MADREAN ARCHIPELAGO
RAPID ECOREGIONAL ASSESSMENT

FINAL PRE-ASSESSMENT WORK PLAN

REA Pre-Assessment Work Plan for:
Department of the Interior
Bureau of Land Management
Rapid Ecoregional Assessments

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This final pre-assessment work plan is provided to BLM as a Phase I, Task 1 deliverable.

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1 Rapid Ecoregional Assessments: Purpose and Overview

Working with agency partners, in 2010 the Bureau of Land Management began conducting rapid ecoregional assessments[1] (REAs) covering approximately 450 million acres of public and non-public lands of the American West. The goal of the REAs is to characterize ecological resource status, their potential to change from a landscape perspective, and potential priority areas for conservation, restoration, and development. REAs are intended to serve BLM's developing "Ecoregional Direction" that links REAs and the BLM's Resource Management Plans and other on-the-ground decision-making processes. Ecoregional Direction establishes a regional roadmap for reviewing and potentially updating Resource Management Plans, developing multi-year work for identified priority conservation, restoration and development areas, establishing Best Management Practices for authorized use, designing regional adaptation and mitigation strategies, and developing conservation land acquisitions. While REAs produce information designed to be used in specific management processes, they are not decision documents and stop short of integrating the findings into management actions.

REAs are designed around ***management questions (MQs)*** that specify the key information needs of managers as expressed by the Assessment Management Team (AMT). REAs describe and map ***conservation elements (CEs)***, which are generally ecosystems, species, or other natural features of high ecological value or sensitivity. REAs look across all lands in an ecoregion to identify regionally important habitats for fish, wildlife, species of concern, and other features of management interest. REAs then evaluate the potential impacts on CEs from four overarching categories of environmental ***change agents (CAs):*** climate change, wildfires, invasive species, and development (such as land use, energy development, infrastructure, or hydrologic alterations).

REAs address all lands within the ecoregion of interest, regardless of ownership. Therefore, BLM engages with partners and stakeholders within the ecoregion to obtain input and to provide a set of products that can be used by any interested agency or organization. REAs are conducted by contractors, with guidance and input from BLM and partners within the ecoregion; BLM provides oversight for the project. The Assessment Management Team (AMT) and the Technical Team, which are composed of decision makers and technical experts from state and federal agencies, provide guidance, direction, and input throughout the REA process.

The REA process is organized as a series of tasks in two major phases: Phase I, the Pre-Assessment, and Phase II, the Assessment. Table 1-1 provides a simple summary of the two phases and the major tasks comprising an REA; an outline of the specific components of each task is included in the **Budget** section later in this work plan. The REA for the Madrean Archipelago ecoregion is scheduled to be completed within a two-year period; more information on schedule and timing is provided in the **Schedule** section of the work plan.

[1] Also see BLM's REA website at www.blm.gov/wo/st/en/prog/more/Landscape_Approach/reas.html.

Table 1-1. Simple overview of Phases and Tasks in the REA process.

Phase	Task #	Task
Phase I	Task 1	Initiate REA Project
	Task 2	Implement Pre-Assessment Work Plan
Phase II	Task 1	Create Assessment Work Plan
	Task 2	Inventory, Acquire, and Evaluate Data Develop Process Models
	Task 3	Develop Geoprocessing Models Conduct Analyses Generate Findings Assemble Data Packages
	Task 4	Final REA Report

The work plan assumes the reader has some familiarity with BLM's REAs; for additional information, the reader is referenced to BLM's website (http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach/reas.html), as well as the Statement of Work (SOW) for this REA.

2 Purpose and Objectives of the Pre-Assessment Work Plan

As noted above, the pre-assessment phase is the first of two phases for an REA. The overall goal of the pre-assessment phase is to lay the foundation for the assessment phase. Specific goals of the pre-assessment include the following:

- Assemble and engage the REA team, including the Assessment Management Team (AMT) and Technical Team, in the REA process
- Make initial decisions such as finalizing the assessment boundary
- Communicate with and solicit input from partners and stakeholders on the REA process
- Characterize the ecoregion
- Develop and finalize the approach for selecting and finalizing CEs, CAs, and MQs
- Select and finalize the CEs, CAs, and MQs
- Develop conceptual models for the CEs
- Summarize the above in a Pre-Assessment Report

The Pre-Assessment Work Plan summarizes the initial decisions about the Madrean Archipelago REA and direction for conducting the remaining tasks and subtasks of the pre-assessment phase (Phase I) of the REA. Note that the first AMT workshop was held in early December of 2012 in order to make initial decisions relating to the pre-assessment phase; a summary of that workshop is provided to BLM and the AMT in a separate document, and key decisions (e.g., ecoregional assessment area) or recommendations from that workshop are referenced or reflected within this work plan as appropriate. Specific objectives of this work plan include the following:

- Provide the AMT Charter that describes the membership, responsibilities, authorities, and expectations of the AMT.

- Provide the Technical Team Charter that describes the membership, responsibilities, authorities, and expectations of the Technical Team.
- Provide the Communication Work Plan that provides direction for communications and partner and stakeholder engagement around this REA, and specifies the contracting team's role in these efforts.
- Describe the approach for conducting the Development Forums.
- Describe the process for selecting and finalizing CEs, CAs, and MQs.
- Describe the process for developing conceptual models for both individual CEs and overall ecoregional integrity.

The components listed above have all been updated within this work plan per discussions at the first AMT workshop and subsequent reviewer comments.

3 Project Administration

The Madrean Archipelago REA will be conducted by the contractor team led by NatureServe under the guidance and direction of BLM, the Assessment Management Team (AMT), and the Technical Team, as described below.

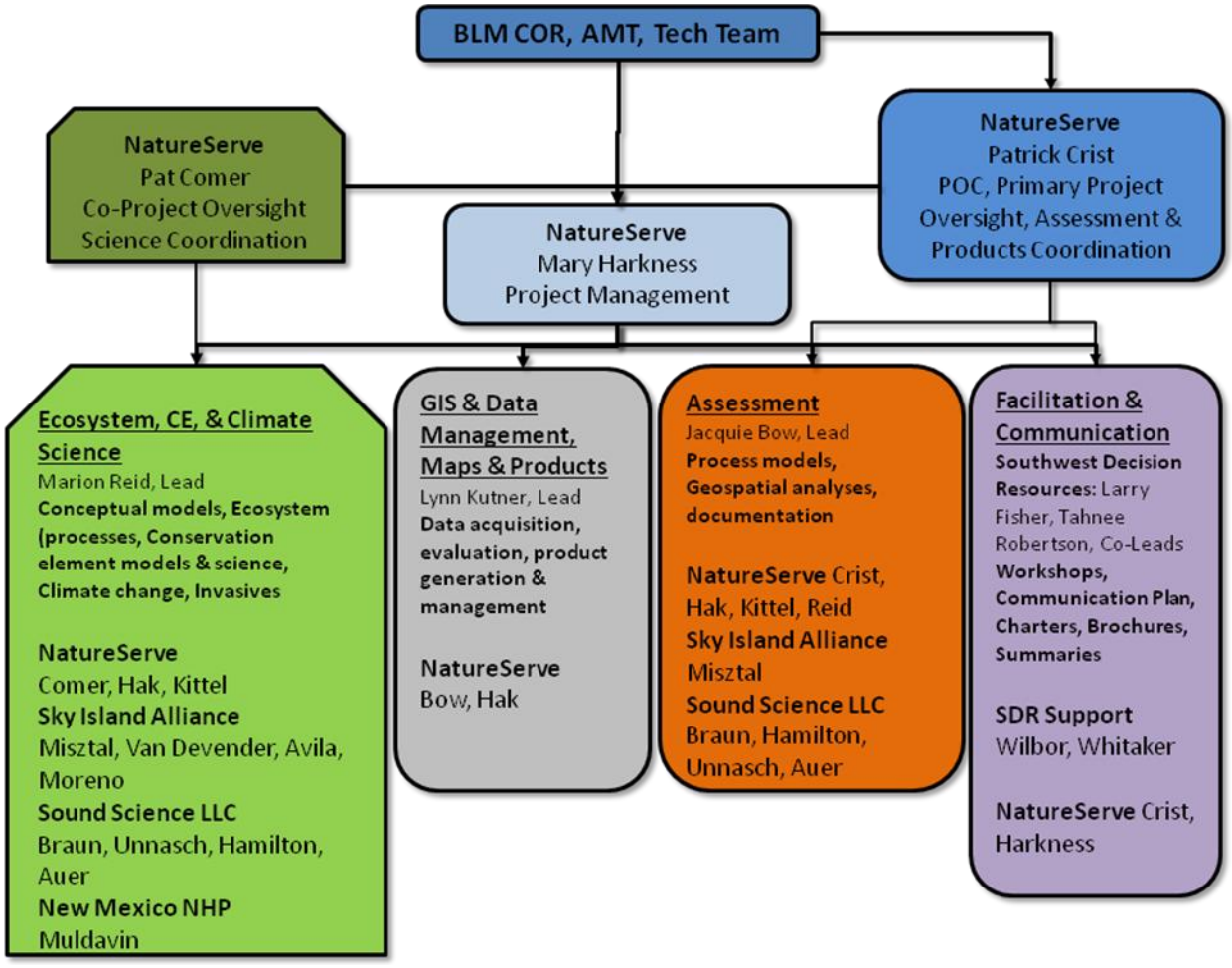
3.1 Contractor Team

NatureServe and its partners, Sky Island Alliance (SIA), Southwest Decision Resources (SDR), Sound Science, and Natural Heritage New Mexico (NHNM), were selected as the contracting team to conduct the Madrean Archipelago REA. The NatureServe REA team is comprised of a core team of experienced REA practitioners and experienced scientists from organizations within the ecoregion. Southwest Decision Resources has strong relationships with partners and stakeholders throughout this ecoregion and provides facilitation and external communication. Sky Island Alliance contributes expertise in landscape species, invasives, and the ecoregion as a whole and is a critical link to in-ecoregion science expertise and data throughout the entire Madrean Archipelago ecoregion. Sound Science team members Dr. David Braun, Dr. Healy Hamilton, and Dr. Bob Unnasch provide expertise in hydrology, climate change assessment and modeling, and fire ecology, respectively. Dr. Braun also has extensive on-the-ground experience with hydrologic systems in this ecoregion. Natural Heritage New Mexico conducts research on the conservation and sustainable management of New Mexico's biodiversity, including inventory and monitoring of the state's biodiversity. NHNM provides in-ecoregion expertise and data on the ecology and species of the ecoregion.

NatureServe will manage the REA delivery and coordinate all team partners. Figure 3-1 illustrates the contractor team organization. The contractor team is organized into four broad thematic subteams – ecology/science, data management, assessment, and facilitation. Oversight of the entire REA is provided by Dr. Patrick Crist, Director of Conservation Planning and Ecosystem Management; overall science leadership is provided by Pat Comer, Chief Ecologist, while routine leadership of ecological work by the ecology/science team is led by Marion Reid, all located at NatureServe's Western Regional Office. Routine project management is conducted by Mary Harkness, Conservation Planner/Project Manager for NatureServe. Jacquie Bow manages geospatial analyses and Lynn Kutner manages database operations, metadata adherence, and QA/QC and product delivery to BLM. Other NatureServe staff members play key roles in geospatial modeling and analyses, decision support, database management,

and map production. Facilitation is co-led by Tahnee Robertson and Larry Fisher of Southwest Decision Resources.

Figure 3-1. Organization of the NatureServe contracting team in relation to BLM, the AMT, and the Technical Team.



3.2 Project Management

The PI and Science Lead provide oversight and work closely with the project manager (Harkness) and thematic team leads (Reid, Bow, Robertson/Fisher, Kutner) to maintain daily project management and team coordination. In addition to the pre-assessment and assessment work plans that are part of the scope of work, the project manager is coordinating with the thematic team leads to maintain a detailed project work plan in Microsoft (MS) Project to track progress and anticipate problems among dependent activities and scheduled deliveries. All contractor team tasks are tracked within this file, as well as major BLM, AMT, and Technical Team tasks relating to reviewing various versions of deliverables. The project file also includes dates for AMT workshops, stakeholder update webinars, and similar events. The project file by design allows the project manager to specify which tasks or events (e.g., AMT workshops) are dependent on the completion of previous tasks and the amount of time planned (or specified by the SOW) to complete each task. This file is used on a day-to-day basis to monitor progress on specific tasks and to immediately identify any issues arising around timing of task completion or scheduling of events.

(Where such issues arise, they will be immediately communicated with BLM's COR to identify appropriate solutions.) It serves as the primary resource for timing, sequencing, and scheduling of tasks and events for this REA. The MS Project file will also be utilized to provide monthly status reports to BLM.

NatureServe has an established Microsoft SharePoint site for contractor team collaboration functions, such as shared workspaces, and for collaborating on documents and document and process management. The Pre-Assessment Report, Final Report, and other deliverables will be collaboratively developed using the SharePoint platform and coordinated by the project manager. Presentations for AMT workshops, update webinars, and other REA presentations will be developed in the same manner. Final deliverables (documents, presentations, data packages) will be posted on NatureServe's transfer site. The contractor team will also utilize the BLM REA portal or SharePoint site for coordination of product reviews with the AMT.

Contract oversight is provided by NatureServe's VP of Conservation Services and its Grants and Contracts department to ensure compliance with the terms and conditions of the REA contract.

3.3 Project Guidance and Collaboration

As a large landscape, cross-jurisdictional assessment, the REA process for the Madrean Archipelago will be guided and implemented by inter-agency teams led by the BLM and following collaboration guidance outlined in team charters and a communication and collaboration work plan.

3.3.1 Assessment Management Team

The Assessment Management Team (AMT) provides overall guidance and direction for the development of the REA, ensures that procedures and products are consistent with project objectives, ensures a collaborative, inter-agency approach, and provides policy and workload guidance to the Technical Team. The AMT is comprised of federal, tribal, state and local land management agencies. For more information, refer to the Team Charter provided in Appendix B, which provides specific guidance to the AMT.

3.3.2 Technical Team

The Technical Team provides technical and ecological guidance, direction, review, and recommendations for the development of the REA. The Technical Team is tasked with providing specific information and technical knowledge about the ecoregion to the Assessment Management Team in order to assist with developing management questions, evaluating conceptual models, reviewing process models, and interpreting results of the assessment. The Technical Team is comprised of technical experts from participating federal, tribal, state and local land management agencies. For more information, refer to the Team Charter provided in Appendix B, which provides specific guidance to the Technical Team.

3.3.3 Communication and Collaboration

The Communication Work Plan outlines strategies and mechanisms for proactive interagency communication, collaboration, cooperation, and resource sharing between the BLM and partner agencies/entities. Most partner communication and collaboration will be fostered through the team workshops and meetings, webinars, brochures, and key documents. For more information, please see the Communication Work Plan, provided as a separate document.

Project Sideboards

The geographic and thematic scope of REAs provide an excellent opportunity to conduct a wide range of assessments that may be useful to natural resource managers throughout the ecoregion in question. It is important to keep in mind that while the REA team as a whole will focus on providing information and analyses that are most needed by and useful to managers through this assessment process, the REA will necessarily be conducted within the bounds of a number of sideboards on the project.

3.3.4 REA Purpose Limitations

As noted previously, the goal of the REAs is to characterize ecological resource status, potential to change from a landscape viewpoint, and potential priority areas for conservation, restoration, and development. The contract for this REA, as with all of BLM's REAs, clearly calls for the assessment to produce information designed to be used in specific decision-making and management processes. However, REA contracts also clearly stop short of including efforts to actually integrate the findings into management actions; **an REA is a toolbox, *not* a decision document**. REAs provide one of many sets of information that can be used to inform in decision-making processes; decision-making is informed by current conditions and impacts on multiple resources, as identified from an array of information sources such as REAs. The BLM has chosen to retain responsibility for all aspects of integrating the assessment into management actions and decisions.

3.3.5 REA Scope Limitations: Research and Data Collection

The BLM's Rapid Ecoregional Assessments are intended to be a relatively rapid assessment of the natural resources and major change agents of an ecoregion. Consistent with a broad scope, and with BLM requirements, only existing and available data will be used; the contractor team will not collect new data or conduct new research, inventories, or monitoring. Standard modeling approaches may be used to generate datasets from these existing data if useful for the REA. Limitations to answering management questions and assessing conservation elements or change agents resulting from a lack of data (data gaps) will be identified and tracked by the NatureServe team over the course of the REA and included in the final report. Data gaps identified during the REA may be addressed with follow-up sub-assessments, supplemental assessments, research, inventory, or monitoring outside of this contract.

3.3.6 Spatial Extent

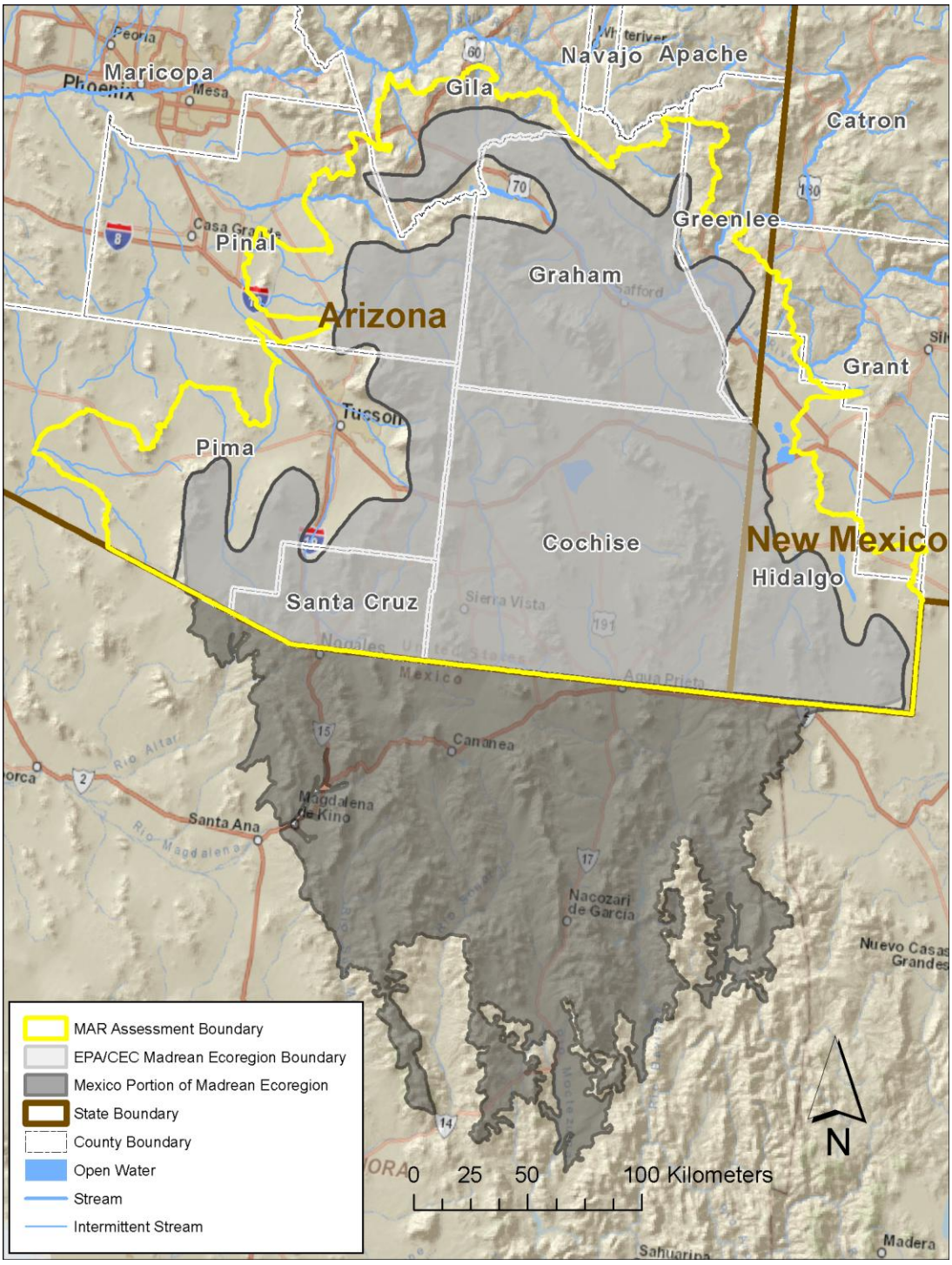
The Madrean Archipelago (MAR) ecoregion, as defined by the Commission for Environmental Cooperation (CEC, 1997) Level III Ecoregions, plus its intersecting 5th-level watersheds as defined by the Natural Resources Conservation Service (NRCS) Watershed Boundary Dataset (WBD), comprise the geographic extent of this ecoregional assessment. All land within this ecoregion and its buffer on the U.S. side will be assessed, not just BLM lands (if selected assessment features occur there). All 5th-level watersheds intersecting the Madrean Archipelago ecoregion, including those with minimal overlap and two watersheds almost touching the ecoregion (HUC 1505030502 in Pima County in AZ and HUC 1303020105 on the southern border of Grant County in NM), are included as part of the assessment area shown in Figure 3-2. (The rationale for being more inclusive was to ensure that entire mountain ranges were assessed, rather than being cut off at the ridgeline, and that other landforms were similarly included with associated features.) The assessment area for this ecoregion is 15.7 million acres or 24,600 square miles.

A substantial portion of the Madrean Archipelago ecoregion lies in Mexico, as shown in Figure 3-2. To date, the REAs have been conducted entirely within U.S. borders. From both an ecological and a management standpoint, it may be useful to understand the ecosystems and change agents throughout

the entire ecoregion in order to address some management questions. Per decisions in the first AMT workshop, narrative text in the conceptual models for Conservation Elements will address the CEs' ecology for the entire Madrean Archipelago ecoregion (both U.S. and Mexico portions). Availability of key data sets for the Mexican part of the ecoregion will also be preliminarily evaluated and discussed with the AMT. At this stage, a decision has not been made to conduct spatial assessments beyond the U.S. border; data availability and project sideboards will inform that decision.

BLM has recently finalized and approved the Sonoran Desert REA (adjoining the west side of the Madrean Archipelago) and initiated the REA for the adjacent Chihuahuan Desert to the east. Given that REAs assess areas composed of ecoregions and their intersecting HUCs, there is built-in overlap in the geographies addressed in adjacent REAs. While BLM and the contractor team will coordinate accordingly with the Chihuahuan REA team on boundary concerns, overlap between the two assessment areas is ensured.

Figure 3-2. The MAR assessment area boundary (yellow line), composed of the U.S. Madrean Archipelago ecoregion (light gray area) combined with its intersecting 5th-level watersheds. Per decisions in the first AMT workshop, all intersecting watersheds are included in the assessment boundary, including those with minimal overlap and two watersheds that almost touch the ecoregional boundary. The Mexico portion (dark gray area) of the Madrean Archipelago ecoregion is shown for reference.



3.3.7 Schedule

The Madrean Archipelago REA will be conducted over the two-year period from September 30, 2012 through September 29, 2014. As noted previously, it is divided into two phases, the Rapid Ecoregional Pre-Assessment Phase (Phase I) and the Rapid Ecoregional Assessment Phase (Phase II), with specific tasks in each phase. Table 3-1 summarizes the two Phases, their component tasks, and the timeframe for each task. In general, the timeframes are as specified in the SOW. However, given that the AMT membership is still in the process of being assembled for this REA, the project initiation task (Phase I, Task 1) has a slightly longer time frame (3 months instead of 2), with the caveat that the additional month would be made up elsewhere to ensure completion according to the original schedule. Start dates for each task are approximate because in some instances, a minimal or small amount of work for the task in question may need to be initiated during the previous task (e.g., the Development Forums will take place during Phase I, Task 2, but scheduling and other preparations will take place during Phase I, Task 1). For details on the requirements of each of the tasks, the reader is referenced to the Statement of Work for this REA.

Table 3-1. Summary of REA phases, tasks, and timeframes. Note that the start dates listed in Appendix A are not always accurate due to software limitations and therefore may not match the actual Approximate Start Date listed here.

Phase	Task #	Task	Timeframe: # of months (adjusted)	Approximate Start Date	End Date	Timeframe Comments
Phase I	Task 1	Initiate Project	3 months	Monday, 10/1/12	Wednesday, 1/16/13	End date is currently extended beyond 13 weeks proposed, even with shortened turn-around time by both BLM and contractor on deliverables and their review, because AMT 1 workshop could not be scheduled earlier.
	Task 2	Implement Pre-Assessment Work Plan	6 months (5.6 months)	Wednesday, 1/2/13	Friday, 6/21/13	
Phase II	Task 1	Create Assessment Work Plan	2 months	Monday, 6/24/13	Tuesday, 8/27/2013	
	Task 2	Inventory, Acquire, and Evaluate Data Develop Process Models	6 months (5 months)	Tuesday, 8/27/2013	Monday, 1/6/14	Due to the challenges frequently encountered in acquiring and evaluating data, data acquisition is expected to begin at the beginning of Phase II.
	Task 3	Develop Geoprocessing Models Conduct Analyses Generate Findings Assemble Data Packages	5 months	Friday, 1/3/14	Thursday, 6/26/14	
	Task 4	Final REA Report	3 months	Thursday, 6/26/14	Tuesday, 9/30/14	

AMT workshops are generally milestone events in each task where products or assessments or deliverables are reviewed by the AMT and Technical Team for needed revisions. In general, the contractor has committed to providing draft deliverables to the BLM, AMT, Technical Team, and others as specified or appropriate one week prior to AMT workshops, per contract requirements. In general, BLM has committed to providing comments or accepting or rejecting deliverables within 14 days after AMT workshops or after final deliverables have been submitted, also per contract requirements. The time needed to complete various components of REA tasks, the timing and sequencing requirements around AMT workshops and other events, and the broader timeframe constraints associated with each task collectively determine the details of the project schedule.

As noted previously, the contracting team is managing the Madrean Archipelago project in MS Project. This project management document contains the details of the project schedule and specific tasks within each of the overall REA tasks. Appendix A is provided as a separate pdf file and shows the sequencing of project milestone events (AMT workshops, submission of deliverables, etc.) within the overall context of the two phases and six tasks, including projected deadlines for BLM and AMT to provide review comments on proposed or draft deliverables. All AMT workshops, and other webinars and workshops are shown in lime green. Deadlines for BLM and AMT review products, as specified by the contract, are shown in gray shading. Deliverable deadlines for the contracting team are highlighted in yellow.

3.3.8 Budget

The budget is designed to cover the work proposed by BLM's Statement of Work for the Madrean Archipelago REA as defined by the contracting team's accepted proposal. The available budget was planned to address up to 20 conservation elements (CEs): 10-12 coarse-filter and 8-12 landscape species. Four primary categories of change agents, as specified by BLM, will be addressed: climate change, fire, invasives, and development. A limited number of MQs will be addressed, depending on their complexity. While these basic parameters for the REA are established, details about specific CAs and CEs, necessary input data generation, types of MQs, etc. will influence how many outputs are feasible within the time and budget constraints. The outline below summarizes the major components of each REA Phase and Task that will be conducted or provided by the contracting team for the budgeted amount.

The REA process is designed to allow for review and comment by the BLM and AMT to improve or enhance the REA products, and time is built into the project to accommodate this. Where suggested revisions or enhancements go beyond the original proposal, it will be up to the contracting team's discretion to determine whether such items can be addressed within the available budget. In general, work that goes beyond the original conceptual or geographic scope of the REA proposal, or would alter the timeline, cannot be part of a rapid assessment.

Phase I: Rapid Ecoregional Pre-Assessment

1) Task 1: Initiate Project
    a) Develop and Submit Draft and Final Deliverables:
        i) Pre-Assessment Work Plan
        ii) Assessment Management Team Charter
        iii) Technical Team Charter
        iv) Communication and Collaboration Work Plan

b) Organize and Lead AMT Workshop 1

c) Conduct Communication Updates

i) Conduct Partner Update Webinar

ii) Develop and Submit Brochure

2) Task 2: Implement Pre-Assessment Work Plan

a) Organize and Lead 3-5 In-Person Development Forums

b) Develop and Submit Proposed, Draft, and/or Final Pre-Assessment Report

i) Management Questions

ii) Conservation Elements

iii) Change Agents

iv) Draft Conceptual Models for 2 or 3 example Conservation Element (Key Ecological Attributes (KEAs), indicators, model diagram)

v) Final Conceptual Models for all Conservation Elements (final only)

vi) Conceptual Model for Ecological Integrity (draft and final only)

vii) Annotated Bibliography (final only)

c) Organize and Lead AMT Workshop 2

d) Develop and Submit Final Pre-Assessment Report

e) Conduct Communication Updates

i) Conduct Partner Update Webinar

ii) Develop and Submit Brochure

Phase II: Rapid Ecoregional Assessment

1. Task 1: Create Assessment Work Plan
    a. Develop and Submit Draft Assessment Work Plan
    b. Organize and Lead AMT Workshop 3
    c. Develop and Submit Final Assessment Work Plan
    d. Conduct Communication Updates
        i. Conduct Partner Update Webinar
        ii. Develop and Submit Brochure
2. Task 2: Inventory, Acquire, and Evaluate Data & Develop Process Models
    a. Develop and Submit Proposed, Draft, Final Data Inventory/Acquisition/Evaluation, Data Quality Assurance, and Process Models
        i. Data Inventory & Tracking Report
        ii. Data Quality Assurance Worksheet
        iii. Process Models for each CE/Conceptual Model

b. Organize and Lead AMT Workshop 4

c. Conduct Communication Updates

i. Conduct Partner Update Webinar

d. Updated Assessment Work Plan

3. Task 3: Develop Geoprocessing Models, Conduct Analyses, Generate Findings, and Assemble Data Packages

a. Develop geoprocessing models based on the process models completed in Phase II Task 2, one for each conceptual model: Proposed (examples), Draft, Final

b. Conduct analysis to deploy the geospatial models and document the processes involved: Proposed (examples), Draft, Final

c. Conduct climate change vulnerability assessment and document the processes involved: Proposed, Draft, Final

d. Generate and interpret findings for each model with a focus on the status and potential for change for each CE: Proposed (examples), Draft, Final

e. Assemble data packages for each geoprocessing model, containing all data and tools required to run each geoprocessing model: Proposed (examples), Draft, Final

f. Organize and Lead AMT Workshop 5

g. Conduct Communication Updates

i. Conduct Partner Update Webinar

h. Updated Assessment Work Plan

4. Task 4: Final REA Report

a. Develop and Submit Report, Other Electronic Datasets, Working Documents, Background Documents and Index: Draft, Final

b. Organize and Lead AMT Workshop 6

c. Conduct Communication Updates

i. Conduct Partner Results Webinars

ii. Develop and Submit Final Brochure

4 Phase I Product Characteristics

This section characterizes the key content products resulting from Phase I tasks and the approach or processes for developing these products: Conservation Elements, Change Agents, Management Questions, CE Conceptual Models, and the Pre-Assessment Report documenting these assessment products.

4.1 Candidate CEs

4.1.1 Conservation Element Candidates

Conservation Elements (CEs) are the species, ecological systems, and other identified resource values that form the core of the REA and must be established prior to beginning the extensive effort of developing conceptual models for each one (see below). Potential candidates for coarse and fine-filter CEs were provided in the contractor proposal (Table 4-1, Table 4-2); these were discussed in the "mini" Development Forum at the first AMT workshop (AMT 1) and will be revisited as appropriate following the Development Forums and finalization of the REA CE selection criteria.

Selection of "focal natural resources" ("CEs" in REA terminology) for a landscape-scale assessment can be challenging; countless resources or threats may be considered crucial, depending on perspective. Financial and time constraints in an effort such as an REA make it important to focus on a limited set of CEs for assessment. However, selecting too few or too generalized a suite of CEs may preclude a sufficiently rigorous analysis of current conditions that adequately represent the ecoregion as a whole.

An REA aims to address a wide spectrum of characteristic ecological processes; hence the selection of **characteristic** ecosystem or natural community types provides a useful starting point. From there, some individual species with inherent vulnerabilities (e.g., often already endangered or otherwise of conservation or management concern) and having regional significance (i.e., of concern to more than one BLM field office) will require attention. Coarse-filter CEs characteristic of the ecoregion and representing some cross-section of ecosystem processes and diversity will be identified, but not all ecosystems mapped within the ecoregion boundary will be assessed. Management concerns will significantly inform which coarse-filter CEs are selected for assessment. Selecting individual species CEs can prove more difficult, as numerous species can be considered vulnerable in some way to change agents or otherwise be of conservation or management concern. While elements that would be considered coarse-filter or fine-filter will be selected and assessed in this REA, scope limitations preclude the assessment of a full complement of CEs that would characterize a true coarse-filter/fine-filter approach (in the sense of, for example, Groves 2003).

Coarse-Filter Ecosystem CEs

Terrestrial (including wetland and riparian) ecosystems have recently been mapped comprehensively across most of the western U.S. by the USGS' National Gap Analysis Program (GAP), and comprehensively across the conterminous U.S. by the inter-agency LANDFIRE program. Both of these mapping programs utilized the same classification of ecological systems, one developed by NatureServe (Comer et al. 2003). The contracting team suggests adopting this classification system from which to select and define the ecosystem CEs for this REA. There are several reasons for using this classification: a) it has been adopted by two major national land cover mapping efforts as the base classification for use in mapping; b) it is a comprehensive classification for the U.S.; and c) it was used for selecting the coarse-filter CEs in the adjacent Sonoran ecoregion REA.

Review of the ecological systems mapped in the Madrean ecoregion suggests the following as an initial list of coarse-filter CEs, shown in Table 4-1. Together these represent some 38% of the Madrean Archipelago ecoregion area and account for biophysical and floristic variation within the Madrean ecosystems.

Table 4-1. List of possible coarse-filter conservation elements.

Upland Ecological Systems[2]
Apacherian-Chihuahuan Semi-Desert Grassland and Steppe
Madrean Juniper Savanna
Madrean Encinal
Madrean Pinyon-Juniper Woodland
Madrean Lower Montane Pine-Oak Forest and Woodland
Wetland/Aquatic Ecological Systems
North American Warm Desert Cienegas and Marshes
North American Warm Desert Lower Montane Riparian Woodland and Shrubland & Stream

Fine-Filter (Landscape Species) CEs

The species listed in Table 4-2 were identified as potentially vulnerable species that may serve as fine-filter CEs for this REA. Occupied habitat for many landscape species has been well documented through existing USFWS recovery plans, the SW ReGAP project, the Apache Highlands Ecoregional Assessment, and the Arizona or New Mexico Natural Heritage programs.

Table 4-2. List of possible fine-filter (species) conservation elements.

Species Common Name ***Latin name***	**Justification as Candidate CE**
Chiricahua leopard frog *Lithobates chiricahuensis*	Endemic species of region, active threats, interactions with bullfrog
Ocelot *Leopardus pardalis sonoriensis*	Endangered species, active threats, at northern end of its range
Pronghorn *Antilocapra americana*	Dependent on grasslands and shrub-steppes, requires expansive areas and good landscape connectivity.
Desert tortoise *Gopherus morafkai*	Planned listing work in 2015. Listed as sensitive species by Arizona BLM and as a Species of Greatest Conservation Need by the Arizona Game and Fish Department.
Mexican spotted owl *Strix occidentalis lucida*	Threatened, current threats have transitioned to the risk of stand-replacing wildfire.
American black bear *Ursus americanus*	Dependent on wildlife corridors and large dispersal distances, vulnerable to habitat loss and fragmentation.

[2] See http://www.natureserve.org/explorer/ for type descriptions

Species Common Name *Latin name*	Justification as Candidate CE
Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*	Listed as Endangered in 1988, it is threatened by disturbance of roosts, loss of food sources through land clearing and human exploitation, grazing, and direct killing by humans.

4.2 Development Forums

The contracting team will conduct at least three in-person Development Forums at various BLM offices in the ecoregion, prior to developing the pre-assessment report. The Development Forums are designed to communicate the REA process to a broader group of partners and obtain partner input on what information would be helpful in their resource management work. Given that REAs are relatively complex assessments with many requirements, and partners have limited time and resources to participate in the Development Forums, BLM decided to focus on gathering input, rather than spend time going over the details of the REA process and requirements that place bounds on what can be assessed. Based on revised direction from BLM, the forums are intended to accomplish the following objectives:

- Utilizing examples and lessons from previous REAs and the Madrean Archipelago Statement of Work (SOW), provide an overview of the objectives of the REA as well as constraints
- Obtain feedback on specific questions and issues that partners are facing and would like to have more information on in order to conduct management, planning, or conservation activities
- Identify participants' interest and ability to contribute further to the REA process, including participating on the Technical Team, providing relevant data, or providing expert review of products

The Development Forums will be held as a series of back-to-back workshops at BLM offices over the course of a week. All forums will have the same content; interested participants need only attend one forum to provide input. Providing a series of forums in different locations is intended to make it convenient for partners to attend. Locations, dates, and times are listed here:

Las Cruces, NM	**January 29th**	8:30 am-12:30 pm	BLM Las Cruces District Office 1800 Marquess Street
Safford, AZ	**January 30th**	8:30 am-12:30 pm	BLM Safford Field Office 711 14th Ave
Tucson, AZ	**January 31st**	8:30 am-12:30 pm	BLM Tucson Field Office 3201 E. Universal Way

The contractor team will carefully plan and organize the meetings in coordination with BLM and the AMT, reach out to participants, prepare all necessary presentations and reference materials, and ensure effective facilitation and productive exchange during the forums. The input received will be carefully evaluated and documented, and combined with information from the contracting team's experts; this will include review of published and gray literature for the area to inform the pre-assessment report.

In the development forums, the goal is to get extensive and in-depth input, to fully understand the management issues and management-related information needs that the REA will ideally address, within the overall project sideboards. In the first AMT workshop for this REA, participants agreed the forums should be approached in a relatively open-ended manner and use facilitated discussions to get input on larger management issues from which potential MQs, CEs, and CAs will be identified. A revised draft agenda following that approach is outlined below. To facilitate this level of input, the forums will be structured with more open-ended brainstorming sessions. Although the intent is not to present potential MQs, CEs, and CAs, the contractor team will have examples of MQs, CEs, and CAs available to present to help generate discussion if needed. After brainstorming input relating to CEs, the contractor team may then ask participants for input on any contractor-identified CEs not already proposed by the participants.

8:30-9:15a Introduction

- Welcome
- Overview of the Rapid Ecoregional Assessment (REA) objectives
- Objectives of the development forum, how input will be used
- Questions

9:15-9:30a Overview and examples of the key REA components: Management Questions (MQs), Change Agents (CAs), and Conservation Elements (CEs)

9:30-9:45a Break

9:45-11:45a Participant Input

- What are your natural resource issues?
- What are conservation elements of concern and or what sources of information would you use to populate a list of potential CEs?
- How would you prioritize issues and CEs for consideration?

11:45a-12:00p Wrap up

- Steps to finalize the key components
- Further involvement: Technical team & information provision
- Keeping updated: Stakeholder webinars & task update brochures

4.3 Finalizing Components: CEs, CAs, MQs

All candidate MQs, CEs, and CAs as derived from Development Forum input, the AMT, review of prior REAs and other large-scale scientific research or assessments, and contractor team expertise will be screened by the contractor team according to the selection criteria provided below, which have been refined from the REA SOW. Per discussions at the first AMT workshop, the criteria will be further refined with AMT input. All suggested candidates will be retained in a tracking form, with those candidates not meeting criteria identified as N/A and documented accordingly. The criteria below are quoted directly from the REA SOW, with minor changes to the criteria indicated in [brackets]. Those CEs, MQs, and CAs meeting these criteria will be reviewed and finalized via a webinar that will take place prior to the second AMT workshop. The finalization processes are described below, following the selection criteria.

4.3.1 CE Selection Criteria

These criteria are largely taken from the SOW.

1. A coarse-filter/fine-filter representation that primarily includes communities of regional significance in uplands, wetlands/riparian, and aquatic systems, and select native fish, wildlife, and plants species not [adequately] represented by coarse-filter elements and possessing regional significance or management needs.
    a. A regionally significant conservation element has attributes that give it more than local significance, especially compared to any similar resource or value. These include renewable natural resources and values with attributes associated with special worth, consequence, meaning, or that are distinctive, irreplaceable, exemplary, unique, fragile, sensitive, rare, or vulnerable to adverse change and that require management/conservation beyond the local scale [defined as a single BLM Field Office].
2. Are derived through an ecologically sound approach, and analysis and products generated for each conservation element will serve to answer relevant priority management questions.
3. Will be assessed for status, condition (trend and baseline), future risks, etc. to understand the context/importance of a certain area of occurrence of the conservation element to the occurrence across the ecoregion
4. Initial priority conservation elements are drawn from management questions, prior assessments, sensitive status species lists, etc.
5. The initial list will be prioritized as determined by the contractor and approved by the AMT
6. The final selection of priority conservation elements must be a **limited suite of regionally significant specific conservation elements**, the conservation of which is intended to serve as a coarse-filter/fine-filter representation of the ecoregion's natural resources. [See Sideboards section 3.3.8 above on maximum number of CEs that can be treated in the REA].

4.3.2 CA Selection Criteria

These criteria are largely taken from the SOW.

1. Change agents—at a minimum—will be drawn from the following categories:
    a. Wildland fire
    b. Development (e.g., urban, energy, roadways, dams)
    c. Invasive species
    d. Climate change
2. Initial change agents are drawn from management questions, prior assessments, etc.
3. The initial list will be prioritized as determined by the contractor and approved by the AMT
4. The final selection of change agents must be a limited suite of drivers for the ecoregion that have regional significance
5. Key change agent conceptualizations are:
    a. Change agents are major drivers of ecosystem change and temporal variability.
    b. The change agents initially identified by management question concerns are reduced to a limited suite of those most pertinent drivers of change of the selected conservation elements.
    c. Change agent attributes/indicators are used as conceptual model inputs that drive ecological system change.
    d. Indicators of change agent status and potential for change are REA outputs used to summarize and display the current and potential future change agent stresses within the ecoregion.

4.3.3 MQ Selection Criteria

These criteria are largely taken from the SOW.

1. Management Questions will address regionally significant Conservation Elements and issues affecting them, including the primary change agents.
2. Preliminary management questions will be drawn from across disciplines and interested parties in the ecoregion, literature searches, prior assessments, RMPs and other land use plans, and other sources determined through Phase I, Task 1 [as contributed by the AMT and Development Forum participants].
3. Preliminary management questions will be evaluated against established criteria to prioritize and select a limited set of management questions.
    a. Should be tied to specific landscape level issues and help put individual projects into the larger context
    b. All management questions must identify the potential subsequent decision process and/or action associated
    c. REAs do not develop ecoregional management strategies, priorities, or specify areas that should be the focus for BLM activities. These latter activities are the responsibility of resource managers. However, REAs function as an "adapter kit" for landscape-scale information, re-formatting it to dove-tail into regulated decision-making processes and administrative actions within the compressed timeframes of management. There is no REA predetermination that decisions will be made, or of the outcomes of a decision process, but simply an identification of the appropriate decision process or action for context to guide information collection efforts. For this to occur, management questions must articulate the potential decision processes and agency actions within which the information may be subsequently used. The basic question to be answered is "What would you do with this information if you had it?" Potential decisions and actions that should be considered include:
        i. Resource management planning
        ii. Establishing priorities for conservation and restoration
        iii. Developing best-management practices
        iv. Authorizing uses
        v. Conducting National Environmental Policy Act analyses
    d. In prioritizing management questions the minimum criteria are:
        i. Is the MQ about large-scale, ecoregionally based issues (i.e., impact of decisions cross field office boundaries, connected phenomena, etc.)?
        ii. Can the MQ and processes referenced be answered by available geospatial information, remote sensing, or acceptable surrogates at the landscape scale?
        iii. Does the MQ identify the potential subsequent decision process and or action associated with the answer to the question?
        iv. Does the MQ relate to the key processes, attributes, and indicators for the ecoregional model?
        v. Has the MQ been answered in another recently completed ecoregional assessment and is there additional information that warrants reexamining this issue?

4.3.4 Review and Finalize Components

CEs, CAs, and MQs that have met the finalized REA criteria will be documented accordingly and presented to the AMT as final draft candidates during a webinar for the AMT and Technical Team members in Task 2 of Phase I; this webinar will take place early in this task and prior to the second AMT

workshop. The objective will be to finalize these components at this webinar. If additional consideration is needed, a supplemental draft final list will be distributed for review by the AMT, with the AMT providing their final recommendations to the COR and the COR providing the final list to the contracting team. Establishing a final (or close to final) list of CEs is critical for the contracting team so that it may move forward with developing conceptual models for the CEs. The conceptual models will require a significant investment of time; the REA team as a whole (BLM, AMT, Technical Team, contractor team) will need to carefully consider which candidate CEs are selected for assessment because the project budget and timeline will not allow changes to be made later.

4.4 Conceptual Models: Conservation Elements

4.4.1 Approach

Once the list of CEs has been finalized, the contracting team will begin developing conceptual models for each CE. For Rapid Ecoregional Assessments, conceptual ecological models assist with organizing current knowledge and communicating key assumptions about the environmental controls and dynamics that characterize the regional landscape. Conceptual models form the basis for a science-based process, in that they force users to clearly state assumptions about critical components, and interactions among those components, for a given phenomenon. Conceptual models for both individual CEs and the ecoregional Ecological Integrity will be based on an overall ecoregion conceptual model (see section **Conceptual Models: Ecoregion Model and Ecological Integrity**), which will be developed to summarize the ecosystem drivers that have resulted in the CEs currently found in the ecoregion today. Conceptual models can inform management intervention points, providing a framework for assessing the effectiveness of management actions through measurable indicators for each key ecological attribute. Conceptual models commonly include box-and-arrow diagrams, tabular summaries, and textual descriptions. Current recommended approaches will be followed (e.g., Gross 2005).

CE Conceptual Models

The first step in the development of the conceptual models will be compiling information about the ecosystem's or species' ecology and functioning in the landscape today. For coarse-filter CEs, this will include information such as distribution within the ecoregion; abiotic and biophysical setting (e.g., elevation, aspect, slope, substrates, hydrologic characteristics, landform setting, etc.); biotic composition (e.g., floristic composition, associated aquatic species where known); natural ecosystem dynamics (e.g., fire regime, flood regimes, insects or disease); and altered ecosystem dynamics or stressors (e.g., invasive plants, disrupted fire or flooding regimes, effects of pollutants).

For the species CEs, major components of information will include distribution within the ecoregion; life history characteristics (e.g., reproductive behavior, population dynamics); major habitat requirements (e.g., food requirements, seasonality of use); key interactions with other species; and important vulnerabilities or stressors (e.g., diseases introduced from livestock, disruption of breeding by noise).

Characterizing the biotic and abiotic drivers for each CE is a necessary first step towards understanding how the CE functions and is distributed in the landscape. It provides the foundation for identifying a limited suite of **key ecological attributes** which are the primary drivers of ecosystem condition and dynamics for each CE (Parrish et al. 2003, Unnasch et al. 2008). Ecological attributes serve to identify landscape level biological characteristics (such as plant composition of terrestrial ecosystems), ecological processes (e.g., fire or hydrologic regimes), interactions with the physical environment (e.g., soil or water chemistry), and appropriate anthropogenic change agents (such as impacts from development or invasive exotic species) that distinguish the CE from others. Ecological attributes also shape the natural variation of the CEs characteristics over time and space, and should aid identification of an exemplary

reference occurrence for the CE. Key ecological attributes are organized within the categories of Size, Condition (biotic or abiotic), and Landscape Context (Unnasch et al. 2009).

Only "pivotal" key ecological attributes will be identified for this REA, specifically those that influence a host of other characteristics of the CE and that are important to manage and monitor for individual conservation elements at the landscape scale. Ideally, they will be measurable through remote sensing techniques and be based on data routinely collected across broad scales.

Assessing the status of key ecological attributes requires explicit identification of indicators and specific means for measuring their status. Indicators may be specific, measurable characteristics of the key ecological attribute; or a collection of such characteristics combined into a "multi-metric" index. Indicators may also be measurable characteristics of stressors that are known to affect the natural function and integrity of a key ecological attribute, or a collection of such characteristics, again combined into a multi-metric stressor index. Indicators of stressors are often used as surrogates or for direct indicators of a key ecological attribute, because data on stressor condition is often far more readily available than data on direct indicators. Based on literature and published comparative analysis of field sites, measurable indicators can be identified for each key ecological attribute and an expected range of variation then characterized for each indicator. For each indicator, an **acceptable** range of variation will be identified to define the limits of variation within which the key ecological attribute must lie for the CE to be considered conserved. Acceptable range of variation will be determined through a combination of scientific effort (e.g., literature surveys) and managerial input. It will not be strictly the natural range of variation.

As specified in the SOW, the acceptable range of variation will be defined for each indicator through a measure/metric classifying each indicator within an analysis unit using a set of categories such as "acceptable," "potential concern," or "imminent loss." The categories themselves have not been finalized; a larger area of discussion will be whether the data and literature support the identification of quantitative thresholds that can be used to define such classifications of indicator status. An alternative is to provide the full set of indicator values without assigning thresholds.

Utilizing the above framework (key ecological attributes, indicators, and measures or metrics), the approach for the development of CE conceptual models will build upon material the contracting team has already developed for many terrestrial and wetland/riparian ecosystems, as well as the proposed landscape species CEs. Surveys will be conducted to identify and review recent relevant scientific literature for each CE, and material will be incorporated into the model. Critical causal links between biological characteristics, ecological processes, interactions with the physical environment, and relevant anthropogenic change agents will be diagrammatically represented for each CE. Expected results include a series of models that clarify current assumptions about how CEs function and interact, how CAs drive and influence their ecological status, and how landscape species may be vulnerable to climate change and other CAs.

To enforce consistency across CEs and their models, templates for the conceptual models have been developed; different versions have been drafted for the terrestrial and wetland/riparian coarse-filters, and landscape species (see Appendices C and D).

These are provided to the COR and Technical Teams for review in this report; no revisions were suggested as a result of the first AMT workshop. During Phase I, Task 2, example conceptual models will be developed, one for each CE category, for the three "no-regrets" CEs identified in the first AMT workshop; these three initial conceptual models will provide an opportunity for additional review and comment by the Technical Teams and AMT before work is begun on models for all CEs. "No-regrets" CEs are CEs that the AMT was confident should be included in the REA and for which it agreed the

contracting team could proceed with developing conceptual models. The three no-regrets CEs are 1) pronghorn, 2) Apacherian-Chihuahuan Semi-Desert Grassland and Steppe (representing "semi-desert grassland" discussed by the AMT), and 3) North American Warm Desert Riparian Woodland and Shrubland (representing "low elevation rivers such as the Salt and San Pedro" discussed by the AMT).

Each conceptual model will include:

a. Narrative text that explains the model concepts and interrelationships between/among the conservation element, change agents, and other resources and their associated forms and processes
b. Diagrammatic representation of the model showing key processes and ecological attributes (e.g., Parrish et al. 2003)
c. The basis and scientific support for the model, as documented through surveyed literature
d. A tabular representation of how the model can be used to assess ecological status (called a "scorecard"), most specifically to address potential for change of the conservation elements

Existing resources for coarse-filter CEs include descriptive material and element occurrence ranking criteria developed by NatureServe and member Natural Heritage programs, assessments in this area from The Nature Conservancy and USGS, and conceptual models for fire regime condition developed through LANDFIRE, the Integrated Landscape Assessment Project (ILAP), and Arizona's FireScape program (www.azfirescape.org/) for the Sky Islands region. In addition, the indicators and metrics developed for the Central Basin and Range and Mojave Basin and Range REAs were largely successful in assessing status for the CEs in those ecoregions and will be reviewed for relevance to the MAR CEs.

Existing resources for species' conceptual models include those developed through a USGS-Northern Arizona University study to assess climate change impacts to wildlife in the southwest, as well as conceptual models developed between The Nature Conservancy and the US Forest Service for climate change adaptation plans in the Four Forest Restoration Initiative region of Arizona. These data will be augmented through literature searches and inquiry with regional specialists, and will illustrate the key drivers of ecological integrity (ecological attributes), critical threats, and CAs that affect ecological integrity, key ecological processes, distribution, life histories, and other relevant aspects such as climatic, physical, ecological, and socio-economic drivers. For species with ranges that extend beyond the ecoregion, conceptual models will be tailored to meet ecological considerations specific to the unique setting of the region.

Each conceptual model will be later represented in process models (Phase II Task 2) which explicitly link the conceptual components of the model with the proposed spatial data to be used to assess the CEs' distributions, and current and future ecological status. During Phase II Task 3, status will be spatially assessed and scored for each indicator or attribute by pre-defined analysis units (e.g., 5th level watersheds). Analysis units will be determined through interactions with the Technical Team and AMT during Phase II. Example results will help to frame review and discussion of the reporting units during Phase II. Final results for the report will be aggregated, if necessary, to landscape reporting units for a consistent display of information.

4.5 Conceptual Models: Ecoregion Model and Ecological Integrity

Individual conservation elements must nest within an overarching conceptual model of the ecoregion which in turn follows the standards agreed upon for CE conceptual models; this will form the foundation for developing the ecoregional integrity model. As specified in the SOW, the ecoregional model text and diagram will 1) depict ecoregional ecological features, processes, and interactions among resources and change agents, 2) provide a science-based context as to how key ecological processes and attributes

interact with one another and how they may be driven to change by change agents, and 3) be expressly tied to the Fundamentals of Land Health and Ecological Integrity (see 43 CFR 4180). Key processes will be represented so that the conceptual model can be used to depict the status of landscape units within the ecoregion. The initial draft of the ecoregional conceptual model will be provided for review in the proposed Pre-Assessment Report in Phase I, Task 2.

The ecological integrity conceptual model will follow the standards for CE conceptual models. RFP criteria and literature will be utilized in combination with discussion with the Technical Team and AMT to propose a conceptual model for ecoregional ecological integrity. Past REAs have had different approaches to assessing ecological integrity, based on direction from AMTs; some kept key ecological attributes separate to understand how each influences integrity while others aggregated (or "rolled up") all attributes using combination rules. In addition, some AMTs desired a simple reporting of numeric scores, while others wanted a categorical reporting (e.g., very good, good, fair, poor).

One option for the ecoregion ecological integrity assessment is to combine scores from across multiple CEs in order to identify regional patterns in ecological integrity. As described above, the CE status scores are derived from the interactions of CEs with CAs. CE ecological status scores indicate current relative status for each CE by spatial reporting unit (e.g., 5th level watershed). If this approach is followed, basic rules can be developed for combining scores, based on the proportional contribution of the CE within a given watershed. For instance, a given watershed is made up of 10% developed land, with the other 90% proportionally dominated by 3 coarse-filter CE distributions (e.g., 40%, 20%, and 30% of the unconverted 90% of the watershed, respectively). Area-based weighting of scores would apply to integrate individual CE scores (e.g., 40% = 7, 20% = 8, and 30% = 5 = 5.9 = "transitioning") for ecological integrity roll-up. Further refinement of this approach might suggest aggregating status scores across CE categories (e.g., terrestrial vs. aquatic coarse-filter CEs, coarse-filter plus landscape species CEs).

Another approach would be to identify the key ecological attributes and the change agents impinging upon them, relevant to the majority of the CEs in the ecoregion. These might include such things as invasive exotic species that are altering fire regimes, the impacts of human development activities, and hydrologic alterations affecting the aquatic CEs. These could then be measured as indicators of ecological integrity at the ecoregion-scale without utilizing individual CE status scores in a roll-up process. Each of the ecoregional attributes would then be spatially assessed individually.

Examples for these two options for ecological integrity assessment (roll-up based on individual CE status scores, or ecoregion-wide attributes and scoring) can be developed and presented through webinars during Phase II, and will require review and discussion with the Technical Team and AMT. Ecoregional integrity assessment methods will be formally proposed and finalized in the Phase II Assessment Work Plan.

4.6 Pre-Assessment Report

The Pre-Assessment Report is critical for documenting the decisions and products resulting from Phase I of the REA, including the final conceptual models for CEs, final CAs, final MQs, and the model of ecological integrity for the ecoregion. It will be incorporated into the Final Report of the REA, primarily in appendices (e.g., the conceptual models for each of the individual CEs, the detailed methods, and content already in appendices in the Pre-Assessment Report), to inform REA users of the process and decisions that determined the key components of the REA. The outline for the Pre-Assessment Report is presented in Appendix E, while the process for developing, reviewing, and finalizing the report follows below. The Pre-Assessment Report will include a draft of the Final Report outline; as the outline for the

Final Report evolves, it may suggest changes in the structure of the Pre-Assessment Report to permit easier integration into the final report.

Content for the report sections will be gathered and incorporated into the report as components are finalized. These will include documentation of specific component processes to develop, review, and finalize each component. The proposed Pre-Assessment Report will be the initial delivery to the AMT; it will contain the proposed CEs, CAs, and MQs and ecoregion conceptual model. It will contain only **three** conceptual models, for the "no-regrets" CEs identified at the first AMT workshop, but not any other CE conceptual models nor the ecological integrity model. The CEs, CAs, and MQs will be reviewed and finalized by AMT via the webinar as described in the **Review and Finalize Components** section above. Once the CEs are finalized, the conceptual models for each CE can be developed, and the ecological integrity model will be developed. These components will be added to the Pre-Assessment Report and the report will be submitted in draft version for distribution to the AMT a week prior to the second AMT workshop. All components will be presented at the AMT 2 workshop and comments will be captured during that meeting. AMT and Technical Team members will also have a period of time to provide written comments on the draft report to the COR which will be forwarded to the contractor. Comments will be addressed through responses and incorporated, as appropriate, in the final draft.

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6 Glossary

Areas of Critical Environmental Concern (ACEC): Areas within the public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards (FLPMA 1976).

Assessment Management Team (AMT): BLM's team of BLM staff and partners that provides overall direction and guidance to the REA regarding ecoregional goals, resources of concern, conservation elements, change agents, management questions, tools, methodologies, models, and output work

products. The team generally consists of BLM State Resources Branch Managers from the ecoregion, a POC, and a variety of agency partners depending on the ecoregion.

Attribute: A defined characteristic of a geographic feature or entity.

Change Agent (CA): An environmental phenomenon or human activity that can alter/influence the future status of resource condition. Some change agents (e.g., roads) are the result of direct human actions or influence. Others (e.g., climate change, wildland fire, or invasive species) may involve natural phenomena or be partially or indirectly related to human activities.

Coarse Filter: A focus of ecoregional analysis that is based upon conserving resource elements that occur at coarse scales, such as ecosystems, rather than upon finer scale elements, such as specific species. The concept behind a coarse filter approach is that preserving coarse-scale conservation elements will preserve elements occurring at finer spatial scales.

Community: Interacting assemblage of species that co-occur with some degree of predictability and consistency.

Conservation Element (CE): A renewable resource object of high conservation interest often called a conservation target by others. For purposes of this TO, conservation elements will likely be types or categories of areas and/or resources including ecological communities or larger ecological assemblages.

Development: A type of change (change agent) resulting from urbanization, industrialization, transportation, mineral extraction, water development, or other non-agricultural/silvicultural human activities that occupy or fragment the landscape or that develops renewable or non-renewable resources.

Ecological Integrity: The ability of an ecological system to support and maintain a community of organisms that have the species composition, diversity, and functional organization comparable to those of natural habitats within the ecoregion.

Ecological Status: The condition of a criterion (biological or socio-economic resource values or conditions) within a geographic area (e.g., watershed, grid). A rating (e.g., low, medium, or high) or ranking (numeric) is assigned to specific criteria to describe status. The rating or ranking will be relative, either to the historical range of variability for that criterion (e.g., a wildland fire regime criterion) or relative to a time period when the criterion did not exist (e.g., an external partnerships/collaboration criterion). (also see *Status)*

Ecoregion: An ecological region or ecoregion is defined as an area with relative homogeneity in ecosystems. Ecoregions depict areas within which the mosaic of ecosystem components (biotic and abiotic as well as terrestrial and aquatic) differs from those of adjacent regions (Omernik and Bailey 1997).

Ecosystem: The interactions of communities of native fish, wildlife, and plants with the abiotic or physical environment.

Element Occurrence: A term used by Natural Heritage Programs. An element occurrence generally delineates the location and extent of a species population or ecological community stand, and represents the geo-referenced biological feature that is of conservation or management interest. Element occurrences are documented by voucher specimens (where appropriate) or other forms of observations. A single element occurrence may be documented by multiple specimens or observations taken from different parts of the same population, or from the same population over multiple years.

Extent: The total area under consideration for an ecoregional assessment. For the BLM, this is a CEC Level III ecoregion or combination of several such ecoregions plus the buffer area surrounding the ecoregion. See *grain*.

Fine Filter: A focus of ecoregional analyses that is based upon conserving resource elements that occur at fine scale, such as specific species. A fine-filter approach is often used in conjunction with a coarse-filter approach (i.e., a coarse-filter/fine-filter framework) because coarse filters do not always capture some concerns, such as when a T&E species is a conservation element.

Fire Regime: Description of the patterns of fire occurrences, frequency, size, severity, and sometimes vegetation and fire effects as well, in a given area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval (NWCG 2006).

Fragmentation: The process of dividing habitats into smaller and smaller units until their utility as habitat is lost (BLM 1997).

Geographic Information System (GIS): A computer system designed to collect, manage, manipulate, analyze, and display spatially referenced data and associated attributes.

Grain: Grain is the spatial unit of analysis for ecoregional assessment and is the smallest area analyzed and used for regional planning purposes. The many data and model outputs incorporated into an ecoregional analysis are usually upscaled or downscaled to grain scale. The grain for ecoregional analysis may be a regular size and shape (e.g., square, hexagon) but also may be defined by a particular level of hydrologic unit or similar geographic feature.

Grid Cell: When used in reference to raster data, a grid cell is equivalent to a pixel (also see *pixel*). When a raster data layer is converted to a vector format, the pixels may instead be referred to as grid cells.

Habitat: A place where an animal or plant normally lives for a substantial part of its life, often characterized by dominant plant forms and/or physical characteristics (BLM 1990).

Heritage: See *Natural Heritage Program.*

Heritage Program: See *Natural Heritage Program.*

Hydrologic Unit: An identified area of surface drainage within the U.S. system for cataloging drainage areas, which was developed in the mid-1970s under the sponsorship of the Water Resources Council and includes drainage-basin boundaries, codes, and names. The drainage areas are delineated to nest in a multilevel, hierarchical arrangement. The hydrologic unit hierarchical system has four levels and is the theoretical basis for further subdivisions that form the *watershed boundary dataset* 5th and 6th levels. (USGS 2009).

Indicator: Components of a system whose characteristics (e.g., presence or absence, quantity, distribution) are used as an index of an attribute (e.g., land health) that are too difficult, inconvenient, or expensive to measure (USDA et al. 2005).

Inductive Model: Geo-referenced observations (e.g., known observations of a given species) are combined with maps of potential explanatory variables (climate, elevation, landform, soil variables, etc.). Statistical relationships between dependent variables (observations) and independent explanatory variables are used to derive a new spatial model.

Invasive Species: Species that are not part of (if exotic non-natives), or are a minor component of (if native), an original community that have the potential to become a dominant or co-dominant species if

their future establishment and growth are not actively controlled by management interventions, or that are classified as exotic or noxious under state or federal law. Species that become dominant for only one to several years (e.g. short-term response to drought or wildfire) are not invasives (Modified from BLM Handbook 1740-2, Integrated Vegetation Handbook).

Key Ecological Attribute (KEA): An attribute, feature, or process that defines and characterizes an ecological community or system or entity; in conjunction with other key ecological attributes, the condition or function of this attribute or process is considered critical to the integrity of the ecological community or system in question. In the BLM REAs, various analyses will be conducted to calculate scores or indexes indicating the status of key ecological attributes for various Conservation Elements (CEs).

Landscape Species: Biological species that use large, ecologically diverse areas and often have significant impacts on the structure and function of natural ecosystems (Redford et al. 2000).

Landscape Unit: Because an REA considers a variety of phenomena, there will be many phenomena and process (or intrinsic) grain sizes. These will necessarily be scaled to a uniform support unit, which herein is called a *landscape unit*. This landscape unit will be the analysis scale used for reporting and displaying ecoregional analyses.

Management Questions: Questions from decision-makers that usually identify problems and request how to fix or solve those problems.

Metadata: The description and documentation of the content, quality, condition, and other characteristics of geospatial data.

Model: Any representation, whether verbal, diagrammatic, or mathematical, of an object or phenomenon. Natural resource models typically characterize resource systems in terms of their status and change through time. Models imbed hypotheses about resource structures and functions, and they generate predictions about the effects of management actions. (Adaptive Management: DOI Technical Guide).

Native Plant and Animal Populations and Communities: Populations and communities of all species of plants and animals naturally occurring, other than as a result of an introduction, either presently or historically in an ecosystem (BLM Manual H-4180-1).

Native Species: Species that historically occurred or currently occur in a particular ecosystem and were not introduced (BLM 2007b).

Natural Community: An assemblage of organisms indigenous to an area that is characterized by distinct combinations of species occupying a common ecological zone and interacting with one another (BLM 2007b).

Natural Heritage Program: An agency or organization, usually based within a state or provincial natural resource agency, whose mission is to collect, document, and analyze data on the location and condition of biological and other natural features (such as geologic or aquatic features) of the state or province. These programs typically have particular responsibility for documenting **at-risk species and threatened ecosystems. (See natureserve.org/ for additional information on these programs.)**

Occurrence: See *Element Occurrence*.

Pixel: A pixel is a cell or spatial unit comprising a raster data layer; within a single raster data layer, the pixels are consistently sized; a common pixel size is 30 x 30 meters square. Pixels are usually referenced

in relation to spatial data that are in raster format. In this REA, some pixels sizes included 30 x 30 m and 2 x 2 km (also see *Grid Cell*).

Population: Individuals of the same species that live, interact, and migrate through the same niche and habitat.

Rapid Ecoregional Assessment (REA): The methodology used by the BLM to assemble and synthesize that regional-scale resource information, which provides the fundamental knowledge base for devising regional resource goals, priorities, and focal areas, on a relatively short time frame (within 2 years).

Rapid Ecoregional Assessment Work Plan (REAWP): The work plan (scope of services) that guides the Phase II Assessment component of a REA. This document fully establishes the design of the Phase II effort, and is essentially the blueprint for that work effort and resulting products.

Resource Value: An ecological value, as opposed to a cultural value. Examples of resource values are those species, habitats, communities, features, functions, or services associated with areas with abundant native species and few non-natives, having intact, connected habitats, and that help maintain landscape hydrologic function. Resource values of concern to the BLM can be classified into three categories: native fish, wildlife, or plants of conservation concern; regionally-important terrestrial ecological features, functions, and services; and regionally-important aquatic ecological features, functions, and services.

Scale: Refers to the characteristic time or length of a process, observation, model, or analysis. ***Intrinsic scale*** refers to the scale at which a pattern or process actually operates. Because nature phenomena range over at least nine orders of magnitude, the intrinsic scale has wide variation. This is significant for ecoregional assessment, where multiple resources and their phenomena are being assessed. ***Observation scale***, often referred to as sampling or measurement scale, is the scale at which sampling is undertaken. Note that once data are observed at a particular scale, that scale becomes the limit of analysis, not the phenomenon scale. ***Analysis*** or ***modeling scale*** refers to the resolution and extent in space and time of statistical analyses or simulation modeling. ***Policy scale*** is the scale at which policies are implemented and is influenced by social, political, and economic policies.

Scaling: The transfer of information across spatial scales. ***Upscaling*** is the process of transferring information from a smaller to a larger scale. ***Downscaling*** is the process of transferring information to a smaller scale.

Status: The condition of a criterion (biological or socio-economic resource values or conditions) within a geographic area (e.g., watershed, grid). A rating (e.g., low, medium, or high) or ranking (numeric) is assigned to specific criteria to describe status. The rating or ranking will be relative, either to the historical range of variability for that criterion (e.g., a wildland fire regime criterion) or relative to a time period when the criterion did not exist (e.g., an external partnerships/collaboration criterion).

Step-Down: A step-down is any action related to regionally-defined goals and priorities discussed in the REA that are acted upon through actions by specific State and/or Field Offices. These step-down actions can be additional inventory, a finer-grained analysis, or a specific management activity.

Stressor: A factor causing negative impacts to the biological health or ecological integrity of a Conservation Element. Factors causing such impacts may or may not have anthropogenic origins. In the context of the REAs, these factors are generally anthropogenic in origin.

Subwatershed: A subdivision of a *watershed*. A *subwatershed* is the 6th-level, 12-digit unit and smallest of the hydrologic unit hierarchy. Subwatersheds generally range in size from 10,000 to 40,000 acres. (USGS 2009).

Value: See *resource value*.

Watershed: A watershed is the 5th-level, 10-digit unit of the hydrologic unit hierarchy. Watersheds range in size from 40,000 to 250,000 acres. Also used as a generic term representing a drainage basin or combination of hydrologic units of any size. (USGS 2009).

Watershed Boundary Dataset (WBD): A national geospatial database of drainage areas consisting of the 1st through 6th hierarchical hydrologic unit levels. The WBD is an ongoing multiagency effort to create hierarchical, and integrated hydrologic units across the Nation. (USGS 2009).

Wildland Fire: Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire (NWCG 2006).

7 List of Acronyms

Not all acronyms listed here have yet been applied in this REA; however, those listed have been commonly used in other REAs and so are included here.

AADT	Annual Average Daily Traffic
ACEC	Area of Critical Environmental Concern
AMT	Assessment Management Team
AR4	International Panel on Climate Change - Fourth Assessment Report
AWC	Anadromous Waters Catalog
BLM	Bureau of Land Management
CA	Change Agent
CCVI	Climate Change Vulnerability Index
CE	Conservation Element
CVS	Conservation Value Summary
DEM	Digital Elevation Model
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
EIA	Ecological Integrity Assessment
EIS	Environmental Impact Statement
EO	Element Occurrence
EPCA	Energy Policy and Conservation Act
ESA	Endangered Species Act
ESA	Ecological Status Assessment
ESD	Ecological Site Descriptions
FO	Field Office
FRI	Fire Return Interval
GA	Grazing Allotment
GCM	General Circulation Model
GIS	Geographic Information System
HMA	Herd Management Area
HRV	Historic Range of Variation
HUC	Hydrologic Unit Code
ILAP	Integrated Landscape Assessment Project
IPCC	Intergovernmental Panel on Climate Change
KEA	Key Ecological Attribute
LCM	Landscape Condition Model
LF	LANDFIRE (Landscape Fire and Resource Management Planning Tools)
MAR	**M**adrean **Ar**chipelago
MLRA	Multiple Resource Land Area
MQ	Management Question
MRDS	Mineral Resource Data System
NHD	National Hydrography Dataset
NHNM	Natural Heritage New Mexico
NPMS	National Pipeline Mapping System

NRCS	Natural Resource Conservation Service
NREL	National Renewable Energy Laboratory
NRV	Natural Range of Variability
NTAD	National Transportation Atlas Database
NWI	National Wetland Inventory
ORV	Off-road Vehicle
PRISM	Parameter-elevation Regressions on Independent Slopes Model
REA	Rapid Ecoregional Assessments
REAWP	Rapid Ecoregional Assessment Work Plan
RegCM	International Centre for Theoretical Physics Regional Climate Model
ROC	Receiver Operating Characteristic
SDM	Species Distribution Model
SDR	Southwest Decision Resources
SIA	Sky Island Alliance
SOW	Statement of Work (for REA contract)
SSURGO	Soil Survey Geographic Database
STATSGO	State Soil Geographic Database
SWAP	State Wildlife Action Plan
TWI	Topographic Wetness Index
USGS	United States Geological Survey