

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

FY 2015 STATEMENT OF NEED

Resource Conservation and Climate Change (RC) Program Area

**NEW PARADIGMS FOR MANAGING SPECIES AND ECOSYSTEMS IN
A NON-STATIONARY WORLD**

1. Objective of Proposed Work

The objectives of this Statement of Need (SON) are to: (1) define those plausible environmental and other conditions that Department of Defense (DoD) resources managers may confront 25 or more years from now in a non-stationary world and (2) identify, develop, and assess emerging theoretical and applied understanding that can be used to address management challenges associated with those potential futures within relevant, testable, and adaptable conceptual frameworks. Proposals responding to this SON must address both of these objectives.

Proposals are sought that are forward looking and innovative, while still adhering to extant or emergent scientific understanding and principles. Research needs include developing or improving our understanding of:

1. Conceptual frameworks and models for species and ecosystem-based management that explicitly accommodate multiple plausible futures, uncertainty characterization, management feedback loops, and dynamic management boundaries.
2. Ecosystem properties that may (a) provide useful management end points and (b) track ecosystem response to non-stationary conditions and also provide appropriate benchmarks for determining ecosystem status and the efficacy of future management actions. Ecosystem properties include different types of diversity and rarity metrics, species interactions, disturbance regimes, and ecosystem structure, function, and resilience.
3. “Rules” of ecological community assembly, disassembly, and reassembly, including how these may change in a non-stationary world, that would enable managers to plan for and manage novel or no-analogue ecosystems to retain desired ecosystem properties and services.
4. Regime shift theory and its capability to provide methods and tools for advancing prognostic detection of rapid ecosystem change under non-stationary conditions to enable either management intervention or to prepare for change.
5. Characteristics of species that are either (a) conservation (management) reliant or (b) adaptable to potential changes in climate and human activities. For conservation reliant species improved understanding includes the post-recovery of currently listed species and of at-risk species not yet listed but still reliant on management interventions and how their reliance on continued management may change under non-stationary conditions.

Proposals submitted in response to this SON may address one or more of the research needs listed above. Ecosystems of interest include terrestrial, freshwater aquatic, and near-shore marine ecosystems for which DoD has management responsibilities. Decision support systems and tools should not be the main focus of proposals, but may be included if they are presented as a mechanism for testing theoretical advances that may have future applications for management. Moreover, any development of climate change projections needed to support proposed research should rely as much as possible on already available information or use of plausible future scenarios.

2. Expected Benefits of Proposed Work

The desired outcome is knowledge that improves our understanding, in the context of a non-stationary world, of: (1) plausible futures and how they may be applied to provide the context for the future management of species and ecosystems and (2) extant and emergent theory that can inform DoD's management of ecosystems in general, novel and no-analogue ecosystems, and conservation reliant species.

3. Background

The DoD manages a diversity of ecosystems and numerous listed and at-risk species. Effective and sustainable management of these resources supports both military readiness and stewardship needs. DoD must manage within the context of:

- (1) future climate change, and associated phenomena such as sea level rise;
- (2) continued alteration of natural disturbance regimes such as fire;
- (3) presence of non-native invasive species; and
- (4) continued loss and fragmentation of habitat.

Social, regulatory, and management frameworks that focus strictly on individual listed species or environments that assume static ranges of variability (i.e., assumptions of stationarity) potentially represent soon to be outdated contexts for conservation on military and other lands that are themselves subject at times to dynamic land use. If the rapid and profound future ecological changes anticipated by climate scientists and ecologists manifest, the current species-specific and narrowly defined approaches to maintenance of required habitat are likely to require ever-increasing resource inputs (financial and otherwise) to manage the response of species and ecosystems subject to new climate regimes, disturbance regimes, and often continued loss and degradation of habitat. Although these changes have potential consequences for currently listed species, more importantly they portend significant uncertainties for how ecosystems in general and their full complement of species and services may be affected. Understanding how different ecosystems and individual species may respond—what makes some resilient and others not—may provide important insights for conservation and management. Such insights are important for sustaining DoD military readiness and stewardship responsibilities.

New conceptual paradigms or frameworks for managing and conserving ecosystems, and at times focal species of interest, are needed to confront the reality of a non-stationary and at times no-analogue future and the potentially inherent conflicts with maintaining listed and at-risk species habitat that may or may not be possible with current management paradigms under future climate change scenarios, disturbance regimes, and land use. At ecological community and

landscape scales, new social, regulatory, and management frameworks—informed by advances in community ecology and regime shift theory and an understanding of ecosystem properties useful and meaningful for assessing and guiding management—must account for these new potential and plausible futures. This SON seeks to advance the theoretical and applied basis for informing these new paradigms of managing species and ecosystems in a non-stationary world through innovative and forward-looking research.

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. Two options are available:

Standard Proposals: These proposals describe a complete research effort. The proposer should incorporate the appropriate time, schedule, and cost requirements to accomplish the scope of work proposed. SERDP projects normally run from two to five years in length and vary considerably in cost consistent with the scope of the effort. It is expected that most proposals will fall into this category.

Limited Scope Proposals: Proposers with innovative approaches to the SON that entail high technical risk or have minimal supporting data may submit a Limited Scope Proposal for funding up to \$150,000 and approximately one year in duration. Such proposals may be eligible for follow-on funding if they result in a successful initial project. The objective of these proposals should be to acquire the data necessary to demonstrate proof-of-concept or reduction of risk that will lead to development of a future Standard Proposal. Proposers should submit Limited Scope Proposals in accordance with the SERDP Core Solicitation instructions and deadlines.

5. Point of Contact

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For Core proposal submission due dates, instructions, and additional solicitation information, visit the SERDP website at www.serdp-estcp.org/Funding-Opportunities/SERDP-Solicitations.