Executive Summary

Introduction

The Bureau of Land Management's Bishop Field Office (BLM) entered into a cooperative agreement in September 2007 with The Nature Conservancy (TNC) to develop a Conservation Action Plan (CAP) for approximately 200,000 acres in California's Bodie Hills and northern Mono Basin. The Bodie Hills project area is a largely unfragmented landscape that includes a diversity of Great Basin ecosystems. It has no major development other than remnant buildings in Bodie State Historic Park. Moreover, major fires and invasive species have not yet overtaken the dominant sagebrush ecosystems, as they have done elsewhere in the Great Basin.

The CAP's purpose was to inform and guide the formulation of future site-specific vegetation management projects to protect and enhance the ecological integrity of the area. The CAP was developed using satellite imagery, remote sensing, predictive ecological models and cost-benefit assessments. Three workshops were held with a diverse group of stakeholders during 2008 to review and refine ecological models, review findings and identify potential vegetation management scenarios. The BLM-TNC cooperative agreement reflects the mutual desire of the two organizations, and shared by many stakeholders, to conserve and restore the Bodie Hills' ecological systems.

BLM – TNC Objectives for Bodie Hills CAP

- ✓ Assess current ecological condition using Fire Regime Condition Class (FRCC) and share findings with stakeholders.
- ✓ Use predictive ecological models to evaluate potential future trends.
- ✓ Obtain stakeholder input to help identify potential vegetation management scenarios to meet BLM's Resource Management Plan and other plans' goals and objectives.

Process and Methodologies

<u>Assessment of Ecological Condition</u>

Prior to the first workshop, TNC used FRCC (Fire Regime Condition Class) methodology developed under the national LANDFIRE program to assess the project area's ecological condition. Although called "fire regime" condition, FRCC is actually an integrated, landscape-level estimate of the ecological condition of terrestrial, riparian, and wetland ecological systems. FRCC incorporates species composition, vegetation structure, and disturbance regimes to estimate an ecological system's departure from its natural range of variability (NRV). NRV is the percentage of each vegetation succession class that would be expected under a natural disturbance regime.

Specifically, TNC did the following:

- Worked with Spatial Solutions, Inc. to obtain satellite imagery, ground-truth the imagery via field surveys, and conduct remote sensing to interpret and map current ecological systems and their succession classes across the project area;
- Obtained and refined peer-reviewed ecological models for each major ecological system. These models incorporated vegetation composition, structural classes and disturbance regimes to predict the natural range of succession classes;
- Mapped the project area's biophysical settings (the dominant vegetation types expected in the physical environment under a natural disturbance regime); and
- For each ecological system, compared current vegetation class distributions with the biophysical setting and calculated each system's departure from its NRV. Each ecological system was assigned a Fire Regime Condition score (0% to 100% departure from NRV) and a Fire Regime Condition Class (1, 2 or 3) rating.

Stakeholder Workshops

To develop the CAP, TNC facilitated a series of three workshops with a diverse group of stakeholders interested in the Bodie Hills. Invitations were extended by BLM to Coordinated Resource Management Planning members and other interested parties, seeking to capture their experience and a diversity of perspectives. Stakeholders participating in the workshops included private ranchers and ranch managers, representatives of environmental organizations, natural resource advisers, and staff from BLM and other public agencies. Highlights from the three workshops are as follows:

Workshop I -- March 18-20, 2008

A. Reviewed and refined the following 15 ecological systems for the Bodie Hills:

1. Alpine
2. Aspen – Seral
3. Aspen – Stable
4. Basin Wildrye – Big Sagebrush
5. Juniper Savanna
6. Low Sagebrush
7. Montane Sagebrush Steppe
8. Montane Subalpine Riparian
9. Mountain Mahogany Woodland
10. Mountain Shrub
11. Pinyon – Juniper Woodland
12. Tobacco brush
13. Wet Meadow
14. Wyoming Big Sagebrush – Loamy
15. Wyoming Big Sagebrush – Sandy

B. Reviewed and refined state-and-transition predictive ecological models for the ecological systems, including their natural succession classes as well as major uncharacteristic classes (such as cheatgrass invasion), with special attention to the dominant montane sagebrush steppe ecosystem.

C. Reviewed maps of the ecological systems and their current classes.

D. Reviewed each ecosystem's current condition using the FRCC methodology.

Workshop II -- May 6-8, 2008

A. Confirmed a set of key conservation and restoration objectives for the Bodie Hills, as follows:

Conservation and Restoration Objectives

- Restore ecological systems to NRV (or "acceptable range" if NRV is not feasible).
- Reduce high-risk classes, such as cheatgrass or invasive weeds.
- Avoid threshold conversions to high-risk classes.
- Conserve high value ecosystems (e.g. habitat for special status species).
- Maintain mosaic of communities and classes, with special attention to the current lack of earlier succession classes and the requirements of special status species.
- Protect human settlements, Bodie State Historic Park, and cultural resources from wildfire.

B. Identified the ecosystems likely to suffer future impairment over the next 20 years, based on computer simulations using the predictive ecological models.

C. Selected eight focal ecological systems for treatment, based upon their high departure from NRV, likelihood of high future departure and/or presence of high-risk classes.

D. Developed an initial set of conservation and restoration strategies and reviewed estimated costs. Strategies included; establishing and maintaining fuelbreaks, prescribed fire, lopping, canopy thinning/mowing, drill seeding, weed inventory and spot herbicide application, active herd management, early-season grazing of cheatgrass, and fencing.

E. Developed a set of three management "scenarios" to be tested for each ecosystem. Each scenario encompassed varied strategies and their associated budgets. Scenarios included; 1) minimum management, 2) ecologically-based management, and 3) combined ecologically-based and wildfire protection management.

F. Reviewed how the potential impacts of climate change would be evaluated via ecological modeling in selected scenarios.

Workshop III--June 17-19, 2008

A. Reviewed 20-year outcomes of computer model runs for each management scenario (model runs to this point were non-spatial simulations).

B. Refined the combined ecologically-based and wildfire protection management scenario, emphasizing high ecological returns at relatively low cost.

C. Reviewed spatial ecological modeling to be conducted post-workshops.

D. Discussed approaches to assessing return on investment for various strategies among all of the targeted ecological systems.

Spatial Modeling, Statistical Analysis and Return on Investment Analysis

Using results from the 3rd workshop, TNC subsequently completed four technical tasks:

1. Worked with consultant ESSA Technologies Ltd. to spatially simulate and map the outcomes of the model runs using five replicates over a 20 year period.
2. Conducted analysis to determine the mean outcomes of each management scenario, the degree of variance among the replicates, and the statistical confidence in the predicted outcomes.
3. Applied two metrics to assess the landscape-level benefits of alternative management scenarios to wildlife species.
4. Developed and tested three metrics to determine which management scenarios produced the greatest ecological benefits per dollar invested across the targeted ecological systems, as compared to minimum management. TNC's recommended metric integrates the total area treated and the associated improvement in ecological condition, i.e. improved departure from NRV and reduction in high-risk classes.

Key Findings

The primary findings of the CAP are summarized as follows:

1. **The Bodie Hills is a largely unfragmented landscape that includes a diversity of Great Basin ecological systems.** Major fires and invasive species such as cheatgrass have not yet overtaken and highly altered the area, as they have done elsewhere in the Great Basin.
2. **The current condition of the Bodie Hills ecological systems varies widely in terms of departure from their NRV.** Of the 15 ecological systems, five are slightly departed from their natural range of variability, five are moderately departed, and five are highly departed.
3. **The primary cause of high departure is that the sagebrush systems are significantly lacking the earliest successional classes.** Montane sagebrush steppe comprises almost 120,000 acres, over 63% of the project area. It has very little vegetation in the early succession classes and is dominated by late-succession classes. In addition, a portion is depleted of native grasses and forbs, cheatgrass has invaded the existing perennial grasses, and conifer tree species have encroached native sagebrush at middle elevations.
4. **Several ecological systems are predicted to become increasingly departed from NRV over the next 20 years in the absence of thoughtful active management.** Without thoughtful active management, several systems will have substantial increases in "high-risk" vegetation classes such as invasive weeds.
5. **Eight ecological systems were targeted for management action.** Based on their current condition, likely future departure from NRV and/or potential for increased high-risk classes, as well as feasibility of management action, the following ecological systems were targeted by workshop participants for development of conservation strategies: montane sagebrush steppe, Wyoming big sagebrush (both sandy and loamy systems), low sagebrush, aspen (stable), montane subalpine riparian, wet meadows and basin wildrye-big sagebrush.
6. **Various management strategies were explored for each targeted ecosystem, using computer simulations to test their effectiveness and adjust the scale of application. Multiple strategies are required for most ecosystems.**
    - ***Sagebrush*** strategies include: prescribed fire; chainsaw lopping and canopy thinning of encroaching conifer trees; mowing along existing roads to establish fuelbreaks to prevent wildfire spreading to human settlements and adjoining ecosystems; and restoration of depleted sagebrush through mowing and drill seeding of native herbaceous species.

- ***Wet meadow and riparian*** strategies include: continued weed inventory and spot application of herbicides; continued active herd management by ranchers; temporary exclosure fencing; and restoration of some entrenched stream banks.
- ***Aspen*** strategies include: prescribed fire or mechanical treatment; temporary fencing; and continued active herd management.

7. **The combined *ecologically-based and wildfire protection management scenario* meets the conservation and restoration objectives for the least cost for seven of the eight ecological systems, and therefore is the recommended management scenario for these systems.** In addition to ecological benefits, this scenario also reduces wildfire risks to Bodie State Historic Park and nearby human settlements. In general, implementation costs are within anticipated BLM budgets.
8. **The predicted climate change impacts generally have nominal effects for most systems over 20 to 50 years.** The key factor explaining these results is that increased adverse effects of CO_2 enrichment ("fertilizer" for cheatgrass and conifers) are cancelled out by decreased soil moisture due to predicted increased droughts. For a few systems, drought increases the predicted mortality to shrubs and trees.
9. **The basin wildrye – big sagebrush, aspen (stable), montane sagebrush steppe, wet meadows, and montane subalpine riparian ecological systems accrue the highest ecological "return on investment."** TNC's return on investment analysis shows that these five ecological systems, in the above order, achieve the greatest predicted ecological benefits per dollar invested in the recommended management scenario.