.opendata.arcgis.com/	Polygon / Public	All reported fires categorized as a valid Wildfire (WF), Prescribed Fire (RX), or Incident Complex (CX).

WFIGS - Current Wildland Fire Perimeters	NIFC / WFIGS	https://data-nifc.opendata.arcgis.com/	Polygon / Public	All reported fires categorized as a valid Wildfire (WF), Prescribed Fire (RX), or Incident Complex (CX). Current and ongoing fires.
WFIGS -National Interagency Fire Center	NIFC / WFIGS	https://data-nifc.opendata.arcgis.com/pages/new_firehistory_services	Point / Public	
Other Relevant Websites and References				
Alaska Fire Service: https://afs.ak.blm.gov/				
CALFIRE: https://frap.fire.ca.gov/mapping/gis-data				
BIA - data prior to 2017 from WFDSS, 2017-2018 Agency Provided, 2019 and after WFIGS				
BLM: https://gis.blm.gov/arcgis/rest/services/fire/BLM_Natl_FirePerimeter/MapServer				
NPS: New data set provided from NPS Fire & Aviation GIS. cross checked against WFIGS for any missing perimeters in 2021.				
https://nifc.maps.arcgis.com/home/item.html?id=098ebc8e561143389ca3d42be3707caa				
FWS -https://services.arcgis.com/QVENGdaPbd4LUkLV/arcgis/rest/services/USFWS_Wildfire_History_gdb/FeatureServer				
USFS - https://apps.fs.usda.gov/arcx/rest/services/EDW/EDW_FireOccurrenceAndPerimeter_01/MapServer				

Table A 4. Interagency tools and databases

Tool / Database	Agency	Scale	Website	Sources	Primary Contact	Primary Contact Info	Comments
National							
IFTDSS /FTEM	DOI	National	https://iftdss.firenet.gov/landing_page/	FS and DOI	Henry Bastien, DOI		Info on data sources: https://iftdss.firenet.gov/firenetHelp/help/pageHelp/content/10-ftem/datatechnical/treatments.htm
Landfire Disturbance Layer	FS & DOI	National	LANDFIRE Program: Get Data	FS and DOI + assorted others	Henry Bastien, DOI		does not include many attributes/details about disturbances, info on data sources: https://landfire.gov/compiled_data_search.php

SWARM	NASF	National	N/A	NASF + National Data	Keith Smith, NASF		currently being built, complete date TBA
National Wildfire Coordinating Group (NWCG)	NWCG	National	https://www.nwcg.gov/publications/pms437/weather/data-resources	NFDRS stations in the United States			
USDA Fire Occurrence	USDA	National	https://www.fs.usda.gov/rds/archive/catalog/RDS-2013-0009.6	federal, state, and local fire organizations			
MTBs, RAVG, Burn Severity	(EROS) and the USDA (GTAC)	National	https://www.mtbs.gov/	national forests, parks and other federal and tribal lands			
Interagency Fire Occurrence Reporting Modules (InFORM)	National Association of State Foresters NASF	National	https://in-form-nifc.hub.arcgis.com/	DOI-IRWIN			
State / Regional							
Arizona WRAP	Arizona Forestry	Arizona	AZ WRAP | Department of Forestry and Fire Management				Public viewer doesn't contain treatment layers, not sure about professional viewer
CAL FIRE Fuels Reduction Projects	CAL FIRE	California	https://services1.arcgis.com/jUJYIo9tSA7EHvfZ/arcgis/rest/services/CM_FRAR_Recent/FeatureServer/2	State, possibly others			
Southern California Fuels Treatment Data	California Fire	Southern California	https://www.cafiresci.org/partners-tools-source/category/south	State, possibly others			

	Science Consortium		ern-california-fuels-treatments-data-set				
Roadmap to a Million Acres (RMA)	Spatial Informatics Group	California	https://sig-gis.com/roadmap-to-a-million-acres-rma-strategy/	Focus on private and public lands			Develop an inventory of completed and known planned fuel treatments across California
Colorado WRAP	CSFS	Colorado	https://co-pub.coloradoforestatlas.org/#/				Public viewer doesn't contain treatment layers, not sure about professional viewer
Colorado Interagency Fuel Treatment Database	CFRI	Colorado	In Development	FS, FWS, State, Tribes, Other			
Southwest Idaho Interagency Fuel Treatments	USFS	Southwest Idaho	https://www.arcgis.com/home/item.html?id=e494975c312749c49494a931c882b618	Federal and State			
NM Vegetation Treatment geodatabase	NMFWRI	New Mexico	vegetationtreatments.org	Federal, State, Tribal, Other			
NM Shared Stewardship Portal	NMSFD	New Mexico	https://nmssp.org/#/	Federal, State, Other			mostly planned projects
San Juan Headwaters Forest Heath Geodatabase	San Juan Headwaters	NM/CO	http://sanjuanheadwaters.org/resources/gis-database-maps/	Federal and State			Viewer using existing data
Nevada WRAP	Timmons	Nevada	NV Resource & Fire Portal - Public Viewer (nevadaresourcesandwildfireinfo.com)				Public viewer doesn't contain treatment layers, not sure about professional viewer

Oregon Interagency		Oregon	In development				Not sure of status, but want to create something similar to NM Veg
Texas WRAP	Timmons	Texas	https://wrap.texaswildfirerisk.com/Map/Public/#whats-your-risk				Public viewer doesn't contain treatment layers, not sure about professional viewer
Southern WRAP	Timmons	Southeast US (13 states)	https://southernwildfirerisk.com/Map/Public/#whats-your-risk				Public viewer doesn't contain treatment layers, not sure about professional viewer
Utah WRAP	Timmons?	Utah	https://utahwildfirerisk.utah.gov/Map/Public/#whats-your-risk	State, possibly others			
Washington State Forest Health Tracker	Washington DNR	Washington	https://foresthealthtracker.dnr.wa.gov/	FS, FWS, State, Tribes, Other			Map appears only as point data but if you view detail polygon appears. Not sure if there is a way to download polygon data
Region 6 FY21 Fuel Treatment Effectiveness Monitoring - Dashboard	USFS	Washington / Oregon	https://usfs.maps.arcgis.com/apps/dashboards/ffc4df6747d14e09a57f5d9b813f4cc6	Federal			Fuel Treatment Effectiveness Monitoring
Confronting the Wildfire Crisis (StoryMap)	USFS	10 specific areas of the western US	https://experience.arcgis.com/experience/0fe032e92fad464fbcdc7faf12cd7928/	FS and DOI			To build the necessary workforce capacity and coalition support for complementary cross-boundary treatments across landownerships

Table A 5. Summary of Phase 1 Scoping outreach activities

Projected Date	Event / Outreach (OSEC Lead)	Participants / Audience	Outcomes / Materials
October 11, 2022	SWERI SWOT Analysis	SWERI	SWERI Visioning Doc
October 21, 2022	SWERI Strategic Planning	SWERI	SWERI Visioning Doc
November 2022	Release of Briefing Paper		

November 2022	Update of Website		
November 14 – 18, 2022	Cohesive Strategy Meeting		Introductions and relationships
January 2023	Updated Website		
January 2023	Release of Updated Briefing Paper		
January 2023	Survey of NM Portal users		
January 25, 2023	Meeting with DOI in Boise, Wildland Fire, IFTDSS, FTEM, NASF	SWERI advisors, CFRI Director, NMFWRI GIS Tech	Notes and pre-planning before larger partner meeting
February 2023	Draft Iterative scope of work	Advisors, SWERI, elected officials	
March 2023	Updated Briefing Paper	Advisors, SWERI, elected officials, interested public	
February 24, 2023	Meet with representatives for Senator Bennet		
February 27-March 3, 2023	Meeting in Boise with data managers, program developers	SWERI	Key introductions and relationships, draft work plan
February 15, 2023	Tribal engagement		
March 16, 2023	Meet with representative for Senator Hickenlooper		
March 17, 2023	Meet with NASF and SWRM		Understand effort
March 19, 2023	Meet with WRRIT		Understand effort
March 27-31, 2023	Meet with representatives of elected officials Meet with USDA, DOI	Elected officials and Staff, USFS WO, Fire and Aviation, Research and Development	
March 27, 2023	Release of Contractor RFP		
April 10, 2023	Quarterly Report	Advisors	Regular update to funders and advisors
April 2023	Outreach to tribal organizers and BIA	NM Staff and Program Director	Understand interest and values
May 2-4, 2023	Poster Presentation		
May 2023	Discussion with NASF about effort to collect state data	Program Director and Keith Smith	Relate SWERI effort to NASF effort

May 2023	Discussion with project manager for the NM Shared Stewardship portal	Program Director, NM GIS Team, Manager of portal	Understand challenges and opportunities for managing a geospatial database
June 2023	Present pre-Beta prototype to staff on Senate Energy and Natural Resources Committee		Listen to feedback and direction
June 2023	Updated briefing paper		
June 2023	Release of communications and outreach plan		
June 2023	Release of scoping report		
July 10, 2023	Quarterly Report	Advisors	Regular update to funders and advisors
October 10, 2023	Quarterly Report	Advisors	Regular update to funders and advisors
October 2023	Present pre-Beta prototype and Communication Plan to federal partners that attended Boise workshop		Listen to feedback and direction
January 10, 2023	Quarterly Report	Advisors	Regular update to funders and advisors