

**Work Plan
For
Challenge Cost-Share Agreement
Between
USDA Forest Service, Southwestern Region
And
The Nature Conservancy, Arizona and New Mexico Chapters**

This work plan covers tasks to be completed in three strategic focal areas identified by the U.S. Forest Service Region 3 as necessary to meet regional priorities, including preparation of Forest Plan revisions. Five of Region 3's 11 forests are scheduled to begin Forest Plan revisions in fiscal year 2006; five are scheduled to initiate plan revisions in fiscal year 2007; one Forest (Coronado) has already initiated its plan revision.

Region 3's Strategic Action Plan identifies the 'restoration of functionality of fire-adapted systems' as a priority goal. Forest Plan revisions provide an opportunity for Forests to propose strategies for accomplishing this goal. Region 3 has identified 6 essential components needed to formulate ecological-based management objectives and meet the requirements of Forest Plan Regulations. This work plan addresses three priority tasks, including:

- (1) **Assessment of Assessments**, a review of information developed since the last round of Land and Resource Management Plans that will enable the Forest Service to satisfy information standards established under new planning rules and to ensure that the best available scientific information is integrated into the development of Forest Plans.
- (2) **Determining the Historical/Natural Range of Variation** for major vegetation types and the biological diversity they harbor. HRV characterizations provide a baseline for evaluating the short- and long-term effects of natural and anthropogenic disturbances on forest resources. The historical range of variation in disturbance regimes, and climatic effects on those regimes, is the foundation for developing models of vegetative change.
- (3) **Developing Models of Vegetative Change** for major Southwestern vegetation types. Development of ecological models for vegetation types will enable the Forest Service to evaluate management activities and better incorporate the role of ecological processes in forest management.

The Nature Conservancy will establish a team of ecologists from the Arizona and New Mexico Chapters to work with the Forest Service over an 18-month period to complete tasks identified under the three strategic areas. The following pages contain detailed statements of work to be completed. A basic summary of need, the approach that would be used to carry out the work and an itemized list of deliverables is included in each. A table charting the timeframe for deliverables and a budget for the 18-month project

period are also provided. Finally, we have provided a statement of qualifications that summarizes the experience of Conservancy staff relative to the proposed work.

I. ASSESSMENT OF ASSESSMENTS

Background:

Forest Plan revisions will be guided by forest planning rules and strategic goals established at national, regional and Forest levels. The extent to which strategic goals may be accomplished in a timely manner will, in part, be a function of the information base available on the status and ecological condition of forest lands and the relationship between forest conditions and the status of biological diversity. Region 3 is planning to convene a workshop for forest planners, biologists and researchers to identify and evaluate the relevance of available ecological and conservation assessments. An expected outcome of the workshop is a better understanding of and commitment to use ecological assessments in Forest Plan revisions. An additional, likely outcome will be a set of standards, criteria or common understanding about the types of assessment information that would be most useful, both for evaluating new assessment information that comes to light as well identifying new assessment information that will be important to collect in the future. Standards will facilitate an efficient literature and data review, which will be an ongoing process important to parts II and III of this proposal. Standards will also enable us to evaluate the utility of USFS legacy data sets, or those data still in paper form that have not been integrated into electronic, corporate data sets but may contain information that meets standards for needed assessment information.

Approach:

The Nature Conservancy began developing ecoregional conservation assessments in 1996. Ecoregional assessments synthesize multiple types of scientific data to identify the most important areas to maintain biological diversity and the ecological processes that perpetuate ecosystem dynamics and sustain habitat across the landscape. They include contemporary analyses of traditional and new data sources. Collectively, they represent the most comprehensive analyses of biological diversity available.

The Conservancy will participate in the Forest Service-sponsored workshop presenting results from ecoregional assessments, including information on the distribution of important conservation areas and the conservation targets found within identified areas; results of the grassland assessment conducted in Arizona and now being implemented in New Mexico, with particular emphasis on results relating to the role of fire in maintaining this major biome of the Southwest; results from fire regime condition assessments conducted for the region and for particular landscapes; and results of an aquatic assessment prepared for Arizona, focusing on native fishes. Presentation will include a review of the criteria used to select conservation targets and the systems supporting targets, and how this approach may be relevant to forest plan revisions. Sufficient background on how the assessments were developed will be provided to enable workshop participants to evaluate the utility of the data.

The workshop will present the first opportunity to review assessment information developed by TNC and others. Parts II and III of this work plan will involve ongoing

evaluation and integration of assessment information into the Forest Plan revision process. Moreover, assessment information will be critical to informing the subsequent components of work outlined in this proposal (parts II & III). Therefore, we will continually review, evaluate, and integrate, where warranted, new or existing assessment information into the deliverables outlined in this proposal. Additional assessment information will be sought from primary and secondary literature sources, and government, academic, and private institutional sources.

Deliverables:

- 1) Presentation and interpretation of Conservancy scientific assessments at the Forest Service-sponsored assessment of assessments workshop.
- 2) Standards and criteria, developed collaboratively with Regional staff, for identifying and evaluating existing data that will be useful for Forest Plan revisions.
- 3) Reports or annotated bibliographies that identify and describe the scientific information sources that promise to be most useful in the ecological assessment phase of the Forest Plan revision process.
- 4) Provide TNC ecological assessment data in the forms that would be most useful to the Forest Service -- databases, narrative reports, spatial data, or other.

II. Determining Historical/Natural Range of Variation

Background:

'Ecosystem diversity' and 'ecological sustainability' have been identified by USFS as key concepts guiding the development of Forest Plan revisions. Ecosystem diversity across a landscape is a function of potential natural vegetation types, disturbance regimes, succession, and competition for resources under shifting climatic patterns that influence ecosystems across spatial and temporal dimensions. Understanding the result of this type of change, relative to the distribution and abundance of major vegetation types, habitat, and, ultimately, populations of forest-dependent organisms, is at the heart of understanding the historical or natural range of variation (HRV). Return intervals for fire, pest and disease outbreaks, the composition and structure of vegetation, and the response of forest-dependent organisms are all important components in describing the variation of ecosystems.

The overlay of anthropogenic activities within forests represents another type of disturbance that shifts the trajectories and relative proportions of ecosystem types, which, in turn, changes the abundance and distribution of forest resources, such as sensitive species. Managing the proportions of ecosystem types and their trajectories such that forest resources remain viable is the basis for "ecological sustainability." Characterizing the various facets of HRV for ecosystem types found on Forest lands will require synthesizing information on the spatial and temporal variation in disturbance regimes, which will provide model input for ecological modeling described in part III of this proposal. This synthesis should also provide an important baseline from which to (1) identify desired future conditions; (2) assess the benefits and limitations of forest management practices (further articulated in part III of this proposal); (3) make predictions about the responses of forest organisms to management practices that can be tested in an adaptive management and monitoring system; and (4) determine information gaps that limit our understanding of key ecosystem components and their function.

Approach:

In conjunction with Regional and Forest-level staff TNC will identify the most appropriate sub-regional scale or unit of analysis on which to characterize HRV and to perform ecological modeling specified in part III. Available data sources to determine the base unit of analysis (vegetation component) include, Gap Vegetation, Terrestrial Ecosystem Surveys, General Ecosystem Surveys, Land Type Associations, Forest Inventory Analysis, and Potential Natural Vegetation. These data sources will be evaluated for completeness across Forests and scale of resolution. We estimate that, at the coarsest level, HRV would be characterized for 15 or more potential natural vegetation types (see Appendix 1 for preliminary list).

HRVs, ultimately, will be compiled from primary and secondary literature sources, supplemented with input by regional experts. The final determination of the appropriate sub-regional unit of analysis will likely be based on matching reasonably complete

vegetation/system data sets with an adequate literature base on disturbance regimes, successional pathways, and climatic patterns from which to derive meaningful HRV characterizations.

Data permitting HRV characterizations will focus on attributes such as vegetation composition and structure over large and small scales, patch size, patch dynamics, frequency and types of disturbance regimes (frequency, intensity, spatial extent, seasonality, etc.) and how climatic variability affects interactions among variables.

Data on select wildlife species will be synthesized to determine known and likely population responses to major natural or anthropogenic disturbance regimes operating across the landscape at different spatial and temporal scales. These analyses will provide a basis from which to evaluate effects to target species from various forest management strategies, and to establish testable hypotheses that could be evaluated under an adaptive management and monitoring system. Analysis at this level will enhance the Forest's overall ability to propose management strategies that will meet the "ecological sustainability" standard set forth in Forest Plan regulations. Target species will be selected based on discussions with Regional and Forest-level staff.

Deliverables:

- 1) Base vegetation data set – utilizing one or more of the base data sets identified above – covering all Region 3 Forests attributed with available data on HRV.
- 2) Spatial data set depicting locations with empirical information on disturbance regimes and accompanying photo documentation of conditions where available.
- 3) Narrative and tabular syntheses of HRV attributes for each ecosystem unit suitable for use or inclusion in planning and environmental analysis documents.
- 4) Annotated bibliography for all primary, secondary and expert resources consulted in the development of HRV characterizations.
- 5) Narrative synthesis of literature and data on how managing for historical range of variability will affect populations of select wildlife species.
- 6) Training sessions for Forest staff in HRV results.

III. Developing Models of Vegetative Change

Background:

Ecological models provide an important basis from which to conduct adaptive management and monitoring programs. They provide researchers with predictive capability and managers with a tool to evaluate management activities. State-and-transition models are particularly useful for understanding change across ecosystems. By characterizing the direction and types of changes in vegetation states as a result of disturbance and succession, state-and-transition models enable users to better understand forest dynamics. Predicting directional changes in vegetation states enables managers to predict changes in forest habitat, which then can be used to predict and evaluate changes in the populations of forest organisms. Quantitative state-and-transition models also make it possible to conduct landscape scenario analyses that planners can use to compare predicted outcomes of alternative management regimes. Inherent to the restoration of fire adapted systems is the notion of change, so model development will play a central role in enabling the Forest Service to understand change and evaluate desired future conditions.

Approach:

TNC will use the Vegetation Dynamic Development Tool (VDDT) to complete state-and-transition models for major vegetation types. We will collaboratively identify the appropriate ecosystem classification unit and scale of models, and therefore number to be completed, based on an assessment of the scale of current vegetation data with data on disturbance regimes and vegetation effects. Available data sources to evaluate include, Gap Vegetation, Terrestrial Ecosystem Surveys, General Ecosystem Surveys, Land Type Associations, Forest Inventory Analysis, and Potential Natural Vegetation. We estimate that, at the coarsest level, HRV would be characterized for 15 or more potential natural vegetation types (see Appendix 1 for preliminary list). Models will be developed through a combination of data from primary and secondary literature sources supplemented by input from regional experts. Models will be subjected to review by peers in jointly selected private institutions, agencies, and universities.

TNC will work with Forest staff to identify potential management scenarios and treatments to facilitate scenario analyses at the Forest level. To facilitate widespread and consistent use of VDDT models within Region 3 TNC will hold training sessions for Forest staff in conjunction with training associated with HRV identified in section II of this proposal.

Deliverables:

- 1) A select set of VDDT models for major vegetation/ecosystem units identified jointly by TNC and the Forest Service and model output describing forest states. Models will provide basis for determining natural vegetation, historical range of variability,

Desired Future Conditions and subsequent scenario analysis using different management treatments.

- 2) Supporting documentation for key attributes and assumptions built into models.
- 3) Training sessions for Forest staff on development and use of VDDT models for landscape management scenario analysis.

Appendix 1. Preliminary list of Potential Natural Vegetation Types for which HRV and VDDT would be based

- 1) Madrean pine-oak woodland
- 2) Madrean encinal woodland
- 3) Ponderosa pine (up to 4 types)
- 4) Chaparral (up to 2 types; interior and Madrean)
- 5) Mixed conifer (up to 2 types; Madrean and Rocky Mountain)
- 6) Gallery coniferous riparian forests
- 7) Mixed broadleaf deciduous riparian forest
- 8) Cottonwood-willow riparian forest
- 9) Spruce-fir forest
- 10) Aspen
- 11) Montane willow riparian forest
- 12) Pinyon-Juniper woodland (up to 2 types)
- 13) Grassland/savannah (up to 3 types; semi-desert, Montane, Great Basin)
- 14) Sub-alpine grassland
- 15) Sagebrush

Deliverables and Timeframe						
Deliverable	1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter	5 th Quarter	6 th Quarter
I. Assessment of Assessments						
Participate in Forest Service-sponsored workshop and provide presentations on ecoregional and related assessment data						
Develop standards and criteria for identifying and evaluating existing data that will be useful for forest plan revisions						
Compile report/annotated bibliography describing relevant ecological assessment info						
Provide TNC ecological assessment data and analyses in appropriate formats.						
II. Historical Range of Variation						
Develop base vegetation data set covering all Region 3 Forests attributed with available data on HRV						
Develop spatial data set depicting locations with empirical information on disturbance regimes and accompanying photo documentation of conditions where available						
Develop narrative and tabular syntheses of HRV attributes for each ecosystem unit suitable for use or inclusion in planning and environmental analysis documents						

Deliverables and Timeframe						
Deliverable	1 st Quarter	2 nd Quarter	3rd Quarter	4th Quarter	5th Quarter	6th Quarter
Develop annotated bibliography for all primary, secondary and expert resources consulted in the development of HRV characterizations.						
Develop narrative synthesis of literature and data on how managing for historical range of variability will affect populations of select wildlife species						
Conduct training sessions for Forest staff in HRV results						
III. Ecological Models						
Develop VDDT models for major vegetation/ecosystem units						
Develop supporting documentation for key attributes and assumptions built into VDDT models						
Conduct training sessions for Forest staff on development and use of VDDT models.						

