

**Strategic Environmental Research and Development Program
(SERDP)**

FY 2020 STATEMENT OF NEED

Resource Conservation and Resiliency (RCR) Program Area

**DOD WILDLAND FIRE MANAGEMENT RESEARCH
FOR IMPROVED MILITARY LAND USE**

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to improve understanding of self-organization of convective structures and near-fire smoke plume development for the purpose of ultimately improving the management of fire for military land-use. Specific research objectives include the following:

- Improve understanding of physical fire processes at spatial and temporal scales relevant to plume dynamics, fire behavior, and spotting,
- Advance understanding of the impact of wild land fires on both ozone (O₃) and particulate matter (PM),
- Advance understanding of fuel dynamics and structure, especially fuel moisture dynamics and the importance of fuel heterogeneity as it relates to fire intensity, ember production, emissions, and crown fire.

Proposers must specifically state the rationale for their research approach, describe their understating of current practice, and explain how their approach will result in new insight into fire phenomena and result in research outcomes that move fire science and fire management forward. In addition, proposers must clearly articulate their objectives in terms of knowledge points or research objectives critical to the success and further progress of their proposed project. If a knowledge point is critical for overall project success, the proposer should establish a go/no go criterion and state an approach to risk mitigation should the research outcome at a critical knowledge point not meet the established go criterion.

Research efforts should coordinate with and leverage other, concurrent national efforts such as the Fire and Smoke Model Evaluation Experiment (FASMEE) research effort (Ottmar et al., 2017. Fire and Smoke Model Evaluation Experiment (FASMEE) study plan. Joint Fire Sciences Program Project 15-S-01-01, 148 pp.). Proposers also should demonstrate a knowledge of the SERDP Fire Science Strategy: Resource Conservation and Climate Change (September 2014), relevant current and past SERDP research efforts, and place their proposed research within the context of the SERDP strategy and current efforts. To the extent that modeling is proposed, a model validation scheme and approach to incorporation of the resultant model into current tools must be explicitly described.

All three research objectives need not be addressed in a proposal; however, preference will be given to robust interdisciplinary research teams proposing holistic research efforts that encompass the stated objectives.

2. Expected Benefits of Proposed Work

Efforts addressing the objectives of this SON will result in reductions in risk, improved control, and heightened confidence in the models and methods needed to manage and control the fire inherent in military land-use. The reduction of risk and improved control is the explicit expected long term benefit of this research; however, to realize the benefit, both fundamental and applied bodies of scientific knowledge related to fire phenomena must be matured. The immediate benefit of this proposed work is to develop and improve the understanding self-organization of convective structures, advanced understanding of the impact of wild land fires on both O₃ and PM, and near-fire smoke plume development in an effort to establish a physics based understanding of these fire dynamics and the poorly understood plume “cores” and the critical fire-atmospheric feedback.

3. Background

Fire is uniquely present on military training and testing lands as an element of military land-use since mission readiness requires the delivery of ordnance and pyrotechnics. As such, the management of fire to meet current and future military land-use, stewardship requirements, and future military capabilities is a SERDP research focus. In addition, fire can be one of the most effective ecological processes for restoring historically degraded lands to functioning ecosystems, but the ecological processes are complex and not well understood. This complexity is exemplified in the manner in which the presence of insects, disease, and drought affect forest health and the degree to which fire can be applied as a management tool to improve forest health in the face of these and other challenges.

Moreover, the use of fire for management purposes often is constrained by air quality and smoke safety (visibility) considerations while wildfires, which are unplanned, tend to occur at times, such as the summer, when human populations are most susceptible to smoke exposure due to other concurrent air quality issues. These fires tend to occur during the annual warm seasons, when human populations are often already subject to exposure to elevated ozone and particle concentrations. These fires tend to consume heavier fuels (i.e., woody fuels and not just fine fuels), organic soil horizons, and can smolder for extended periods. The incomplete combustion associated with smoldering may lead to much higher emissions of reduced compounds, including many air toxics. Wildfires also pose higher risks for human safety, assets, training, and unplanned suppression costs. Wildfires may also result in ozone and particulate matter air quality metrics that exceed healthy limits, yet the formation and dispersion of ozone and particulate matter associated with fires remains poorly understood.

Prescribed burning, on the other hand, is commonly performed with the aid of fire weather forecasting systems that can help to minimize direct human exposure to smoke, minimize the impact to transportation activities, and limit fire severity and smoldering combustion by constraining the temperature, humidity, wind, and fuel conditions under which burning occurs.

To support DoD's continued use of fire as a management tool, SERDP has funded efforts to address how best to characterize the emissions associated with fire and their dispersion in the atmosphere, as well as to understand how fire acts as a disturbance process that resets ecological communities.

Complementary SERDP-Funded Projects: In an effort to mature the science of fire management for DoD unique military land use, SERDP developed the Fire Science Strategy: Resource Conservation and Climate Change (September 2014) and supported projects relating to the science of fire management. The strategy and a brief description of completed and ongoing projects can be found at the [SERDP website](#).

4. Cost and Duration of Proposed Work

The cost and time to meet the requirements of this SON are at the discretion of the proposer. The proposals must describe a complete research effort. It is anticipated that the scope of this statement of need is such that a multi-disciplinary team will be required to execute a successful effort. While proposals for single investigator efforts are accepted, they are unlikely to be of sufficient scope to compete successfully. The proposer should incorporate the appropriate time, schedule, and cost requirements to accomplish the scope of work proposed. SERDP projects normally run up to four years in length. Project budgets vary but must remain consistent with the scope of the effort. Limited scope proposals, proposals encouraged in previous statements of need for funding up to \$200,000 and approximately one year in duration, will not be accepted under this statement of need.

5. Point of Contact

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For Core proposal submission due dates, instructions, and additional solicitation information, visit the [SERDP website](#).