

**Clark County Desert Conservation Program**  
**Biennial Adaptive Management Report**  
**2004**

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## **Executive Summary**

The Clark County Multiple Species Habitat Conservation Plan (MSHCP) adaptive management process (AMP) was instituted to gauge the effectiveness of existing conservation measures, propose additional or alternative conservation measures as the need arises, and deal with changed or unforeseen circumstances in order to better conserve the species and ecosystems of Clark County. This Biennial Adaptive Management Report is the instrument of communication of the assessment of the Science Advisory Team regarding all aspects of the AMP to the Implementation and Monitoring Committee and the Administrator of the MSHCP.

The findings of this assessment are:

- 1) The measurable biological objectives of the MSHCP, including no net loss of species or habitats, require scientific quantification of mitigation to balance take. The mechanism of that quantification is effectiveness monitoring. Scientific standards for obtaining reliable information through effectiveness monitoring are used to assess status and recommend direction for the Clark County MSHCP as part of the Adaptive Management Program.
- 2) The Conservation Actions and projects of the MSHCP agency partners were examined for consistency with the goals and objectives of the MSHCP. Self-reported information was used to assess the intent of projects. Scientific standards for reliability were applied to the assessment of information contained in MSHCP reports and other available reports on those projects.

Many of the Conservation Actions described in the MSHCP had been implemented through MSHCP projects or other programs, although, many of the Conservation Actions listed in the MSHCP are land use or other management policies without explicitly described actions that are easily documented and whose value to achieving MSHCP goals and objectives may be indirect. Many projects were described as addressing threats and species of concern to the MSHCP. However, reports on how Conservation Actions, species and threats were addressed by MSHCP or other projects (regardless of funding source) either did not contain sufficient detail to assess their value in reaching the goals and objectives of the MSHCP, or were not available.

- 3) The obligation of the MSHCP to provide Species Status Reports for those species covered by the incidental take permit was addressed using information from scientific literature, MSHCP reports and other information.

Scientific literature searches were conducted for all MSHCP species and individual species accounts were updated. Status of species that were categorized in the MSHCP as “most likely to be listed without proactive action” was updated from MSHCP research and inventory projects. The status of the Desert Tortoise, the first umbrella species of the Clark County DCP and the only species listed under the Endangered Species Act that is

covered by the permit, is summarized from the Desert Tortoise Recovery Plan Assessment Committee (DTRPAC) report.

In most cases for species not explicitly addressed by research and monitoring projects, there is insufficient reliable information to determine status and trend. For those species for which there is reliable information, that information is not consistent with the measurable biological objectives of the MSHCP. Habitat loss and population declines were documented for several species. Knowledge Gap and Risk/Uncertainty analyses are presented to aid in prioritizing future work on the status of the 78 species covered by the permit.

4) The development of tools for adaptive management was examined with discussion of results and implications of the initial five adaptive management projects selected by the USFWS. The AMP has improved its capacity to inform management decision-making by building GIS capacity, developing metrics for threat assessment, identifying indicator species for disturbance and documenting a means to improve efficiencies in effectiveness monitoring.

The current deficiencies of the adaptive management program were summarized from information provided in previous chapters. Major deficiencies and technical or administrative problems include: a) insufficiency of many kinds of information; b) competing priorities for resource management at many levels, and for staffing and expertise; and c) failure to secure and quantify mitigation to balance take.

5) Suggestions for future MSHCP projects submitted by the MSHCP agency partners were categorized by project type (implementation, inventory, research, research, infrastructure/capacity or administration), MSHCP species category (covered, evaluation or watch list), taxon, and habitat type. Suggested projects were heavily weighted toward inventory, monitoring, and research, and toward riparian/riverine species and habitats. The distribution of projects showed that the need for information on species and the need to address threats is widely recognized among the management agencies. The many redundancies in agency priorities suggest multiple opportunities to build collaborative relationships for resource management and monitoring to encompass the entire landscape covered by the MSHCP.

6) The Science Advisory Team recommends:

Separate upland and riverine initiatives (groups of projects addressing implementation of management actions, inventory, research and monitoring needs). The upland initiative projects should include:

- a) Continuation and expansion of the PIE Mojave Max Program with an effectiveness monitoring project
- b) Continuation of inventory of low elevation plants where that will inform planning, new inventories for upland reptiles and other priority Covered Species
- c) Effectiveness monitoring for all implementation projects that do not have a record of demonstrated conservation benefits

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- d) Continuation of population monitoring for desert tortoise, bearpoppy, relict leopard frog, other low elevation plants and new efforts for species high priority species with high risk and uncertainty
- e) Develop a threats monitoring program
- f) Continue current desert tortoise research
- g) Continue development remote sensing and indicators
- h) Continue pollinator studies
- i) Continue Red Rocks to the Summit studies of springs
- j) Continue leopard frog habitat and breeding studies and expand to southwestern arroyo toad and other rare anurans
- k) Develop desert tortoise studies on barriers, corridors, genetics
- l) Examine Chuckwalla genetics for Distinct Population Segments
- m) Test Gila monster habitat model
- n) Continue fencing with an effectiveness monitoring project
- o) Continue law enforcement with an effectiveness monitoring project
- p) Continue weed eradication and restoration with an effectiveness monitoring project
- q) Continue burro removals with a demonstration of conservation benefit
- r) Continue Clark County and agency administration of the program and increase staff capacity in deficient areas
- s) Continue and increase capacity of Clark County, agency and Science Advisory Team GIS program
- t) Address desert tortoise and other species research and monitoring facility needs
- u) Host a conference or workshop to solicit outside expertise on tortoise biology, conservation and management
- v) Improve management and monitoring of Boulder City Conservation Easement and mitigate for past mismanagement

The riverine initiative projects should include:

- a) PIE projects that inform private land owners about weed control
- b) Inventory for priority Covered Species
- c) Effectiveness monitoring for all implementation projects that do not have a record of demonstrated conservation benefits
- d) Research projects that will inform the riverine planning efforts
- e) Continuation of weed eradication and restoration on public lands and on private lands with a binding commitment to conservation in perpetuity

Develop a comprehensive database to support species status reports

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Programmatic monitoring with appropriate scale and scope, and following templates developed as products of the Monitoring Workshop

Information standards and information sharing protocols that are common to all regional conservation programs so that the incremental addition of species and habitat benefit due to the MSHCP projects can be quantified

Improve project identification process and proposal evaluation

Define better the temporal scope of projects, increase the length of ongoing projects such as law enforcement or weed eradication beyond 2 years to improve efficiency and economy

Improve reporting and information sharing, including networking with other programs

Support planning efforts and emphasize landscape level projects

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**Chapter 1  
Purpose and Method of the Biennial Adaptive Management Report**

**PURPOSE**

As part of the Adaptive Management Process Reporting (MSHCP 2.12.1.1), the MSHCP requires that on March 15 of each even-numbered year, the contracted entity (UNR-BRRC, here also called the Science Advisory Team) will provide a full report on AMP activities and significant findings to the Plan Administrator, who shall distribute the report to the I & M Committee members for review by April 15 of the same year.

The context and framework for this Biennial Adaptive Management Report (BAMR) is the Adaptive Management Process as described in the MSHCP. The Adaptive Management Process for the Clark County MSHCP was put in place to gauge the effectiveness of existing conservation measures, and to propose additional or alternative conservation measures, as the need arises, and to deal with changed or unforeseen circumstances.

Adaptive management to support Clark County's Multiple Species Habitat Conservation Plan (HCP), is resource management that is informed by monitoring and research. It is a flexible, iterative approach to long-term management of biological resources that is directed over time by the results of ongoing monitoring activities and other information. The AMP is designed to provide an objective, quantitative, scientifically sound evaluation of effectiveness. This means that biological management techniques and specific objectives are regularly evaluated in light of monitoring results and new information on species needs, land use, and other factors. These periodic evaluations are used over time to adapt both management objectives and techniques to better achieve overall management goals as defined by measurable biological objectives. For the MSHCP, these measurable biological objectives include the maintenance of the long-term net habitat value of the ecosystems in Clark County with a particular emphasis on Covered Species and recovery of listed species and conservation of unlisted Covered Species.

The AMP is intended to provide resource managers with objective scientific data and analysis upon which to base management decisions as well as scientifically valid evaluation of management actions. The AMP is also intended to provide the I & M Committee with objective and scientifically valid evaluations of the need for various actions, and assessment of the effectiveness of those actions.

The AMP will, (a) do an analysis of all land use trends in Clark County to make sure that take and habitat disturbance is balanced with solid conservation, (b) monitor population trends and ecosystem health, and (c) evaluate the effectiveness of management actions at meeting MSHCP goals of conservation and recovery. However, it is clear that each BAMR during the 30-year period covered by Clark County's Federal incidental take

permit, must address the current status of the program and tailor its recommendations for maximal utility to the next biennium.

## SCOPE OF THE 2004 BIENNIAL ADAPTIVE MANAGEMENT REPORT

In order to focus the efforts of the Science Advisory Team in producing an Adaptive Management Report that would be most useful to the MSHCP, the Science Advisory Team consulted with the Plan Administrator, the USFWS, MSHCP partners and members of the I & M Committee. The following elements of the 2004 Biennial Adaptive Management Report (BAMR) were determined:

- a) To review new or ongoing or completed projects for consistency with MSHCP goals and objectives
- b) To review the program as a whole for progress toward overall goals and objectives of the MSHCP and likelihood that those goals and objectives can be reached
- c) To make recommendations for how program should change/not change in order to reach it's goals and objectives
- d) To make recommendations on program areas and issues of concern for action

## METHOD

The review process undertaken for this BAMR was framed in a scientific approach to gathering reliable information. We examined MSHCP projects for their potential to provide unambiguous quantitative information of sufficient resolution to reduce uncertainty in management decision-making. In practice that meant formulating a robust and general model for the primary source for information that is internal to the MSHCP, that is, monitoring.

### Considerations for Monitoring

The ability of the HCP to draw reliable information from monitoring assumes that monitoring efforts carried out under the auspices of the program are reliable. Although most ecologists and resource managers have at least some idea of what monitoring is and what it can accomplish, the HCP requirement that monitoring provide the basis for quantification of mitigation over a specified landscape demands a rigorous and standardized paradigm. This outline is intended as a general framework for evaluation of program performance to date, and as guidance for the design and selection of future HCP projects; however, we recognize that a brief overview can address only a small proportion of the issues that confront those who will design and implement monitoring plans and interpret their results. Accordingly, we provide a short list of resources in Appendix 1 that have informed the advice presented in this BAMR, and contain further information directly pertinent to the development of monitoring programs.

### Monitoring Defined

Monitoring is not watching things happen. Monitoring is not counting. Monitoring is not measuring in the absence of a clear management context. (Albeit observing, counting, and measuring all play roles in monitoring programs.) Monitoring is explicitly intended to provide information that can help us explain phenomena that concern us. A frequently cited definition of monitoring in environmental management is “measurement of environmental characteristics over an extended period of time to determine status or trends in some aspect of environmental quality.” However, embedded in that deceptively simple definition are challenges that vex the most experienced researchers and practitioners – which characteristics should be measured, using what measures, where, when, and for how long?

Most participants in monitoring recognize distinct applications of their efforts. Implementation (or compliance) monitoring, for example, is designed to track or verify implementation of a management plan, compliance with a regulation, or performance on a commitment to restore or enhance a resource. Effectiveness monitoring, by contrast, evaluates status and trends of a system and its components that result from a management action in an effort to determine whether the action has achieved the desired target or outcome. Effectiveness monitoring is the primary focus assessment tool for the Clark County MSHCP Adaptive Management Program.

### Effectiveness monitoring

Within the context of effectiveness monitoring, it is important to recognize the distinction between Retrospective monitoring and Prospective monitoring. Retrospective monitoring (sometimes referred to as effects-oriented monitoring) attempts to identify effects of management on ecosystems by monitoring changes in the status of an environmental attribute, such as the population size of a sensitive species or the composition of a vegetation community. Retrospective monitoring strives to detect environmental changes after they have occurred, and attempts to attribute causation when an effect is found. Prospective or predictive monitoring (also referred to as stressor-oriented monitoring), differs from Retrospective monitoring in that it attempts to detect factors that cause responses by elements of an ecosystem before undesirable effects occur or before effects become serious.

### When is it appropriate to use retrospective or prospective monitoring?

Both retrospective and prospective monitoring approaches have some utility and can be complementary in a diversified monitoring program that assesses the effects of multiple management actions in a complicated field setting. But retrospective and prospective monitoring activities are not equally appropriate or useful in every assessment effort. When risks or costs of a failed management action are relatively low, the probability of detecting changes in the system is high, or the lag time between a cause and effect is short, retrospective monitoring may prove effective and may be less expensive than alternative options. However, when risks and costs are high, the ability to detect changes is comparatively low, and lags in system responses are relatively long, prospective monitoring is required. If there are substantial numbers of at-risk species in its purview, the HCP must respond to perceived environmental needs quickly, using focused

restoration efforts that capitalize on the best available technical information and immediately replacing management actions that prove to be less than successful with more effective actions.

## ELEMENTS OF AN INFORMATIVE MONITORING PROGRAM

In order to make ecosystem management as effective and responsive as possible monitoring must build on what is known and must provide clear answers to management questions. Thus, informative monitoring programs need to consist of four elements: 1) clearly stated goals and objectives for management actions, 2) well-defined conceptual models, 3) good justification of the selection of indicators, and 4) sampling designs that adequately address scope and resolution.

### 1. Goals and Objectives for Management Actions

Monitoring programs should be capable of determining whether current or proposed management practices are maintaining the ecological integrity of the target environmental system and the ability of the system to deliver expected goods and services (for example, numbers of chuckwalla or erosion control by riparian vegetation). Certainly no universal set of goals or objectives characterizes a “high quality” environmental state or can apply to all ecosystems subject to management and monitoring. But each proposed management action (or ongoing management action for which new monitoring is being proposed) should be accompanied by a set of specific project goals that guide the development of monitoring objectives. Management goals may take many forms – for example, a target number of desert tortoises, a restored mesquite bosque with a specific species composition and structure, or a Muddy River floodplain of predetermined extent inundated for an expected time period. Those goals may be articulated in response to a legal mandate, for example recovery goals under the Endangered Species Act or as attainment goals under the Clean Water Act. Whatever the basis for the management goal, the goal should be articulated in such a manner that clear, quantifiable objectives can be identified and direct the monitoring design.

### 2. Conceptual Models

Barriers to the attainment of management goals and the success of restoration efforts are inevitable. These barriers arise from both human-generated and natural environmental “stressors.” Stressors are physical, chemical, or biological phenomena that cause deleterious effects on ecosystems and their constituent elements. Stressors include a wide variety of environmental disturbances, such as wildfires, invasions of exotic species, stream diversions, and conversion to agricultural land use. Stressors have defining characteristics, including frequency of occurrence, extent of occurrence, magnitude (intensity and duration), selectivity (elements of the system on which they act), and variability, which allow them to be categorized during development of a monitoring plan. Stressors that act on managed ecosystems must be described in terms of causes and effects. That description is best presented as a conceptual model that links environmental stressors to environmental attributes of concern.

Well-designed conceptual models enable a monitoring program to investigate relationships between environmental perturbations and likely consequences. Conceptual models outline the connections among ecosystem elements and environmental stressors, the strength and direction of those links, and attributes of the system that can be used to characterize the state of resources. Conceptual models show how environmental systems function and emphasize anticipated responses to natural and human-caused stressors.

A conceptual model that describes the managed system is absolutely necessary to design an effective monitoring program. Although a thorough narrative description of an ecosystem of concern can serve as a conceptual model, conceptual models are most useful when presented as visual representations of the relationships among factors that contribute to ecosystem function. Conceptual models should explicitly link ecosystem attributes, which include both abiotic and biotic elements and inputs, to system stressors. The expected cause-and-effect relationships that result in ecosystem changes identified in the conceptual model serves to assist selection of candidate indicators for measurement in the monitoring program.

### 3. Indicator Selection

Because ecosystems are complex, monitoring programs cannot possibly measure all of their attributes. The health of ecosystems, their responses to restoration, and their susceptibility to long-term change therefore must be assessed using a limited set of indicators (sometimes referred to as performance measures or performance metrics). The theory and practice of indicator selection is demanding; selection of ineffective indicators will cause a monitoring program to fail.

A conceptual model provides a basis for selection of candidate indicators, the responses of which are expected to reflect ecosystem changes that may result from management actions or environmental stressors. Indicators are expected to provide information on other resources from and attributes of the same ecological system. The most effective indicators respond in a fashion similar to the dynamics of the ecosystem that supports them and respond rapidly to changes in their environment. The changes in status of effective indicators can be accurately measured, their natural variability is sufficiently limited that changes in response to management can be differentiated from background variation, and they can be measured in a cost effective manner.

There are at least three categories of indicators that can be useful for monitoring:

- 1) Function or process indicators measure ecosystem processes and their rates. Processes include but are not limited to primary productivity, nutrient cycling, sediment accumulation, and water flows.
- 2) Indicators of ecosystem structure are used to assess ecosystem structure at any spatial extent and resolution, from local patches of vegetation to patch distributions and connectivity across the landscape.
- 3) Species-based indicators – an important category of indicators for the HCP given its focus on at-risk and listed species – typically are members of taxonomic groups that are important to ecosystem function (predators, pollinators, decomposers), provide

insight into the integrity of the ecosystem (that is, they may serve as umbrella species, keystone species, or ecological engineers), are direct targets of management (because they are recognized as threatened or endangered), or are sensitive to ecosystem change.

Candidate indicators for monitoring should provide a clear “signal,” alerting managers to the true state of the system in time to respond with appropriate action. The most effective indicators are those whose mechanistic behavior in response to a specific stressor is well understood. Because no standing body of information exists that can *a priori* guide and assure selection of the best indicators in all management scenarios, best professional judgment must be used, along with available empirical data and pertinent literature, in evaluating potential indicators in many management scenarios. Subsequent data collection will be the means by which the effectiveness any given indicator is proven.

#### 4. Sampling Design

Designing a sampling plan for monitoring after indicators are selected is a complex task that varies greatly with the nature and scope of the management action that is monitored. However, several key issues must be addressed. First, it is necessary to estimate the status and trend(s) of an indicator with appropriate precision; this demands substantial statistical expertise. Essential to the monitoring program is establishment of expected values (or trends) of indicators as benchmarks against which the indicator states are compared following management actions. Second, values that will be used to trigger management responses must be identified. This requires information on, or assumptions about, what constitutes an ecological effect sufficiently great to warrant management response or amendment – the effect size – as well as a sampling scheme that is adequate to detect that effect. Only by identifying appropriate trigger points (a value or distribution of values) for management intervention is a monitoring plan made operational. Third, a substantial number of practical issues of design and analysis pervade the development of a sampling frame – boundaries to the ecosystem and area subject to management must be defined; the temporal resolution and extent of sampling must be established; a sample size appropriate to estimate the value of the indicator must be identified; a survey design that responds to spatial heterogeneity needs to be constructed; and units of measure for each indicator must be chosen.

All of the four major elements, above, plus other issues important to the design of a successful monitoring program (discussed in varying detail in many of the sources listed in Appendix 1) were used to frame this assessment of program status.

#### HOW MONITORING CONSIDERATIONS WERE USED TO ASSESS PROGRAM STATUS

This BAMR is based on available information gathered from self-assessments of status of MSHCP projects, as well as from scientific literature, from determinations of species and ecosystem status by independent entities, and from MSHCP-contracted assessments of portions of the Desert Conservation Program. Sources of the information are referenced

in the text. All conservation actions and projects were reviewed for their potential to advance the goals of Clark County's Desert Conservation Program as described in the MSHCP. This BAMR presents a snapshot of Program status as seen through the lens of science-based adaptive management.

For each MSHCP conservation action and MSHCP project we asked a series of questions:

- 1) Does the project description address the goals of the MSHCP to (a) maintain the long-term net habitat value of the ecosystems in Clark County with a particular emphasis on Covered Species and (b) recover listed species and conserve unlisted Covered Species? We used self-selected species and threat lists to answer this question.
- 2) Is documentation available that supports the assertion that the goals of the MSHCP are addressed; that is, are there reports and/or maps as appropriate?
- 3) If the project is an implementation of conservation measures, are the goals and objectives sufficiently clear that it is possible to design a monitoring program (using the monitoring considerations, above) to gauge the effectiveness of those conservation measures?
- 4) If the project is itself described as monitoring, does it contain the elements of a useful monitoring program (using the monitoring considerations, above)?

Chapter Two examines how the initial Conservation Actions derived from management plans of the MSHCP cooperating management agencies have addressed MSHCP objectives.

Chapter Three examines how MSHCP projects have advanced compliance with permit conditions requiring documentation of the status of Covered Species.

Chapter Four examines progress on the development of tools for adaptive management and new and persistent problems that must be addressed in order to achieve the goals of the MSHCP.

Chapter Five examines the current priorities and suggestions for future projects from the Land and Wildlife Management Agencies cooperating in the MSHCP in relation to MSHCP goals.

Chapter Six presents recommendations for future projects and future program direction from the Science Advisory Team.

Recommendations for the improvements to individual projects are based on increasing the clarity of management objectives and the direction of projects toward HCP goals as well as increasing the reliability of information provided by the projects based on the monitoring considerations described above.

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Assessment of Program status, and recommendations for future projects and direction for the Program is based on the distribution of completed and on-going projects in relation to MSHCP goals and the reliability of information provided by those projects. Recent scientific literature, significant research findings and independent planning and assessment efforts are also incorporated in our overall assessment and recommendations.



## **Chapter 2**

### **Summary and Assessment of the Current and Completed Projects**

#### INTRODUCTION

This chapter examines the formal documentation of MSHCP activities since 1999, and the information content of that documentation in relation to achieving MSHCP goals and objectives. The conservation activities of the MSHCP agency partners were examined in relation to their own initial lists of conservation actions. Descriptions of projects funded through the MSHCP were examined in relation to MSHCP species and threats. And finally, project reports were examined for their sufficiency to address MSHCP goals and objectives using the four elements of effectiveness monitoring described in Chapter 1.

#### SUMMARY OF ACTIVITIES IN INITIAL PLANNING BY MSHCP PARTNERS

An iterative adaptive management process must have a concrete starting place. For this MSHCP, the Federal Land Management Agency and State Agency MSHCP partners generated lists of initial conservation actions. Approximately 640 conservation actions were drawn from Agency management plans to define the range of possible management actions that might be accelerated by the addition of funding from the MSHCP. These actions were not intended to be unalterable. Rather, through the process of effectiveness monitoring, alternative strategies would be examined and actions and policies could be changed, if necessary, to improve management.

To that end, the MSHCP agency partners were asked to address a series of questions regarding the status of each of the initial Conservation Actions in the MSHCP with regard to how actions were funded, whether the projects were initiated, and whether reports had been submitted. The Science Advisory Team made a determination of the appropriateness of effectiveness monitoring for each activity based on the project description containing or implying measurable biological objectives. The status of each of the Conservation Actions of each of the agency partners is presented in Appendix 2. The summaries presented below reflect both duplicative information (projects in multiple categories) and missing information, so the numbers do not necessarily add up to the total number of actions.

#### BLM

One hundred and thirty seven (137) conservation actions (with subsections) are listed, of which 104 are described as policy rather than action. One hundred eighteen have been initiated, two have been completed, and one is not yet implemented. Effectiveness monitoring is appropriate for 18 of the actions, but has not been initiated for any of them. Reports on the status of conservation actions have not been made available for most (103)

of the conservation actions. Funding for projects has come from Section 10, PLMA, Section 7, National Fish and Wildlife Foundation funds, as well as agency budgets.

#### NDF

NDF has three conservation actions listed, of which 2 are described as policy. These three conservation actions have been initiated. Effectiveness monitoring was listed as appropriate for all three of the conservation actions, but monitoring has been initiated for none of them. Funding for projects addressing the conservation actions has come from PLMA, Section 10, and internal funding.

#### NDOT

NDOT has 35 conservation actions listed in the MSHCP. All items are described as Action items; 34 are ongoing. All have been funded by NDOT or other cooperating agencies. With the exception of quarterly reports on land disturbance and take, there have been no activity reports and no effectiveness monitoring.

#### NDOW

Forty-eight (48) Conservation Actions are listed in the MSHCP of which 9 are described as policy. Forty-one of these actions have been initiated: 4 PIE, 11 data gathering (inventory, research or monitoring), and 18 implementation projects (restoration or enhancement, and protective measures). Effectiveness monitoring has been initiated for 1 PIE project and 5 of the 18 implementation projects. No reports or spatial data have been shared with the MSHCP, although spatial data are available for some projects. The projects have been funded by internal agency budgets, Federal ESA Section 6 and SNPLMA Conservation Initiatives. No MSHCP (ESA Section 10) or SNPLMA-MSHCP funds were used.

#### NPS

NPS has 61 conservation actions (with subsections) listed in the MSHCP. Twelve of these actions are listed as policy, and 54 as action items. Fifty-seven of the conservation actions are initiated, and four are not yet implemented. Effectiveness monitoring is appropriate for 28 of the conservation actions, but no effectiveness monitoring has been initiated. Funding for these projects has come from Section 7, PLMA, MSHCP, NPS, NDOW, BLM, EPA, BOR, USGS, and agency budget.

#### USFS

USFS has 308 conservation actions (with subsections) listed in the MSHCP. Twelve of these items are listed as policy, and 54 as actions. Effectiveness monitoring was only listed as appropriate for four of the actions, and has been completed for one of them. Funding for these projects has come from the Nevada Bird Breeding Survey and other sources.

#### USFWS

USFWS has 52 conservation actions listed under the MSHCP. Twenty-two of these items were listed as policy, and twenty-one as action items. Effective monitoring was listed as

appropriate for 38 of the listed conservation actions, and has been initiated for none of them. Funding for USFWS projects covering these actions has come from PLMA, MSHCP, and Agency Budget.

### **MSHCP PROJECTS OF MANAGEMENT AGENCY PARTNERS**

These projects were funded by ESA Section 10, Section 7 or PLMA Development. The project listings are available on the MSHCP database and are shown in Appendix 3. The numbers in the text below reflect database queries and are not quite accurate with regard to breakdown by biennium because many, but not all, of the approved proposals for the 2003-2005 biennium are not yet listed as projects.

#### BLM

BLM has had 35 MSHCP projects since 1999 for a total of \$11,257,620. For the 2 biennia spanning 1999-2003, MSHCP project descriptions listed 28 BLM conservation actions, 5 NPS actions, 9 USFS actions, and 2 USFWS actions. For the 2003-2005 biennium, project descriptions listed 34 BLM conservation actions, 2 USFS actions, 17 NPS actions and 16 USFWS actions.

#### NDF

NDF has been funded from the MSHCP for five projects since 1999, totaling \$690,614. For the 2 biennia spanning 1999-2003, no information was available on conservation actions addressed for any of the 4 projects. For the 2003-2005 biennium, the project description listed all 3 of the NDF conservation actions.

#### NDOT

NDOT has not received funding for any projects from the MSHCP since 1999, although they are listed as cooperators for 3 projects for other contractors.

#### NDOW

NDOW has had 2 MSHCP data gathering projects (inventory, research or monitoring) since 1999 for a total of \$105,162. Neither of these projects cited the conservation actions listed in the MSHCP.

#### NPS

NPS has 38 projects under the MSHCP since 1999, for a total MSHCP funding of \$7,066,318. For the 2 biennia spanning 1999-2003, MSHCP project descriptions listed 42 of the 61 NPS conservation actions, in addition to 6 BLM actions, 5 USFS actions, and 3 USFWS actions. For the 2003-2005 biennium, project descriptions listed 40 NPS conservation actions, 2 USFS actions, 6 BLM actions and 1 USFWS action.

### USFS

USFS has had 27 projects funded through the MSHCP since 1999 for a total of \$5,328,995. For the 2 biennia spanning 1999-2003, MSHCP project descriptions listed 59 of the 308 actions for USFS. For the 2003-2005 biennium, project descriptions listed 148 USFS conservation actions, 4 BLM actions and 3 NDOW actions.

### USFWS

The USFWS has two projects funded through the MSHCP since 1999 for a total funding of \$521,055. For the 2 biennia spanning 1999-2003, MSHCP project descriptions listed 8 of the 52 conservation action items.

Many of the conservation actions on the MSHCP lists are policies without accompanying actions thus are not likely to be addressed by individual MSHCP Projects.

However, some policy is implemented indirectly through law enforcement, and public information and education programs that are intended to increase compliance with land use regulations, thereby reduce anthropogenic threat. These policies may be very important to MSHCP goals, but because their effects on measurable biological objectives are not clearly delineated, the value of these programs is not clear at this time. Both the Law Enforcement program and the Public Information and Education program have been the subjects of separately contracted assessments that are discussed later in this document.

### HOW MANY MSHCP PROJECTS CAME FROM THE INITIAL MANAGEMENT PLAN LISTS?

Taken as a whole, approximately one quarter of the items on the conservation actions lists have been addressed by MSHCP projects of some kind in 1999 and 2001 biennia, but because citing the MSHCP Conservation Actions in project descriptions was not required in all cases for the 1999 and 2001 biennia, this figure may underestimate the intent and actions of the land and resource managers. Reference to Conservation Actions was required in 2003, and large inventories (surveys) were initiated in 2003, thus the number of Conservation Actions cited in the descriptions was higher.

Many additional Conservation Actions have been addressed by projects funded by non-HCP sources. There was no formal reporting on these projects despite the MSHCP requirement that Implementation Agreement signatories report on their programs to the Implementation and Monitoring Committee (IMC), so that during the MSHCP budget process, the IMC will be able to assure that the budget recommendation to the Clark County Board of Commissioners complies with the MSHCP requirement that projects “augment, but not replace Federal and State land manager budgets.”

HOW DO PROJECT DESCRIPTIONS RELATE TO MSHCP THREATS?

Species threats

1999-2003 Projects

Of 150 individual projects, most do not claim to address threats to species in the 17 general threat categories. The threat category that is addressed by the greatest number of projects encompasses threats from recreation activities. The largest number of threat categories addressed by any project is seven. 126 of the 150 MSHCP projects funded since 1999 list no threat categories as addressed.

<b>Species Threat Category</b>	<b>Number of Projects Addressing</b>
<b>Threat 1 - Population Dynamics/Life History</b>	<b>7</b>
<b>Threat 2 - Commercial Collection and Collection by Hobbyists</b>	<b>2</b>
<b>Threat 3 - Fire Management</b>	<b>3</b>
<b>Threat 4 - Recreation</b>	<b>11</b>
<b>Threat 5 - Highways, Roads, and Trails</b>	<b>5</b>
<b>Threat 6 - Pest Control</b>	<b>2</b>
<b>Threat 7 - Grazing</b>	<b>5</b>
<b>Threat 8 - USAF Military Activities</b>	<b>1</b>
<b>Threat 9 - Mineral Extraction</b>	<b>4</b>
<b>Threat 10 - Woodcutting and Collection</b>	<b>2</b>
<b>Threat 11 - Development</b>	<b>5</b>
<b>Threat 12 - Utility Lines</b>	<b>3</b>
<b>Threat 13 - Aquatic Resources</b>	<b>3</b>
<b>Threat 14 - Springs</b>	<b>0</b>
<b>Threat 15 - Exotic, Subsidized and Parasitic Species</b>	<b>7</b>
<b>Threat 16 - Feral Animals</b>	<b>2</b>
<b>Threat 17 - Illegal or unauthorized Activities</b>	<b>6</b>

2003-2005 Projects

Projects from earlier biennia were not required to identify the threat that would be addressed, it is nevertheless clear that a greater proportion of threats in the 17 categories will be addressed by the work proposed for the 2003 biennium than have been in the past. The most threat categories addressed by any one proposal is 11. Only 25 of the 97

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projects in the current biennium program did not propose to address threats to species in any of the 17 threat categories.

Species Threat Category Addressed	Number of Projects
<b>Threat 1 - Population Dynamics/Life History</b>	<b>39</b>
<b>Threat 2 - Commercial Collection and Collection by Hobbyists</b>	<b>10</b>
<b>Threat 3 - Fire Management</b>	<b>15</b>
<b>Threat 4 - Recreation</b>	<b>48</b>
<b>Threat 5 - Highways, Roads, and Trails</b>	<b>25</b>
<b>Threat 6 - Pest Control</b>	<b>8</b>
<b>Threat 7 - Grazing</b>	<b>12</b>
<b>Threat 8 - USAF Military Activities</b>	<b>1</b>
<b>Threat 9 - Mineral Extraction</b>	<b>7</b>
Threat 10 - Woodcutting and Collection	<b>1</b>
<b>Threat 11 - Development</b>	<b>8</b>
<b>Threat 12 - Utility Lines</b>	<b>3</b>
<b>Threat 13 - Aquatic Resources</b>	<b>19</b>
<b>Threat 14 - Springs</b>	<b>20</b>
<b>Threat 15 - Exotic, Subsidized and Parasitic Species</b>	<b>30</b>
<b>Threat 16 - Feral Animals</b>	<b>5</b>
<b>Threat 17 - Illegal or unauthorized Activities</b>	<b>13</b>

Ecosystem threats  
1999-2003 Projects

Of the 150 projects conducted, most (139) of them do not claim to address threats to ecosystem categories that fall under the 17 specified threat categories. The greatest number of threats to ecosystem addressed by any one project was three.

Ecosystem Threat Category	<b>Number of Projects Addressing</b>
<b>Threat 1 - Population Dynamics/Life History</b>	<b>0</b>
<b>Threat 2 - Commercial Collection and Collection by Hobbyists</b>	<b>2</b>
<b>Threat 3 - Fire Management</b>	<b>2</b>
<b>Threat 4 - Recreation</b>	<b>4</b>
<b>Threat 5 - Highways, Roads, and Trails</b>	<b>2</b>
<b>Threat 6 - Pest Control</b>	<b>0</b>
<b>Threat 7 - Grazing</b>	<b>0</b>
<b>Threat 8 - USAF Military Activities</b>	<b>0</b>
<b>Threat 9 - Mineral Extraction</b>	<b>0</b>
<b>Threat 10 - Woodcutting and Collection</b>	<b>0</b>
<b>Threat 11 - Development</b>	<b>0</b>
<b>Threat 12 - Utility Lines</b>	<b>0</b>
<b>Threat 13 - Aquatic Resources</b>	<b>2</b>
<b>Threat 14 - Springs</b>	<b>0</b>
<b>Threat 15 - Exotic, Subsidized and Parasitic Species</b>	<b>3</b>
<b>Threat 16 - Feral Animals</b>	<b>0</b>
<b>Threat 17 - Illegal or unauthorized Activities</b>	<b>5</b>

2003-2005 Projects

Of 97 projects nearly half (43) do not claim to address threats to ecosystem categories that fall under the 17 specified threat categories. The greatest number of threats to ecosystem addressed by any one proposal is 12, the average is 2.1.

Ecosystem Threat Categories Addressed	<b>Number of projects</b>
<b>Threat 1 - Population Dynamics/Life History</b>	<b>0</b>
<b>Threat 2 - Commercial Collection and Collection by Hobbyists</b>	<b>11</b>
<b>Threat 3 - Fire Management</b>	<b>18</b>
<b>Threat 4 - Recreation</b>	<b>35</b>
<b>Threat 5 - Highways, Roads, and Trails</b>	<b>26</b>
<b>Threat 6 - Pest Control</b>	<b>13</b>
<b>Threat 7 - Grazing</b>	<b>11</b>
<b>Threat 8 - USAF Military Activities</b>	<b>1</b>
<b>Threat 9 - Mineral Extraction</b>	<b>4</b>
<b>Threat 10 - Woodcutting and Collection</b>	<b>3</b>
<b>Threat 11 - Development</b>	<b>5</b>
<b>Threat 12 - Utility Lines</b>	<b>7</b>
<b>Threat 13 - Aquatic Resources</b>	<b>13</b>
<b>Threat 14 - Springs</b>	<b>12</b>
<b>Threat 15 - Exotic, Subsidized and Parasitic Species</b>	<b>16</b>
<b>Threat 16 - Feral Animals</b>	<b>9</b>

**Threat 17 - Illegal or unauthorized Activities**

**20**

HOW DO PROJECT DESCRIPTIONS ADDRESS MSHCP SPECIES?

We enumerated the number of projects that addressed each MSHCP species. The counts were generated by MSHCP database query of descriptions of projects by the project proponents. Because many of the projects claimed to be working on many more species than might be reasonable to report on in a manner that could inform species status, we assumed that the intent of those projects was to address ecosystems. We did not include projects that claimed to affect more than 10 species in the species analysis (see Appendix 4).

1999-2003 Projects

A total of 182 of 232 identified species (78%) have no projects addressing them. This can be broken down to 53 of 79 of the Covered Species (67%), 29 of 38 evaluation-high species (76%), 10 of the 11 evaluation-low species (91%), 51 of the 53 evaluation-medium species (96%), and 39 of the 51 species on the watch list (76%), are without focused activity of any sort..

2003-2005 Projects

A total of 85 of 232 listed species (37%) have no projects addressing them. This can be broken down to 8 of 79 of the Covered Species (10%), 20 out of 38 of the evaluation-high species (53%), 5 out of the 11 evaluation-low species (45%), 31 of the 53 evaluation-medium species (57%), and 21 of the 51 species on the watch list (40%)

Overall, additional requirements for project description for the 2003 biennium resulted in many more projects being linked to MSHCP species and threats. This reflects the intent of the project proponents to address threats and species, but it does not necessarily result in reliable information provided to the MSHCP that will inform species status or quantify threat reduction.

DO PROJECTS HAVE CLEAR HYPOTHESES OR CONCEPTUAL MODELS?

The central thesis of the MSHCP is that funded projects on federal lands will have a measurable conservation benefit based on published data or widely accepted and demonstrable metrics. The alternative is that funded projects will be implemented as an hypothesis that can be tested for measurable benefits. A project that is determined, by testing an hypothesis, not to have provided a species benefit is an adaptive management success since it informs next management decisions. Most of the conservation actions identified in the Appendix 2 spreadsheets do not state an hypothesis for testing the benefit to the MSHCP or establish a rationale the would justify a theoretical benefit. Most of the projects funded in the last biennium did not adequately describe the rationale for the project providing benefits or advancing the MSHCP goals. The U. S. Fish and Wildlife



Service required more than 20 approved projects to establish specific goals that could be monitored to determine the success of the proposed action.

#### HOW DOES PROJECT REPORTING ADDRESS EFFECTIVENESS MONITORING?

In some cases, final reports on projects that addressed single species contained sufficient reliable information to inform species status (see Chapter 3), but most projects had broader and more diffuse goals, and incomplete reporting, and there was little effectiveness monitoring to document management efficacy. There were no projects that directly quantified the mitigation intended to balance take.

The Desert Conservation Program has been slow to conform to this requirement of the MSHCP and the Permit. To address this deficiency and to improve the quality of proposals for the 2005-2007 biennium the U. S. Fish and Wildlife Service and Clark County have directed the Science Advisory Team to convene a monitoring workshop for the Implementation and Monitoring Committee and DCP participants. The workshop will provide an introduction to monitoring for managers and DCP participants. In addition, there will be an opportunity for management professionals to engage in a dialogue with monitoring professionals about DCP projects.

One of the concerns expressed by project proponents and many others is that every management project should not have to include effectiveness monitoring, especially if it is described to be similar to other projects. This is a legitimate concern. Fencing projects by PIC, NDOT, BLM and NPS to exclude tortoises from roads or gravel pits or other dangerous situations should not each be required to demonstrate that fencing is effective. The program should address this by justifying fencing using existing literature, best professional scientific opinion, tortoise density monitoring, and, if necessary, programmatic monitoring. The proponents of similar management projects need to meet with the County, appropriate Working Groups and the Science Advisory Team to design programmatic monitoring. Such an effort for current and proposed weed eradication and restoration projects led by the University of Nevada Cooperative Extension currently includes SNRT, USGS, UNR, USFWS and other participants. Such cooperative, programmatic monitoring and effectiveness research efforts offer the best opportunity for adaptive management success.

### **Chapter 3**

#### **Species Status Reports**

Clark County's Federal incidental take permit allows take of 78 species if conditions specified in the MSHCP are met. The general obligation of the MSHCP is to assure that these 78 species are conserved and that their conservation is documented in species status reports. Species status reports contain information about distribution, abundance and natural history as well as population trends.

This chapter provides available information from the literature on all 78 species covered by the permit as well as the evaluation and watch list species. The direction of the program toward the goals of documenting conservation of species was examined in the previous chapter by evaluating the distribution of projects in relation to species. In addition, this chapter provides information from reports on MSHCP projects and independent assessments for several species of special concern.

Analyses of knowledge gaps, and species risk and uncertainty are presented to suggest a means of focusing future efforts.

#### **REVIEW OF LITERATURE ON SPECIES**

The baseline status reports for all MSHCP species were reviewed, new literature searches were conducted for all species, and literature citations were updated (Appendix 5). Most species status reports were not updated with new inventory or monitoring data, because appropriate documentation was not provided. At this time only status reports for species that were individually addressed by MSHCP projects can be completed.

#### **SPECIES OF SPECIAL CONCERN UPDATES**

The DCP has invested in inventory, monitoring and research on species or groups of species of special concern. In some instances this was a result of the long-standing concern of management agencies about threats to rare species. The Gila monster, for example, is an Evaluation species and a charismatic animal that is believed to be subject to intense pressure from illegal collecting because of the very high prices it commands on the pet market. It's secretive habits and the paucity of published literature elevated it to a special concern. The relict leopard frog, a Covered Species, is probably the most imperiled vertebrate in Nevada. The relict leopard frog, long presumed to be extinct was recently discovered in a few small springs. Finally, the desert tortoise, the first Covered Species of the DCP, is the flagship species for this program. The expansion of the Clark County Desert Conservation Plan into the Multiple Species Habitat Conservation Plan and the Clark County Desert Conservation Program reflects the belief on the part of the Implementation and Monitoring Committee and the U.S. Fish and Wildlife Service that the conservation actions taken for the desert tortoise would provide benefits to many

other upland, desert scrub species. The desert tortoise is elevated to a higher concern since in addition to being Covered, it is also Listed as “Threatened” under the Endangered Species Act and the requirements of the USFWS. The U. S. Fish and Wildlife Service convened a Desert Tortoise Recovery Plan Assessment Committee (DTRPAC) to review the status of implementation of the Recovery Plan throughout the range of the tortoise including Clark County. The major finding of this committee’s report as they pertain to Clark County is included here and the report is appended (Appendix 6). Finally, other species or groups have been, or are scheduled to be, subjects of planning, inventory or monitoring and special attention, are mentioned below.

### Desert Tortoise

The desert tortoise is the flagship species for the CC MSHCP. It is the listed species that shaped the DCP, and rangewide concerns about the tortoise continue to drive many parts of the DCP. Below are brief summaries from the report from the Desert Recovery Plan Assessment Committee (preliminary draft, Appendix 6). Specific comments relating the rangewide report to Clark County are provide as is a map of priority actions for CC in the next 10 years. The recommendations are amplified in Chapter 6.

### **Problems to be solved**

The DTRPAC found the following general problems to solve (occurring naturally and caused by humans) to facilitate desert tortoise recovery.

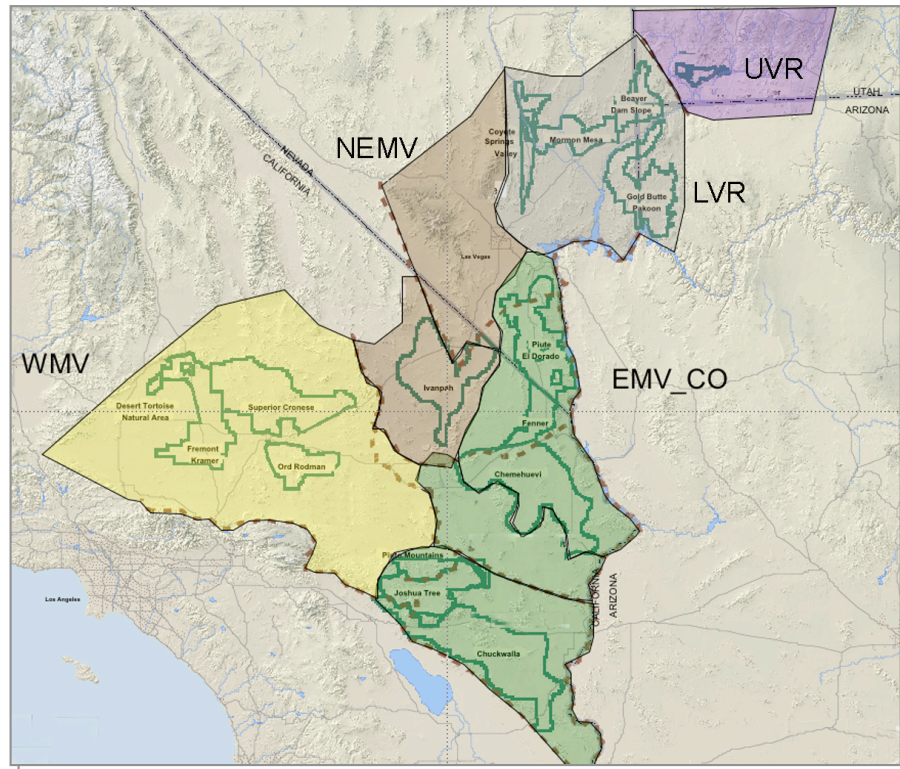
1. The desert tortoise invokes two fundamental challenges: time scale and detectability.
2. Desert tortoise faces simultaneous, multiple threats.
3. Threats to desert tortoises are interactive and synergistic.
4. Recommendations made in the original recovery plan for carefully controlled experiments to generate data and analyses important to monitoring and recovery were not carried out.
5. Much of the data currently available to address tortoise recovery was originally collected for purposes other than addressing tortoise recovery (hence we are doing meta-analyses using data of mixed quality).
6. No group is charged with managing scientific data on the desert tortoise.

### **New DPS designations and the implications**

The DTRPAC has identified genetic evidence that recommends a new designation of “distinct population segments” (formerly called recovery units), and this new arrangement of DPSs changes the landscape dramatically for Nevada because Nevada now will have three (and possibly four) DPSs within the County. This is particularly

difficult because the DPS areas are very small and size alone will make recovery very difficult each DPS is required to recover within its boundaries. The new DPS boundaries and names are as below:

- 1- Upper Virgin River Desert (including Beaver Dam Slope)
- 2- Lower Virgin River Desert -
- 3- Northeastern Mojave Desert (including Amargosa Valley, Ivanpah Valley, and Shadow Valley)
- 4- East Mojave and Colorado Desert
- 5- Western Mojave Desert
- 6- Western Mojave Desert



These new DPSs need to be scrutinized by genetic studies performed rangewide (i.e., by cooperative scientific endeavors in different jurisdictions or planning units. Future revisions will need to respond to the three criteria by which modern DPS units are defined: discreteness, significance, and conservation status. The mechanisms are as follows:

- Genetic core units need to be assessed using both nuclear and mitochondrial genes.
- The genetic boundaries and gene flow among units needs to be critically examined.
- Once these data are available, ecological, morphological and behavioral attributes should be assigned to each of these genetic units. Correlations among established genetic units and carefully quantified and standardized ecological affinities, health status, life history patterns, and stereotypic behaviors.

- The natural history of host-parasite associations for the major disease relationships for desert tortoise should be more deeply elucidated including the genetics of hosts and strains of pathogens.
- At least three disparate, long-term study sites should be established within each proposed DPS to verify the reality, consistency, homogeneity, and variability of these defining traits.
- Finally, DWMA's within each DPS should be geographically revised to maximize their conservation potential in consultation with ecologists and local resource administrators.

Important to Clark County will be nuclear DNA analyses of DPSs in the State. There are particular concerns about the new DPSs as some DPSs are very small now and any threats within DPS boundaries are amplified as a result. This is extremely important and could restructure approaches to desert tortoise recovery.

### **Threats and Impacts**

The old approach to recovery of the desert tortoise is failing everywhere in the range. A new approach emphasizes cumulative, interactive, and synergistic effects of multiple threat factors. The DTRPAC has recommended an entirely new approach.

Important to Clark County is that this approach to threats requires a high level of communication and a cooperative relationship among scientists and management agencies. We must team up to work on these very complicated problems. It is impossible for any agency to launch prioritized threat abatement without analyses like those prescribed by the DTRPAC, and those analyses require team approaches to best inform management actions.

### **Disease as a threat**

A need exists to develop scientifically based recommendations for management of healthy and ill wild tortoises so as to minimize the risk to both individuals and populations of uninfected tortoises, and, by extension, risks both to individuals and populations of infected tortoises. The focus here is on the two recovery actions recommended in the Recovery Plan most relevant to disease threats in light of this need. These two recommendations still are sound, but suffer from almost complete lack of implementation in the past decade. We also recommend epidemiological studies and research on sources of mortality as additional recovery actions, which should be seen as simple extensions of the original actions based on new knowledge available today.

In Clark County, we need to continue studies of disease and develop tools to assess the pitfalls and opportunities of translocation of tortoises in light of potential risks of disease. We have already started in the correct direction for the study of DPSs in Clark County, and the clear needs in the next biennium involve developing immunological tools that will allow us to study the natural history of the pathogen/host relationship directed toward the goal of cautious translocation of tortoises out of Las Vegas Valley into places

like Eldorado Valley (where tortoises numbers are declining dramatically), and to repatriate tortoises in areas where there are problems confounding our recovery.

### **Recommendations important to threats more generally**

Research and management should, through a hypothesis-based approach, focus first on those actions/threats that contribute to a greater number of mortality mechanisms (i.e., involve more linkages in threat topologies) or that affect size structure or fecundity.

Important to the MSHCP are the prescriptions already started that rely on accurate databases, GIS technologies, adaptive management, and peer review. Clark County is already a leader in this area and should continue to blaze the frontier of effective conservation planning.

### **Monitoring**

Monitoring is the heart of any effective conservation program. We have learned much in recent years about monitoring both from our own projects and by interacting with those working on tortoises elsewhere and with those who work on other sensitive species. Monitoring is very difficult, and we now know it must be multidimensional in order to capture enough information to be valuable to adaptive management decisions.

#### **Population-level monitoring**

The DCP has set the standard for tortoise density monitoring, funding not only density monitoring, but also research to improve monitoring, the training of tortoise monitoring personnel for the rangewide effort, analysis of rangewide data and development of improvements to monitoring. We recommend continuation of these efforts with the following considerations:

1. All monitoring should be hypothesis driven. In other words, all monitoring should be experiments to test pre- and post-management actions
2. Data on habitat and threats should be collected as part of tortoise density monitoring so as to extend the scope of density analyses.
3. There should be a top-down organization of personnel to conduct monitoring as a means to have a formalized process for data collection, quality control, and data archival. Standardized data collection and data sharing will allow collaboration so that meta-analyses can be done. All parties who collect monitoring data should have an agreement for data sharing/pooling as well as agreements on publication of the data/analyses.
4. There should be imposed inter-agency coordination to acquire all necessary data for analyses.

5. There should be continued work to modify distance sampling to get most precise estimates possible. This includes, for example, improving detection rates and adding environmental covariates in models of population density.
6. There should be an attempt to determine the maximum rate of growth or decline detectable by the most optimistic methods. This would produce an answer to the question, “in the best of all worlds, is there power to detect a certain level of decline?”

### **Adaptive Management**

The DTRPAC report provides recommendations for a revised desert tortoise recovery plan to include in a framework to guide recovery implementation and conservation planning, whether through individual land management plans, habitat conservation plans, or other management activities undertaken to implement the recovery plan:

- provide quantitative biological goals for the conservation/management plan or recovery action;
- plans should include contingencies applied in the context of hypothesis-based adaptive management;
- data must exist, be accessible, and be explicitly summarized for the conservation/management plan to be scientifically credible;
- include an explicit acknowledgment describing what data are not available to allow a more accurate assessment of uncertainty and risk in the planning process;
- information/data should be maintained in an accessible, centralized location, and monitoring data should be made accessible to other scientists and managers.

### **Science and Adaptive Management**

The need for hypothesis-driven experiments to assess the efficacy of management actions should not be under-emphasized in a revised recovery plan. Other than by coincidence, the effectiveness of recovery efforts depends on the accuracy with which the reasons for decline have been determined (see threats section), and furthermore, we cannot know for sure without an experimental design that an action and any success were causally related. The general list of recommendations for research for desert tortoise is:

#### **Improving understanding of genetics and the relationships between genetics and other attributes**

- Genetic core units need to be assessed using both nuclear and mitochondrial genes.
- Genetic boundaries and gene flow among units needs to be examined critically.

Once genetic data and analyses are available, ecological, morphological and behavioral attributes should be assigned to each of these genetic units. Correlations among established genetic units and carefully quantified and standardized ecological affinities, health status, life history patterns, and stereotypic behaviors.

The natural history of host-parasite associations for the major disease relationships for desert tortoise should be more deeply elucidated including the genetics of hosts and strains of pathogens.

At least three disparate, long-term study sites should be established within each proposed DPS to verify the reality, consistency, homogeneity, and variability of these defining traits

Develop more knowledge about the ecogeography of genetics of disease and hosts as a way to develop recommendations for translocation programs cognizant of the potential harm that can come from lack of information about mismatches between virulence of genetic strains of pathogens with different strains of host.

Non-destructive genetic tissue sampling of tortoises encountered during tortoise density monitoring will allow wide ranging genetic analysis with very little cost for tissue acquisition. This effort is underway in Clark County and should be extend through the tortoise range

### **Improving the value of transect/line distance sampling**

There should be continued work to modify distance sampling to get most precise estimates possible. This includes improving detection rates and adding environmental covariates in models of population density.

If distance sampling is shown not to have enough power to track an population trends, then it may be necessary to redirect effort towards detecting trends in other objects or processes such as changes in carcass density or tracking die-offs, etc. The downside to this suggestion is that some objects or processes may have a time lag that would preclude seeing a decline in adequate time to respond with a change in management.

We recommend that the DCP continue to use transects sampling as these data are extremely valuable. Modify DISTANCE software to incorporate unique needs for tortoises (including modeling  $G_0$  and  $P_a$ ). In addition we recommend the continuation of research to find ways to reduce variance in estimates of  $G_0$  and  $P_a$  as well as to avoid bias due to the clumped distribution of tortoises in the landscape.



**Improving the values of other tortoise sampling methods and statistical interpretation**

There should be an attempt to determine the maximum rate of growth or decline detectable by the most optimistic methods. This would produce an answer to the question, “in the best of all worlds, is there power to detect a certain level of decline?”

Should tortoise densities be determined to be too variable to be useful in assessing effectiveness of management actions, then perhaps density estimates should be treated as “density indicators”. This approach should be used only after it has been determined that assessing density cannot be accomplished precisely enough to be valuable.

There should be an attempt to assess the extent to which data on presence and absence of tortoises could be useful to the goals for monitoring.

We recommend that the continuation of tortoise density monitoring and the research into improving density monitoring includes an assessment of presence and absence data has an alternative or additive data set to inform management.

**Stop Killing Healthy Seropositive Tortoises!**

Ensure that the expedient course of killing seropositive, but otherwise healthy, individuals is kept to a minimum.

**Employ outside expertise**

The DTRPAC and its invited experts consisting of desert tortoise experts, experts on other tortoise species, ecologists, geneticists, epidemiologists, monitoring experts and many others has proved remarkably productive in assessing status of the desert tortoise and recommending monitoring, research and implementation projects. We believe that the solicitation of outside experts from many fields can be a powerful tool in assessing progress, or lack thereof and in focusing on neglected issues.

We have recommend that a science team, including epidemiologists and population biologists, advise the FWS and the DCP on how to make, and keep, the monitoring efforts scientifically credible, and to help adaptively manage monitoring efforts to be most efficacious. This team would also help in prioritization of monitoring efforts.

The monitoring program should include an outside panel of expert analysts to evaluate and recommend how data should be collected and used. The DTRPAC and outside experts agreed that a monitoring program is not useful unless it has a centralized organization, which can provide USFWS with information needed to make informed decision. The centralized program should be rigorous and formal wherein agencies, counties, and municipalities contribute to a centralized fund from which integrated

monitoring projects can be funded which adhere to priorities and approaches consensus on monitoring approaches, data standards, etc.

There should be a conference or workshop to bring experts on many issues of concern to the DCPs tortoise conservation effort to Las Vegas to provide advice and assessment of ongoing programs. Such advice would improve tortoise PIE efforts, monitoring, research and implementation of conservation actions.

The recommendation for tortoise inventory, monitoring, research and management actions from above are formalized as prioritized projects in Chapter 6. In addition, recommendations for tortoise PIE projects not addressed above are in Chapter 6.

### Relict leopard frog

The Relict Leopard frog (*Rana onca*) is a Covered Species that has become extinct in two of the seven known populations since it was included in the Clark County MSHCP. Recent information from the National Park Service indicates, that in recent years, subpopulations may have declined. However, the unit of measure for anuran species like relict leopard frog is not the number of individuals in subpopulations, but the number of subpopulations in the metapopulation. Leopard frogs have an enormous capacity to recruit new frogs into subpopulations, if there is available habitat. Unfortunately, habitat is being lost in Clark County caused by invasion of exotic plants, by predation and competition (actual and potential) with exotic animals (e.g., fish, bullfrogs, crayfish), and by reduced discharge from springs upon which the species depends. The loss of subpopulations has dramatically increased the vulnerability of the species to extinction. The current planning effort lead by the National Park Service has been slow, but it is nearing completion. The very precarious condition of this species, and the recent legal efforts to pursue Listing under the Endangered Species Act through the courts, is a matter of great concern for the DCP since it would suggest that the DCP is not succeeding in conserving a Covered Species. Current MSHCP projects to characterize occupied habitat as well as unoccupied spring sites for their potential as frog habitat are positive steps for conservation of the species. These projects along with other conservation actions taken at springs within the Lake Mead NRA may address some of the concern for the status of this species but they may not be aggressive enough. This species may be the most imperiled vertebrate in Nevada

**Recommendation:** We believe that Clark County should be aggressive in soliciting adequate research and actions to protect its permit. Key to persistence is the populated springs within the Lake Mead NRA. However, NPS should conduct such additional inventory as may be required to search for any additional populations or potential habitat as may exist within the Lake Mead NRA. All management and conservation actions should be conducted as hypothesis-based experiments and evaluated by properly designed monitoring to inform next management steps. Current efforts to increase the number of subpopulations should be accelerated and should include several experimental populations and refugia sites on BLM and other non-Park Service lands. Finally, a temporary, artificial refugium and breeding site should be established in the northern part of the species range near the Muddy or Virgin Rivers. Because leopard frogs can recruit at phenomenal rates if provided opportunities to do so, many tens of thousands of frogs can be generated from experimental ponds tailored to farm frogs for creating new

subpopulations.

### Chuckwalla

The chuckwalla, an Evaluation species for which Clark County originally requested coverage, was the subject of a detailed study contracted through the NDOW (Status of distribution, populations, and habitat relationships of the common chuckwalla, *Sauromalus obesus*, in Nevada). The report, which was late in appearing, has been controversial and has not yet been completely analyzed (see attached report). However, the authors (Brodie, E. D., T.C. Edwards and P. C. Ustach 2003), conducted a detailed survey of the distribution of chuckwallas throughout Clark County and adjacent areas of Southern Nevada. In addition, they conducted a genetic survey using mitochondrial DNA. In their analysis they identify relatively low diversity among individuals two presumptive lineages or clades geographically represented by populations in the Newberry Mountains and Goodsprings and the mountains to the North. The pattern described by these authors raises a number of questions related to next management actions that cannot be resolved with the current dataset.

**Recommendation:** We believe that to determine the current status of chuckwallas as required for the Species Status Report and in order to receive coverage we need a better resolve genetic relationship model. Additional areas of Clark County need to be sampled and an additional level of biochemical analysis needs to be performed. This genetic status survey and a preliminary estimate for populations is need. conducted as experiments and evaluated by properly designed monitoring to inform next management steps. Current efforts to increase the number of frogs and the number of populations should be accelerated and should include experimental populations and refugia sites on BLM and other non-Park Service lands. Finally, a temporary, artificial refugium and breeding site should be established in the northern part of the species range near the Muddy or Virgin Rivers.

### Bats

Worldwide bat species are under assault from habitat loss, the effects pesticide and other industrial toxic effects and other impacts of expanding human development. Several bat species are Covered by the DCP. In addition, one of the requirements of the Permit is for Clark County to develop a Conservation Management Strategy to prioritize next actions to conserve bat species. The Nevada Bat Working Group, a subcommittee of the Western Bat Working Group has produced The Nevada Bat Conservation Plan (Appendix 7). The Plan begun in 1998 and finalized in June 2002 describes each species and suggests general conservation actions by roosting and foraging habitats. It documents approved gate and bridge designs and current and proposed legislation. The document however, does not provide specific inventory, monitoring and management actions for bat species in Clark County. The Planning Working Group and the Implementation Monitoring Committee have prioritized a Clark County Conservation Management Strategy for Bats for the upcoming biennium. During budgeting for the current (2003-2005) biennium Clark County received several proposals for bat monitoring of bat gate installations and for inventories at restricted location (not region-wide, or ecosystem wide). The U.S. Fish and Wildlife Service, the Science Advisory Team and the IMC were critical of and rejected many of the proposals because of the absence of a CMS the prioritized these actions. Literature cited in appendix 7 supports the efficacy of bate gates at excluding most human influences from caves or mines, and permitting ingress and egress by bats, has been demonstrated. The technology for bat inventory and presence/absence surveys is fluid, advancing rapidly and controversial within the bat professional community and the

debate is proceeding rapidly towards but currently is not at resolution.

**Recommendations:** Studies to demonstrate efficacy of bat gate installation in most cases are not necessary and the cost adds little value to the conservation benefit of the gate installation. We believe that localized presence/absence inventories cannot in most cases be justified until the Clark County Bat Conservation Management Strategy has been completed and approved. Finally, we encourage Clark County to proceed with all possible haste in the development of the Bat CMS.

#### Gila Monster

The Gila monster, an Evaluation species was the subject of a detailed masters thesis at the University of Nevada, Reno by Chris Gienger (The Natural History of the Gila Monster in Nevada). In this study Gienger determined that Gila monsters are extremely secretive in their habits and difficult to detect in habitats where they occur. Among other natural history topics addressed by Gienger was the characterization of Gila monster habitat and the creation of a habitat model. The development of this model is extremely important in identifying areas of Clark County where Gila monster inventories should be directed. However, the model needs to be tested using indirect searching techniques. Finding efficacious indicators for Gila monster habitat or more cost efficient survey methods can be extremely valuable in advancing our understanding of the distribution and abundance of the Gila monster to a state sufficient to identify and prioritize conservation actions.

**Recommendation:** The Gila monster habitat model should be tested using several recently developed techniques using the current study population. Countywide testing of the model should follow testing and validation of new survey techniques.

#### Low Elevation Plants

The U.S. Fish and Wildlife Service has directed Clark County to develop a Conservation Management Strategy to prioritize actions for Low Elevation plants. The Federal Land management agencies have been concerned about the status of a number of low elevation plants, both generalists species that are rare and specialist species that are restricted geographically or ecologically. Plants make up the largest taxonomic group among the Covered Species. To address the permit requirement for a Low Elevation Plant CMS Clark County has contracted with The Nature Conservancy to produce a CMS. This CMS addresses nine covered lower elevation plant species: sticky ringstem, Las Vegas bearpoppy, white bearpoppy, threecorner milkvetch, alkali mariposa, forked buckwheat, sticky buckwheat, white-margined penstemon, Parish phacelia (*Anulocaulis leiosolenus*, *Arctomecon californica*, *Arctomecon merriamii*, *Astragalus geyeri* var. *triquetrus*, *Calochortus striatus*, *Eriogonum bifurcatum*, *Eriogonum viscidulum*, *Penstemon albomarginatus*, and *Phacelia parishii*). The CMS will describe background status and trend information; develop conservation measures necessary to adequately protect and conserve; outline plan implementation requirements, including identification of specific projects, needed capacity, schedules and timelines; and, adaptive management strategies and measures of conservation success. The development of this CMS is currently proceeding.

In the last biennium and in the current biennium there were projects to inventory, monitor these species as well as projects to implement on-the-ground conservation actions. The

final reports on these inventory and monitoring projects are uneven, but several that focused on individual species are complete and sufficient to inform the Species Status Reports if they are placed in the context of a CMS.

**Recommendations:** The planning effort for Low Elevation Plants is important and needs to address the priorities for inventory, monitoring, research and management actions for these species. We believe that new or continuing inventory or monitoring projects should be restricted to those that will inform the planning process or the will address immediate and obvious threats and if the projects meet the requirements of inventory and monitoring outlined elsewhere in the report. The matter of informing the Species Status Report with the results of inventory and monitoring is serious since it impacts the ability of Clark County to meet its Permit requirement.

### Butterflies

Substantial attention has been afforded butterflies under the HCP in recognition that nearly a dozen taxa are endemic or mostly restricted to Clark County. The majority of those butterflies are limited to small portions of the Spring Mountains, where they exhibit precinctary distributions resulting from narrow larval host plant associations and limited habitat availability. Several species are at already demonstrated risk from current or potential management activities and are likely to be negatively impacted by increased visitation to the area. Reports to the U. S. Forest Service document the general distributions, relative abundances, and key life history characteristics of these species. The Forest Service has let small (\$10-12,000) contracts annually to “monitor” the HCP’s Covered Species in the Spring Mountains. None of those contracts have produced data that would allow for quantitative assessment of the status or trends for any species. The work carried out, however, has increased an understanding of the extent of the distributions of the target species, has added new locations of occurrence for several species, and has elucidated important life history and other critical information important to future management of them. The funding has not been wasted.

It should be recognized that no field techniques are available to assay and estimate population sizes of any of the Spring Mountains butterflies of concern without prohibitive costs and unacceptable levels of invasive impact on the populations themselves. Furthermore, it is not clear how management would respond to even catastrophic declines in the numbers of several of the species. A review of available information (including the substantial historical database from the Spring Mountains) in support of an evaluation of species needs and management opportunities would be useful. Better characterizing the goals and objectives of the ongoing annual field efforts is necessary. A well-designed set of protocols for determining presence or absence of select species at standard sites could be used to inform an incidence-function modeling effort that could in time allow prediction of expected versus realized distributions, which could be used to trigger management intervention.

At the time of the issuance of the HCP permit, the status of a number of butterflies in Clark County beyond the Spring Mountains was not as well known as it is now. On the strength of recent focused studies on the Muddy River, it is now clear that the two most

at-risk butterfly species may be the Graciaele's skipper and the obsolete admiral both restricted in Nevada to the county's riparian communities, where both have been subjected to dramatic population declines in recent years. These two species, neither recognized in the HCP, need elevated attention.

#### Phainopepla

In southern Nevada, phainopeplas and their principal food, desert mistletoe, are at the edge of their range, where cold and drought may produce fluctuations in bird and mistletoe berry abundance not observed at the range core.

Preliminary analyses suggest that phainopepla occupancy and abundance are positively correlated with mistletoe production, and to some degree, the presence of large riparian trees. The correlation with mistletoe may help explain why in some years, phainopeplas are more abundant in the area south of Las Vegas. However, some short-term temporal variation in phainopepla occupancy and abundance may not be predicted well by mistletoe production.

Breeding success is variable among sites and years, and may not be entirely predicted by berry abundance. Breeding success in catclaw acacia sites may be more variable than in mesquite sites. While phainopeplas' occupancy of a site during the breeding season may depend on mistletoe production (and perhaps past breeding success), the clutch size, number of nests/pair and fledging success appear to be influenced also by spring weather and predation intensity, among other factors.

The density of phainopeplas/site should not be confused with their breeding success at that site. In fact, in many instances, phainopeplas had better breeding success in a given site in years when the density was low than when it was high. In FS2 especially, they had better breeding success in low-density sites than in high. Density, climatic conditions and predation may interact to influence breeding success.

The temporal and spatial variability in phainopepla abundance and breeding success indicate that phainopepla management plans and actions cannot focus solely on a few sites, but must encompass a wide range of mistletoe-infected catclaw acacia and mesquite sites throughout Clark Co. and neighboring counties. These plans must also incorporate the possibility that over the longer term, the spatial distribution of mistletoe could change considerably.

#### Overall status of status reports.

Except as specified above, we have very little information on the status of the 78 species covered by the permit. The DCP needs to address this deficiency quickly. Because there are so many Covered Species, the analyses presented below could aid in prioritizing species for immediate work.

## KNOWLEDGE GAPS

To conserve and manage species adaptively it is necessary to have knowledge of the distribution, habitat requirements, natural history, threats and management options. To adapt management it is necessary to monitor population trends or some indicator and filter environmental noise from the signal. Published, peer-reviewed literature on these topics provides the greatest confidence in the reliability of the knowledge, internal reports, best professional opinion and anecdote are less reliable sources of information. The MSHCP presented limited reviews of the available literature, reports, best available, local professional and amateur opinions on the distribution, habitat requirement, natural history, threats, management options and population trends. In assembling and updating a Species Status Report the first step is to review the recent published, peer-reviewed literature, reports, opinions of experts, and recent anecdotes. We reviewed standard literature citation sources, where possible secured reprints of the papers or, at least the abstracts, added these to the MSHCP website database and cited these papers in the draft Species Status Report by species. The recent internal reports of inventory and monitoring and the data on which they were based for many of the Covered Species by local and regional agencies have not been provided to the Clark County Database and we were unable to cite these and use them to update and inform the draft Species Status Report.

For each of the Covered Species we gave a numerical score of 1 = little or no knowledge and 5 = considerable or sufficient knowledge with intermediate values representing intermediate states. This process was somewhat subjective and reflected a professional level of confidence in the current state of knowledge. For example, a species that is well known within the professional community to occur in one or a few locations, and that has been the object of considerable professional field searches would score a 4 or 5 on knowledge of distribution. An example of such a species would be the Blue Diamond cholla *Opuntia whipplei* var. *multigeniculata*, that is known from only the Blue Diamond area. A species that is more widely distributed but with a patchy and poorly understood distribution such as the long-nosed snake, *Rhinocheilus lecontei lecontei*, might receive a score = 2. Such a scale is subjective and experts might, or probably would argue over tenths of points. However such a categorization is useful in describing gaps in our knowledge and prioritizing projects to fill those gaps. We summed all of the values for each species and assigned priorities of Highest, High, Moderate and Low (see Appendix 8).

No Covered Species ranked in the Highest Priority category which that would have suggested that nothing was known about the species and that it probably should not have been covered. Fifty-four species ranked as High Priority for having knowledge gaps. Undoubtedly reports exist and data is in the possession of agencies and experts that have not been submitted to the MSHCP Database that would have lowered the Priority ranking for some those species. This illustrates one of the problems of the program that is inhibiting our ability to document permit compliance and conservation progress.

Recommendation: The paucity of the information necessary to produce adequate and informative Species Status Reports on the Covered Species is a serious deficiency in the DCP. We propose in Chapter 6 a Species Status Report Initiative that would use existing Knowledge Gap analysis and input from species experts to prioritize and create a timelines for filling the knowledge gaps for Covered Species and other species of concern.

## SPECIES RISK/ UNCERTAINTY ANALYSIS

One approach to prioritize actions for species when there are gaps in our knowledge, limited resources, and threats that are poorly understood is to establish a the highest priority for the combination of greatest risk due to known threats and the greatest uncertainty about risk, biology or management options. When there is greater knowledge or the threats are not as severe then the priority should be less. We conducted such an analysis on the Covered and Evaluation species based on best professional judgment and the information contained in the MSHCP and the scientific literature (appendix 9). Such an analysis is subjective but it provides a basis for comparing relative levels of risk and uncertainty. A manager may be willing to tolerate a higher level of uncertainty for a widely distributed species than for one that is narrowly distributed and that difference would be felt as a difference in the relative risk. This analysis gives considerable weight to uncertainty in establishing management priority and this can be useful in adaptive management scenarios where collecting information (reducing uncertainty) is a significant part of the “next actions” decision-making process.

## SPECIES STATUS REPORTS --CONCLUSIONS

The MSHCP requires Clark County to produce Species Status Reports “detailing results of inventory, monitoring, and research together with recommendations for management action including changes important to the AMP” with “a description of inventory, monitoring, and research activities including data and analyses pertinent to management within the AMP.” It further directs that “ analyses and conclusions will include evaluations with respect to specific goals and objectives identified in the AMP and approved by the I & M Committee and the USFWS” and warns that the “quality of the data, conclusions, and recommendations in the species status reports is critical to this process and to assuring the USFWS that the inventory and monitoring will be ensured through the application of the highest scientific standards” (MSHCP 2.8.2.6). The Species Status Reports for the Covered Species are essential for decision-making by the resource managers, the USFWS and the IMC. At a minimum the Species Status Report must demonstrate that the DCP has properly prioritized funding of projects to assure the USFWS that the Covered Species are being managed so that Listed Species are being recovered and Covered Non-Listed Species are being conserved and managed to meet the biological objectives of the DCP. At a minimum the Species Status Report for each Covered Species and other species of concern should describe the distribution, population status, threats status, management, inventory monitoring and research results. Currently, the Clark County Database has received a few reports and little primary data on Covered Species (with the exception of desert tortoise monitoring on BLM land) that could permit even the most rudimentary Species Status Report.



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The Species Status Report is a required and critical part of HCP reporting and essential to proper functioning adaptive management. The importance of the Species Status Report has not been emphasized during previous MSHCP budget processes.

It is also important to note that species that are not on any MSHCP list have been found in Clark County as the result of monitoring experiments with broadly described taxonomic groups (butterflies). The MSHCP is currently without a mechanism for identifying such new species, or for moving species from Watch list to Evaluation to Covered.

**General Recommendation:** The most important reporting requirement of the MSHCP is the current status of the Covered Species. The highest priority for the next actions is to fill any gaps in our knowledge of the status of the Covered Species.

## **Chapter 4**

### **Adaptive Management Progress and Problems**

The MSHCP identified five significant areas as the initial focus of the Adaptive Management Program: 1) development of the GIS database, 2) identification of indicator species, 3) evaluation and management of roads and OHV activity, 4) management of those species which appear most likely to be listed absent management, and 5) evaluation of the means to enhance cost-effectiveness of existing management actions. The significant areas were identified as a means to acknowledge and address management urgencies and at-risk species, and to develop tools that will address the need for reliable information and management economies. There has been progress in all of these areas, but several new and several persistent problems have been identified. Both progress and problems are discussed below.

#### **PROGRESS ON INITIAL FIVE SIGNIFICANT AREAS OF THE AMP**

1. Development of GIS capacity – The BRRRC established a GIS laboratory in the BRRRC field office. The purpose of this office was to create a central repository for GIS data from all participants in the MSHCP. This repository is meant to be a place where data are assembled, integrated, checked for precision and accuracy, and made available for analyses. The concept was that MSHCP partners and contractors producing spatially explicit data would bring data to the GIS lab, and some coverages spanning jurisdictions would be knitted together and made available to MSHCP participants, such that spatially explicit information would be transformed from agency/entity-specific data into an integrated countywide database. The issue of quality control and archiving has been independently approached Clark Count However, agency GIS specialists appear not to be familiar with the goals and methods for the DCP; this creates a technical barrier between objectives and technologies that need to be addressed. Two facts work against us meeting our goals for the GIS lab. First, we do not have higher-level staff possessing both GIS expertise and HCP/Monitoring expertise who oversee the GIS lab. Second, MSHCP partner agencies have their own GIS facilities and their own protocols for spatially explicit data, and they appear to have little time to help assemble a County product as a database. Thus, the MSHCP GIS lab has not yet reached its potential.

Nevertheless, the GIS lab has been important to various HCP efforts. It maintains the weeds database and supplies spatially explicit data on weeds to the State. It has helped working groups devoted to planning with data on lower-elevation plants, weeds, tortoise fencing, phainopepla, biological aspects of rural roads, DTCC planning, and planning for a new LSTS. Thus, the GIS lab has been extremely important, but it has been slow to develop due to the lack of expert oversight. BRRRC has committed to provide the expertise. Dr. Jill Heaton was recently hired by the UNR Geography Department and BRRRC, and she will be available to help on data management and use. Dr. Heaton has been the principal database expert on tortoise monitoring, and is proficient in structuring database management systems.

2. Indicators Project - The indicators project has monitored populations of small mammals and squamate reptiles with respect to secondary roads, off-road vehicle tracks, and vegetation in a bajada community in the Mojave Desert of southern Nevada to determine whether surrogates could be identified for land management. Three factors were extracted from field measurements of disturbance (using a principal components analysis) that were related to road density, the density of off-road tracks, and vegetative cover. These factors were used in a regression analysis to determine their influence on species richness, diversity, and evenness, along with their influence on the abundance of individual species. Vegetation positively affected species richness and species diversity. Road density negatively affected species diversity. Species evenness was unaffected by vegetative cover, road density, or off-road tracks. Road density, off-road tracks, and vegetative cover influenced the abundances and presence of several species. Furthermore, the absolute and relative abundances of several species were indicative of the richness and diversity of species, though the direction of their effect was not uniform among species. Of all the species examined in this study, *Cnemidophorus tigris* (the desert whiptail lizard) may be a top candidate for indicator species status. High numbers of individuals at a given location, relative to the total number of individuals of all species, was indicative of low diversity and richness, and was associated with impacts from high road density.

While there was substantial information value in the data, the cost of collecting those data was high. The study indicated that better approaches may be available. Specifically, this study showed natural relationships between various kinds of disturbances and presence and absence of specific species, as well as species diversity (a metric for the number and relative abundance of each species in the communities). A project has been initiated to assess disturbance using remote sensing. If environmental modification (e.g., adding unpaved roads, modifying movement of Aeolian sands, change of environment due to fire, changing the water table) can be assessed by remote sensing, predicting the results to environmental biodiversity should be possible.

3. Evaluation and management of roads and OHV activity -The roads project used the network of roads in Clark County as a means to systematically survey the biodiversity of the county, and develop a model that illuminates the abiotic controls on biodiversity patterns in Clark County. A long-term goal of the project is to rank all Clark County roads according to their biodiversity value. There are few direct geographic measures of biodiversity in the county, yet the need to understand the distribution of biodiversity in the county is immediate and great.

The project goals are to 1) acquire and assemble the databases, 2) extract the meaningful data from the GIS data layers, and assemble them into a spreadsheet, and 3) assign rankings to the roads according to their predicted biodiversity value according to a preliminary biodiversity model, 4) collect biodiversity data along roads in the field, 5) perform the analysis again, and 6) refine the biodiversity model. The first three goals were met, progress toward the fourth goal was made, and goals five and six were suspended temporarily due to an unexpected problem in all available road data layers.

A preliminary analysis of the data indicates that the Salt Desert Scrub cover type appears to be adequately protected. Road length was by far the highest correlate to any biodiversity measure, that is, the longer a road, the higher biodiversity score. Short roads either had a stream intersection or not, or came close to the habitat of a species of concern or spring or not. The road case study in the DTRPAC Report (Appendix 6 Sect. 4.3.1) demonstrates that road proliferation has had a significant negative impact on desert tortoise recovery efforts. The current roads project is providing good data on the relationship between biodiversity and roads impacts. This project needs to be expanded into a more detailed assessment of the impact of the Clark County road network on the desert tortoise.

4. Management of those species that appear most likely to be listed without proactive action -The first goal of this project was to assemble information to address species status. Projects that address those species are discussed in Chapter 3. Recommendations for management and future projects are in Chapter 6.

5. Evaluation of the means to enhance cost-effectiveness of existing species and habitat management actions - Data were gathered over a 30-month period to ascertain relationships between invasive salt-cedar and native biodiversity in riparian areas in Clark County. At the primary study site on the upper Muddy River information on salt-cedar densities and the distribution and abundances of native plants, birds, and butterflies was obtained allowing important conclusions about the relationship between the invasive species and native biodiversity. Although monocultures of salt-cedar were depauperate of native species, mixed stands of salt-cedar and native vegetation served to support substantial native species diversity. Because residual native biodiversity is supported in areas subject to salt-cedar management, eradication efforts should attempt to retain native plant cover, be carried out in smaller patches, and be immediately followed with restoration actions, including out planting of natives.

These studies also examined whether relatively limited sampling can provide valid inferences about biological responses to restoration actions. In the Mojave Desert, invasion of salt-cedar (*Tamarix ramosissima*) has altered vegetational communities and some measures of faunal diversity. The effects of six vegetation-based predictor variables on species richness of butterflies in the Muddy River drainage was examined. The effect of sample size on conclusions about relationships between vegetation and butterflies was examined by using data from a subset of the 85 locations included in the study. The major finding was that the effect of non-native plants on species richness of butterflies was negligible. Availability of nectar had the greatest independent explanatory power on species richness of butterflies, followed by species richness of plants. In comparison with the full data set, sub samples including 10%, 25%, and 50% of sites yielded similar conclusions. Results suggested that relatively limited data sets can still allow one to draw reliable inferences for adaptive management in the context of ecological restoration and rehabilitation.

The study also (1) examined relationships between avian diversity and measures of vegetational diversity (species richness, dominance of non-native plants, and vegetation structure [total vegetation volume]), (2) explored the extent to which avian community composition was associated with vegetation composition (floristics) or vegetation structure (physiognomy), and (3) considered the potential effects of alternative land management and ecological restoration strategies. The major finding was that species richness of all birds and of breeding birds was best modeled by total vegetation volume alone. Neither species richness of plants nor dominance of non-native plants had a statistically significant effect on species richness, abundance, or evenness of birds. Species composition of birds between sites was more similar when floristics was more similar, and vice versa. Species composition of birds was not correlated with physiognomy. Species richness of native birds in the Muddy River drainage appears not to suffer from invasion of non-native plants, provided that the vegetational community retains sufficient structural diversity. The composition of the bird community is closely related to floristics, and other taxonomic groups may exhibit different responses to vegetation structure and composition. Therefore, explicit strategies for landscape-scale management, restoration, and maximization of native faunal diversity should consider how removal of invasive plants may affect physiognomy and floristics of the vegetational community as a whole.

Since both time and money for sampling and decision-making are limited, the effects of temporal scale of sampling on inferences about the response of animal diversity to non-native plants and plant diversity were examined. Data were resampled to determine whether similar inferences about relationships between plants and butterflies in the Muddy River drainage could have been obtained by sampling less intensively (fewer visits per site over the same period of time) or less extensively (equal frequency of visits, but over a more limited period of time), testing whether relative occurrence rates of butterflies accurately would be reflected in temporal sub samples. Results indicated that temporal sub sampling generally would not lead to erroneous inferences about the relative importance of six vegetation-based predictor variables on species richness of butterflies. Similarly, regardless of temporal scale of sampling, species composition of butterflies was more similar in sites with similar species composition of plants. The rank order of butterfly species occurrence in the temporal sub samples was highly correlated with the rank order of species occurrence in the full data set. Thus, similar inferences about associations between vegetation and butterflies, and about relative occurrence rates of individual species of butterflies, could be obtained by less intensive or extensive sampling over time. If compromises between temporal intensity and temporal extent of sampling must be made, it is now thought that maximizing temporal extent will better capture deterministic variation in biotic interactions and species occurrence.

Conclusions: These five projects generated information on a small number of species and have improved the capacity of the DCP AMP to inform management decision-making. Also, together with the examination of DCP project reporting described in Chapters 2 and 3, these projects have revealed some new and some persistent problems for the DCP that, if not corrected, are likely to undermine the ability of the DCP to meet its goals.

## **NEW AND PERSISTENT PROBLEMS**

### **Deficiencies of Information.**

#### **Absence of effectiveness monitoring at an appropriate scale.**

The MSHCP requires documentation that funded actions are effective and result in conservation benefits. Such documentation comes from effectiveness monitoring. The need for effectiveness monitoring, or research, or the use of the scientific literature to make a reasoned case that the action has been documented to provide a benefit in similar circumstance in all implementation projects has been discussed many times. We will make specific recommendations (see Chapter 6) for project or programmatic level effectiveness monitoring or research information provided with regard to the four elements of monitoring: 1) clarity of management objectives, 2) conceptual models, 3) selection of indicators, and 4) sampling design.

#### **Absence of population trend or appropriate indicator monitoring.**

The MSHCP the Permit requires that one of the quantifiable biological goals for all Covered Species is a “stable or increasing population numbers.” The MSHCP discusses in detail the use of “short-cuts” or indicators of population trend in order to reduce the expense of monitoring all Covered Species but such indicators must be demonstrated to have a statistically reliable predictive value. We have not yet identified appropriate indicators of population trend for any species. We have available population monitoring for only a few of the Covered Species (desert tortoise, Las Vegas bear poppy, relict leopard frog, peregrine falcon). The absence of population trend data for most Covered Species constitutes a program deficiency.

#### **Absence of habitat and threat monitoring.**

In addition to monitoring population trends, as a measure of the overall effectiveness of all management actions, it is important to monitor threats. In many cases, such as desert tortoise, threats may take a long time to be reflected in population trends and once having caused population levels to decline the management required to reverse the decline may be expensive or require a long time to determine success. Monitoring of threats can be a “short cut” to management actions in efforts to reduce the threats before they can have a significant and deleterious population level threat.

#### **Inadequacy of project description and reporting.**

All aspects of the DCP are geographically based, the distribution of individuals and populations the locations of threats or conservation actions the underlying biological and physical features that define habitat. The use of geographical imaging to understand the population dynamics or threat mitigation has been one of the most powerful developments in adaptive resource management. The accurate and complete reporting of data is a deficiency of the DCP. The capacity of the adaptive management process to inform next steps is crippled by the absence of high-resolution geographic and quantitative information. Many implementation projects are so poorly described and

reported that geographical reconstruction of the presumed conservation actions cannot be documented and the presumed conservation benefit cannot be assessed after the fact.

**Projects with an inappropriate spatial and temporal scope.**

The Clark County DCP has as its program area the entire county and in some cases habitats beyond the county borders. Within the County there are state, federal, and local lands that support habitat for Covered Species. The distributions of many of these species cross administrative boundaries. Individual land managers have organizational priorities that generally stop at the border of the their agency's land. Inventory, monitoring, implementation or other projects directed at species must treat the entire range of the species in order to provide species level information or species level benefits. Inventories for rare species cannot be legitimately hypothesis driven if the inventory is, by design, confined to a single administrative unit. The only known occurrence for a species may be on land managed by one agency, but in few instances will a habitat type be so restricted. Correctly designed inventory searches would need to distribute search effort across the extent of the hypothesized habitat regardless administrative boundaries. This same admonition applies to monitoring, research, and conservation actions to address threats, PIE projects, and others. Temporal scope is sometimes inappropriate to the project and needs to be explicitly defined, or at least reasonably estimated. Some monitoring projects, desert tortoise, for example, must extend through several biennia in order to determine trend. The artificial truncation of projects at two years cannot assure information adequacy in all cases and re-proposing the same project creates needless additional administrative expense. Similarly, the MSHCP has several large ongoing programs (including law enforcement, public information, fencing and administration) that have not changed in general outline for several biennia and might be more efficiently handled with longer periods between re-proposal.

Competing Priorities.

**Differing Needs and Permit Obligations for Upland vs. Riverine species**

The initial list of Covered Species included species from upland habitats, primarily desert scrub communities that harbor the desert tortoise and many other co-occurring species. In addition, species were included from upland riparian, edaphic, aeolian sandy and rocky outcrop upland environments that co-occur with tortoise habitat. Some species found in alpine, riverine, and other environments were also included as Covered, however, the majority of species and the greatest emphasis for conservation was on those species found in upland scrub communities, because these species were most directly impacted by the residential development that is occurring primarily in that environment. For implementation of weeds eradication actions, in contrast, most MSHCP effort has been expended in riparian areas with much less attention to upland weeds that may impact more Covered Species. There are persuasive arguments for such an emphasis but riparian species and riverine environments were identified as subjects for Phase 2 of the MSHCP. Eradicating weeds in riverine environments is clearly important and needs to occur if riverine species are to be conserved but few riverine species are Covered. In addition, riverine weed eradication is expensive and perhaps should not be a priority for

the DCP until the status of currently Covered Species is more secure. Priorities need to be established based on threats to or conservation benefits for Covered Species.

### **Land Management Conflicts: Conservation versus recreation**

All of the federal land managers encourage recreation as part of their management mandate. The National Park Service and the Bureau of Land Management at Red Rock National Conservation Area are directed to emphasize conservation and preservation over recreation. The Spring Mountains Conservation Agreement provides the Forest Service with additional conservation mandates above normal forest management. However, much of the upland areas managed by the BLM are also subject to impacts due to various recreation activities permitted and encouraged by multiple use policies. The cumulative impacts of these recreation activities on Covered Species and ecosystems are not known. In addition, the increase in funding for the projects of the Federal Land management agencies through the Southern Nevada Public Lands Management Act (SNPLMA), including Conservation Initiatives and infrastructure development, have overwhelmingly promoted or supported recreational activities, some even in backcountry areas. Promoting recreation in areas they have had relatively little impact without an assessment of the impacts is in conflict with the goals and objectives of the MSHCP. Those goals should be supported by the Federal Land Management Agencies that are MSHCP partners.

Clark County was assured by the sponsors of the legislation that SNPLMA funding would benefit conservation; instead, the availability of additional funding may have made reaching conservation goals more difficult. The MSHCP is required to mitigate for the impacts of development on the Covered Species. If the projects of the Land Managers are promoting recreation that negatively impacts Covered Species then Clark County must fund additional mitigation to compensate for the cumulative impacts of federal land manager sponsored recreation.

### **Competing Priorities for Staff**

The DCP is a large multidimensional program that places extremely heavy demands on very limited staffing in the County and in all the MSHCP partner agencies. Staff responsibilities often include coordination of many types of activities with very different demands on scheduling and expertise. Under these circumstances, errors of omission are likely to occur and indeed, have occurred, as noted below.

### Deficiencies in Securing and Quantifying Mitigation

#### **Mismanagement of the Boulder City Conservation Easement**

Clark County purchased from Boulder City a conservation easement on approximately 85,000 acres of desert tortoise habitat in Eldorado Valley. The Boulder City Conservation Easement (BCCE) sets forth the conditions of the grant to Clark County and establishes the procedures for management of the Easement for conservation benefits. The Biological Opinion for the issuance of the MSHCP further establishes conditions for Easement management as follows

“Future development or use of the Boulder City Conservation Easement must be consistent with the goals outlined in the DCP to protect and manage desert tortoise



and its habitat, and measures would be taken to ensure maintenance in perpetuity, of connectivity for desert tortoise and other Covered Species”

Among the conditions for Easement management is that OHV Non-Speed Events may be permitted with the approval of Clark County and the U.S. Fish and Wildlife Service. At a recent Fencing Working Group meeting the BLM Recreation staff admitted that BLM has been permitting several speed OHV events each year that pass through the BCCE and have required only written authorization from Boulder City, Department of Parks and Recreation. Neither the USFWS nor Clark County staffs could recall receiving a request to review a permit for a speed or non-speed OHV event in the BCCE. We do not have any information on the number or extent of speed and non-speed events permitted in the BCCE in violation of the terms of the Easement and in violation of the terms of the Permit. It was reported by the Clark County funded law enforcement officer for the BCCE that Boulder City officials has stated they wanted to make Boulder City the OHV racing capital, presumably the races would be in the BCCE.

The DTRPAC Report kernel analysis of tortoise density data shows a large number of tortoise carcasses and very few live tortoises in the BCCE. The tortoise populations in the BCCE are tending toward extinction. Clark County has funded a Law Enforcement position for the BCCE for several years. Clark County and the Nevada Department of Transportation (NDOT) are in the process of constructing tortoise fencing along highways adjacent to the BCCE in compliance with the MSHCP and the Permit to enhance tortoise conservation by fencing roads. The actions of Clark County and the NDOT to implement conservation actions and the deliberate actions of Boulder City to violate the terms of the Conservation Easement and the Permit are clearly in conflict. The BLM Recreation staff has not been well informed about the terms of the MSHCP and the Permit but their actions were clearly inadvertent. The net impact of consequences of Clark County’s purchase of a conservation easement from Boulder City and funding of conservation actions has been to allow Boulder City to jeopardize the continued existence of the desert tortoise in the BCCE.

#### **No Effectiveness Monitoring for Large Section 10 Expenditures.**

A large portion of the Section 10 budget has gone to Information and Education programs and to Law Enforcement. Although these programs can be primary instruments of land use policy, their value to the measurable biological objectives of the MSHCP may be indirect and has not been quantified. The reluctance to pursue effectiveness monitoring is due in part to the widely held presumption that the value to conservation cannot be measured or would be prohibitively expensive to measure. Instead, both programs have been subjected to other kinds of assessments.

The Law Enforcement Needs Assessment (Appendix 10) documented the increased need for public lands law enforcement with increases in population. Increasing MSHCP law enforcement funding in conjunction with that population would rapidly consume all of the Section 10 funds without providing any scientifically reliable information about benefits to species or habitat and without the quantification of mitigation to balance take that is required by our permit. Law Enforcement currently consumes 40% of the Section

10 funds, and it is not reasonable to continue that funding without a commitment to pursue effectiveness monitoring through the formulation of clear conservation goals and a conceptual model for effectiveness of law enforcement activities in reaching those goals.

The PIE program is a requirement of the MSHCP and the permit, but it also consumes program resources without producing quantified benefits to species or habitats. The Strategic Solutions PIE Program assessment (Appendix 11) has so far provided substantial guidance to improving the reach of PIE projects, but the assessment is not intended as effectiveness monitoring for species benefits. Although the effect of PIE programs may be indirect and slow to develop, there is no acceptable rationale for failing to document species benefit for substantial expenditures of the conservation program. Like the law enforcement program, it is not reasonable to continue that funding without a commitment to pursue effectiveness monitoring through the formulation of clear conservation goals and a conceptual model for effectiveness of public information and education activities in reaching those goals.

#### **No Permanent Value for Conservation Actions in Un-Managed Areas**

The MSHCP requires that mitigation funds for “take” of species and habitat will be spent on management actions, primarily on public lands that will meet quantifiable biological goals for each Covered Species. The MSHCP has no quantifiable biological objectives for UMAs. The MSHCP identifies UMAs as including:

- Private lands
- Indian reservations
- Intensive/developed recreation use areas
- Highways and material sites
- Lands disturbed by previous land uses
- Mines
- Landfills
- Intensive agriculture
- Nellis Air Force Base and Indian Springs Air Force Auxiliary Field

Funding conservation actions on these lands was identified in the MSHCP as very low priority because these are lands that are not primarily managed for the conservation of species. The MSHCP identified federal lands as the primary location for funded conservation actions because the federal land managers have laws, policies, procedures and a contractual agreement with Clark County to manage for the conservation of Covered Species. The MSHCP described conservation easements as one of the tools that would permit expenditure of MSHCP funds on private lands that could result in permanent conservation benefits, that is the property owner would legally grant an easement to Clark County to manage for the conservation of Covered Species. The expenditure of substantial funds on conservation actions on the lands listed above without the benefit of a conservation easement or other legally binding permanent commitment to conservation is not readily defended. The MSHCP has spent more than twice the cost of

the Boulder City Conservation Easement (which has a legally binding commitment to conservation) on conservation actions on lands that fall into the above categories without conservation easements. Conservation actions on such land cannot be assumed to have permanent value. There is no justification for such expenditures.

## **CONCLUSIONS**

The MSHCP AMP has been developing and continues to develop better tools for effectiveness monitoring, but there are institutional impediments to developing and sharing reliable information that must be overcome if the measurable biological objectives of the MSHCP are to be met. In addition, it is clear that the program has not been focused on securing quantifiable conservation benefit for species. Permittees and partners have not honored agreements and commitments, and tortoise populations under the protection of the MSHCP are now declining.

## Chapter 5

### Suggestions for Future Projects from MSHCP Partners

The federal land management agency MSHCP partners and two working groups submitted the lists of priorities for consideration as MSHCP projects for the next biennium. These are not complete, but give some indication of the concerns of the land managers and other HCP participants at this time. Brief comments, by the Science Advisory Team, on the distribution of these priorities relative to MSHCP species and habitats are presented at the end of this Chapter.

#### PRIORITIES FOR MSHCP AGENCY PARTNERS

##### NPS, Lake Mead NRA

The following project suggestions, including the text in italics (project description) and the text that is not italicized (brief explanation) as well as the headings are from the National Park Service. The initials NPS (National Park Service) and the number and the bold habitat category in brackets were added by the Science Advisory Team for convenience of reference.

#### Vegetation Program

##### General Vegetation Program

*NPS-1 Surveys of un-surveyed and under- surveyed areas of Lake Mead NRA for undocumented species, including mapping of rare species, collection of voucher specimens, and cataloging and curation of specimens. [upland and riparian]*

It is only through inventory, mapping and documenting rare plant species, are we able to note relative levels of rarity or abundance within Clark County. There are certainly species that are rare that have not yet been documented as being so and other species, thought to be more common, which are in fact, rare. The collection, vouchering, and cataloging of specimens is important for understanding ranges, ecology, and taxonomic subtleties of under-documented, and relatively unknown species. Actual specimens in collections are an invaluable resource for understanding species demography and habitat and for taxonomic determinations necessary for designations of rarity or abundance.

*NPS-2 Surveys for non-vascular plants in Lake Mead NRA. [upland and riparian]*

Non-vascular plants are little understood within Clark County. A flora of non-vascular plants of Clark County does not yet exist, because our knowledge of these plants is incomplete. As collections and surveys continue, our knowledge will increase.

Eventually, we will be better able to determine with greater certainty, which species are truly rare and endemic and which species are more common worldwide.

*NPS-3 Mapping rare and important communities. [upland and riparian]*

A number of vegetation communities are particularly rare or important for sustaining other rare elements of flora and fauna of Clark County. Lake Mead NRA does not have a vegetation map.

*NPS-4 Partner with Lower Colorado River MSCP on Riparian Vegetation Mapping and Characterization for Virgin and Muddy Rivers, Las Vegas Wash, Lakes Mead and Mohave. [riparian]*

The Bureau of Reclamation and the Lower Colorado River have each, for a variety of management needs, mapped riparian habitat along the Lower Colorado River, including areas of the confluence areas of the Virgin and Muddy Rivers. The BOR and Clark County have developed various riparian maps of the Las Vegas Wash. We suggest a project that would partner with the LCR MSCP and BOR to enhance their existing data for the establishment of riparian area maps for habitats of interest to the MSHCP.

### **Rare Plant Program**

*NPS-5 Continued demographic monitoring for Las Vegas bearpoppy, (*Arctomecon californica*) including weather station monitoring on transect sites. [upland]*

The monitoring on bearpoppy for last 6 years is revealing much about bearpoppy demography. However, a long-term dataset will be necessary to understand the boom and bust cycle and if bearpoppies return to sites on which they have become dormant over time.

*NPS-6 Continued monitoring of populations of Threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*) on Sandy Cove. [upland]*

The population on Sandy Cove, the largest population known of this species, fluctuates widely from year to year. A long-term data set is need to show long term trends

*NPS-7 Continued monitoring for recovery of populations of Sticky buckwheat (*Eriogonum viscidulum*.) [upland]*

Sticky buckwheat appears to move from site to site over time, especially if flooding during high water events eliminates populations. The long-term effects of flooding on the population over time are unknown. Is Sticky buckwheat declining- or is it able to recover population sizes?

NPS-8 Continued inventory and research on Virgin thistle (*Cirsium virginensis*.)  
**[riparian]**

This thistle has been found to be much rarer than previous thought. However, taxonomic issues may effect whether this species should be considered for endangered status in Nevada.

NPS-9 Continued monitoring for Beaver dam breadroot (*Pediomelum castoreum*.)  
**[upland]**

This species is found on sandy areas that are under heavy impact and threatened by invasive *Brassica tournefortii*. The species may be less abundant that previously thought. Further mapping and inventory work is needed on this plant in Clark County.

NPS-10 Continued monitoring of Chalk liveforever (*Dudleya pulverulenta*.) **[upland]**

**This species is ultimately poachable and occurs in very small numbers in Newberry Mountains. The abundance and incident of poaching in the rest of Clark County is unknown.**

NPS-11 Continued inventory of Black Mountains. **[upland]**

This is one of the last high diversity areas of Lake Mead NRA that has not been surveyed thoroughly. Preliminary surveys in the area have revealed certain rare plants that had been previously unknown from the area. Certain areas of this region may require special protection.

NPS-12 Continued research on Las Vegas Bearpoppy, including seed bank, seed fates, and pollination. **[upland]**

A study will begin this biennium on seed bank and seed fates. Further research on this species will be needed in future bienniums.

## **Alien Plant Program**

### **Weed Sentry Program**

NPS-13 Continued survey of high priority sites of Clark County for weeds. Baseline mapping of sites surveyed and baseline weed map produced. Development of monitoring and repeat survey protocols for weed sentry program. Use of program as a template for expanded weed mapping and control for all of Clark County. **[riparian]**

The weed sentry program has designed a method and database that can be used for mapping, treating, and monitoring weed invasions in Clark County. It can be expanded as a weed control strategy for Clark County.

*NPS-14 Weed Sentry Program expansion to include more sites within Clark County. [riparian]*

The preliminary sites to be surveyed included the highest priority sites on Federal Lands of Clark County. However, not all sites can be surveyed in the first biennium of this program. Further work will be needed to continue this program and get baseline data from all sites of importance.

*NPS-15 Weed Sentry Program expansion to include monitoring. [riparian]*

Ultimately, the weed sentry program can become a monitoring program for weeds already in Clark County on high priority sites. Once baseline data has been obtained, data on treatment effects and incipient invasions can be analyzed.

### **Interagency Exotic Plant Management Team**

*NPS-16 Continue high priority riparian and wetland habitat restoration and maintenance of exotic plant control for SNRT partners in partnership with NPS Exotic Plant Management Team. [riparian]*

**Continue with the interagency team for riparian exotic plant management, for species of priority to MSHCP and SNRT . Focus of this team is on high intensity projects beyond the initial attack capability of the weed sentry crews.**

*NPS-17 Enhance effectiveness monitoring for riparian habitat restoration. [riparian]*

Enhance the existing program of effectiveness monitoring for the exotic plant management team. Consider an overall effectiveness-monitoring program adopted by the BRRC, and a project level effectiveness-monitoring program. Incorporate additional parameters for soil moisture and other soil characteristics.

### **Additional Alien Plant Concerns**

*NPS-18 Continued research on Athel (*Tamarix aphylla*) establishment and effects on soils and native vegetation, and including research on hybridization with saltcedar. [riparian]*

Study on effects of athel on soils and native vegetation has been initiated and may need to extend into future bienniums. Further research on athel hybridization and the consequences of hybridization on invasiveness of saltcedar and athel will be an important research issue for future bienniums.

*NPS-19 Athel control. [riparian]*

There was an estimated 11,000 athel trees on the shoreline of Lake Mead in 2001. However, since that time, water levels have dropped nearly 70 feet and a large area has been exposed on which new, young athel is establishing. Athel control at Lake Mead will be an important component of the weed control program in future bienniums.

*NPS-20 Control of pernicious and incipient weeds within Lake Mead NRA. [riparian]*

Weed control will need to focus on eliminating incipient populations of pernicious weeds into the future, as weed invasions will be ongoing and new weeds are constantly moving into the area.

*NPS-21 Sahara mustard (Brassica tournefortii) control. [upland]*

The strategy to eliminate the threat of Sahara mustard will be evolving and ongoing for many years and may never be completed. Sahara mustard is rapidly expanding its range throughout the Southwest and will continue to do so into the future. The invasion needs to be controlled while population numbers are small, as populations are predicted to have steep exponential growth curves and therefore, may rapidly get out of control. The biological consequences of this plant becoming out of control in Clark County may be far-reaching and disastrous to many sensitive species, including the desert tortoise.

NPS-22 Continued Sahara mustard research on demography, seed banks, seed germination requirements, seed fates in the field, and effective control methods and techniques. Research on effects of Sahara mustard on native flora, and on Sahara mustard as a possible fire fuel source in Mojave Desert. *[upland]*

Everything we have learned about Sahara mustard this last year of control efforts and preliminary research has been helpful in devising strategies for control. As more information is gained, strategies can be refined to be more effective in preventing spread and containing the invasion. Already much has been learned about seed germination and herbicides that control Sahara mustard, and this information has altered which sites need to be prioritized for control to prevent invasion of high priority sites and, which methods can be used on those sites.

### **Habitat Monitoring**

*NPS-23 Conduct spring inventories in accordance with MSHCP spring inventory and monitoring protocol.*

Begin to fully implement the spring monitoring protocol under development by the Springs Work Group and Dr. Sada.



*NPS-24 Continue habitat disturbance monitoring related to illegal roads and trails.*  
**[upland]**

Continue the monitoring of additional habitat disturbances related to illegal roads and trails. Incorporate recreation monitoring through traffic counters. Enhance the database and GIS products, and work with AMP on effectiveness monitoring.

*NPS-25 Based on mesquite/catclaw inventories from previous biennium, establish monitoring program for loss of habitat, from groundwater or surface flow interruptions, and from poaching.* **[upland/riparian]**

Current biennium establishes inventory and management plan for catclaw acacia habitat. A monitoring program needs to be developed for loss of this habitat due to disruptions of surface or groundwater, regional land use changes, and poaching. The NPS has made recent LE cases on mesquite poaching within the LMNRA.

### **Habitat Management**

*NPS-26 Continue program of management of existing approved roads system to prevent disturbances from illegal OHV use, through road management, restoration, and education.* **[upland]**

Continue the mitigation and management program of managing roads through grading, selected barriers and restoration that maintains the integrity of the approved backcountry road system. More closely tie the mitigation projects to the overall disturbance monitoring and effectiveness monitoring.

*NPS-27 Maintain native plant nursery to support habitat restoration projects by SNRT and other MSHCP partners.* **[upland/riparian]**

Maintain native plant nursery and seed bank facility to support restoration needs of SNRT and other MSHCP partners.

### **Wildlife Program**

*NPS-28 Management and Monitoring of the Relict Leopard Frog* **[riparian]**

Highest priority, this candidate species will still need active management to save it from extinction. A signed conservation agreement should be in place, but the measures prescribed in the plan must be implemented.

*NPS-29 Amphibian Inventory and Amphibian Data Mining* **[riparian]**

**Continue inventories at springs, spring discharge drainages, and selected riparian areas for presence of covered amphibian species. Establish a data mining program**

**county wide through cooperator to review records and gray literature, museum collections, etc. of amphibian species of interest to MSHCP.**

*NPS-30 Burro removals at Lake Mead NRA [riparian]*

This continues to be a high priority. Although over 1500 burros have been removed since the implementation of our burro management plan in 1995, we continue to have a problem with immigration of burros from surrounding BLM lands. Burro removal is specifically recommended in the Desert Tortoise Recovery Plan and is a commitment of the NPS under the MSCP.

*NPS-31 Peregrine Falcon Monitoring [riparian]*

Peregrine falcons have been delisted, but we are still engaged in a five-year post delisting monitoring effort prescribed by the USFWS. Furthermore, peregrine falcons have demonstrated their tendency to suffer from the effects of bioaccumulation and have thereby proven to be a valuable indicator species worth monitoring. Lake Mead NRA contains all but two of the known nesting sites for this species in Nevada.

*NPS-32 Bald Eagle Monitoring [riparian]*

Like the Peregrine falcon, the bald eagle has proven to be vulnerable to bioaccumulation of toxic compounds. Together they constitute a powerful pair of indicator species. Peregrines feed on birds and are therefore more sensitive to terrestrial sources of contamination while bald eagles feed mainly on fish and are consequently more susceptible to aquatic contaminants. Lake Mead NRA harbors the largest concentration of wintering bald eagles in the state of Nevada.

*NPS-33 Desert Tortoise Monitoring [upland]*

Desert tortoises are impacted by many of man's activities in the desert. The tortoise was the initial species covered by an HCP in Clark County, and it is important to continue monitoring this species to see if the numerous management actions which have been taken to benefit this species (e.g. reduced grazing, highway fencing, Off-road-vehicle restrictions, etc.) are accomplishing their intended goal.

*NPS-34 Bat Habitat Protection [upland/riparian]*

Lake Mead NRA encompasses many important habitats for a variety of species of bats, several of which are covered or evaluation species under the Clark County MSHCP. In particular, several abandoned mines in the park have become important habitat features to a variety of bat species. By gating these mines, populations of bats can be protected from disturbances and vandalism.

*NPS-35 Bat Monitoring [upland/riparian]*

Populations of bats that have been protected by the construction of bat gates should be monitored to determine the effectiveness of those management actions. Lake Mines house the largest wintering population of the California Leaf-nosed bat in the state and are frequently used by Townsend's big-eared bats, a species which is very sensitive to disturbances and which many experts believe should be listed under the ESA.

*NPS-36 Bird Monitoring [upland/riparian]*

Many species of birds that are either covered or evaluation species under the Clark County MSHCP are found at Lake Mead NRA, particularly in and around various riparian areas found in the park. These species must be monitored in a way that is consistent with other large-scale programs in order to determine if the various land management actions undertaken as prescribed by the MSHCP are having the desired effect.

*NPS-38 Development of County Wide Inter-Agency Bird Monitoring Protocol [riparian]*

The agencies have reached agreement with Great Basin Bird Observatory on initial protocols for bird monitoring. However, it is not clear that the established protocol will meet all MSHCP needs. Suggest project to develop interagency bird monitoring protocol that is consistent with other large scale programs and looks at species of interest, high value wintering and migratory use areas, riparian areas and sensitive habitats. Protocol could include effectiveness monitoring for birds as it relates to other activities, such as riparian vegetation restoration.

*NPS-38 Cooperation with Lower Colorado River MSCP on Southwestern Willow Flycatcher Monitoring [riparian]*

The Lower Colorado River MSCP and the Bureau of Reclamation annually monitor southwestern willow flycatcher on Lakes Mead and Mohave, and confluences of Virgin River and Muddy River. The two multi-species programs could partner and develop protocol for comprehensive inventories of SWFL in all areas of interest in Clark County, and an assessment of the highest habitat value areas for SWFL.

*NPS-39 Bird Data Mining [upland/riparian]*

It is likely that a tremendous volume of information on covered bird species may exist in agency gray literature, agencies which are not partners to the MSHCP, museums, bird groups, etc. Establish an interagency project for data mining for covered bird species.

*NPS-40 Cooperation with USGS-NPS study on The Role of National Parks in Southwestern United States in Providing Wintering Habitats for Birds Breeding in Northern Shrubland Systems [upland]*

**USGS is considering funding for a proposal that would assess a number of NPS units in the Mojave Desert and Colorado Plateau for their significance in providing migratory and wintering habitat for birds breeding in northern shrubland ecosystems in the southwestern US. The proposal would identify primary habitats used by shrubland birds wintering in southwestern National Parks, link breeding ranges of wintering birds to their breeding regions based on analysis of stable isotopes contained in feathers of birds captured in mist-nets and released, and (3) conduct a GIS-based assessment of habitats, landcover changes and the “human footprint” to determine the relative importance of National Parks to migrating and wintering birds. The MSHCP could partner with this program to provide coverage to additional areas of MSHCP interest.**

*NPS-41 Law Enforcement* (added as per phone conversation with Kent Turner)  
**[upland/riparian]**

USDA, Forest Service (USFS)  
Spring Mountains NRA

The following project suggestions in the tables, and the priority rankings are from the USDA Forest Service. The initials FS (Forest Service) and the number and the bold habitat category in brackets were added by the Science Advisory Team for convenience of reference.

**Recommended MSHCP projects for 2005-2007**

#	Priority	Project descriptions
<i>FS-1</i>	High	Sensitive species surveys, flora and fauna of 10,000 acres on Spring Mountains NRA, (GPS GIS data integrity), ANSC, ERCA, VIPU
<i>FS-2</i>	High	Develop plan to monitor biodiversity hotspots
<i>FS-3</i>	High	Law Enforcement (1 full time) and (2 Forest Protection Officers)
<i>FS-4</i>	High	Develop cost effective protocol for inventory and monitoring Palmers chipmunk population and habitats
<i>FS-5</i>	High	Inventory sensitive flora and fauna species, cultural resources and recreation use on trails within wilderness.
<i>FS-6</i>	High	Develop bat monitoring protocol for the Spring Mountains
<i>FS-7</i>	High	Continue endemic butterfly monitoring
<i>FS-8</i>	High	Continue monitoring northern goshawks on the SMNRA using existing nationwide protocol and utilizing inventory info collected 2004-2005.
<i>FS-9</i>	High	Continue monitoring flammulated owls on the SMNRA using existing FS protocol and inventory info gathered in 2002.
<i>FS-10</i>	High	Continue working with Great Basin Bird Observatory on the All Bird Monitoring project started in 2003
<i>FS-11</i>	High	Develop a plan to monitor riparian function and habitat condition

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- |              |      |  |
|--------------|------|--|
| <i>FS-12</i> | High | Continue monitoring of peregrine falcons, using existing nationwide protocol and utilizing inventory info collected 2004 |
| <i>FS-13</i> | High | Continue Sensitive Plant Monitoring - High Elevation Communities   |
| <i>FS-14</i> | High | Continue annual monitoring of Clokey eggvetch  |
| <i>FS-15</i> | High | Continue annual monitoring of rough angelica   |
| <i>FS-16</i> | High | Continue moonwort ( <i>Botrychium</i> ) surveys and genetic analysis   |
| <br>         |      |  |
| <i>FS-17</i> | High | Continue native and rare seed collections, and insure funding for storage of seed collected.                             |
| <i>FS-18</i> | High | Continue research on native species propagation  |
| <i>FS-19</i> | Med  | Forest protection officers OHV enforcement and compliance  |
| <i>FS-20</i> | Med  | Wild horse and burro gather to get numbers to AML  |
| <i>FS-21</i> | Med  | Construct enclosure around Willow Spring and adjacent riparian area (across road from existing enclosure).               |
| <i>FS-22</i> | Med  | Annual inspection and maintenance of existing enclosures   |
| <i>FS-23</i> | Med  | Develop plan, map, and treatments of invasive plants   |
| <br>         |      |  |
| <i>FS-24</i> | Low  | Develop cumulative impact tally to monitor effects on NRA species of concern   |
| <i>FS-25</i> | Low  | Research effects of disturbance on sensitive species   |
| <i>FS-26</i> | Low  | Research pollination and larval relationship with sensitive butterfly species  |
| <i>FS-27</i> | Low  | Research <i>Angelica scabrida</i> metapopulation dynamics  |
| <i>FS-28</i> | Low  | Research impacts of prescribed burning and fuel treatments on sensitive plant and animal species                         |

**[essentially all upland]**

BLM, Las Vegas Field Office

The following project suggestions, including the text in italics (possible funding source) and the text that is not italicized (brief explanation) as well as comment are from the Bureau of Land Management (BLM). The Science Advisory Team for convenience of reference added the initials BLM, the number, and the bold habitat category in brackets.

**Top Conservation Actions**

*BLM -1* Continue to support four law enforcement rangers. (*Section 10*) **[upland]**

*BLM -2* Continue restoration of desert tortoise critical habitat. (*Section 7*) **[upland]**

*BLM – 3* Continue restoration of sensitive habitat outside of tortoise critical habitat. Include actions such as dumpsite clean-ups in IMAs and LIMAs, including Sunrise Management Area, DWMAs, mesquite woodlands, and other high resource areas. (*Section 10*) [**upland**]

*BLM – 4* Continue to support the interagency weed management program, including upland treatment of Sahara mustard.\* (*Section 10*) [**upland**]

*BLM – 5* Continue to support GIS in the Las Vegas Field Office – support a data analyst position and GIS technical support position. (*PLMA Development*) [**upland**]

*BLM – 6* Support Phase II of the Virgin River Conservation Management Strategy. Provide for BLM staff support to assist in the development of the plan. (*PLMA Development*) [**riparian/upland**]

*BLM – 7* Inventory low elevation plant species that are described in the Low Elevation Plant Management Strategy Plan. Also conduct inventories on evaluation plant species, including sensitive mosses. (*PLMA Development*) [**upland**]

*BLM – 8* Continue to inventory pollinators, per the recommendations provided by the Pollinator Study (2003-2005).\*\* (*PLMA Development*) [**upland**]

*BLM – 9* Provide support for roads management program, including monitoring road proliferation in IMAs and LIMAs (including designated Wilderness Areas), assessing the status of signs, reporting vandalism to interpretive infrastructure, and mapping roads in areas proposed as ACECs in the MSHCP Plan Amendment to the RMP. The latter project will provide information that will expedite the environmental analysis for the amendment. The MSHCP Plan amendment, if successful, would add a significant number of acres to the IMAs/LIMAs and offset losses from the Wilderness designation of 2003. (*PLMA Development*) [**upland**]

*BLM – 10* Conduct a bat/bird migration study to analyze and quantify impacts of wind generation facilities that are currently being proposed in Clark County. BLM and NDOW would be cooperators for this study.\*\* (*PLMA Development*) [**upland/riparian**]

*BLM – 11* Develop a model that analyzes aeolian sands from Roach and Jean Lakes to adjacent slopes and that can predict impact of airport development on these sand deposits, which are habitat for white-margined penstemon.\*\* (*PLMA Development*) [**upland**]

*BLM – 12* Inventory and assess springs and riparian areas as directed by the Springs Conservation Management Strategy. (*PLMA Development*) [**upland**]

*BLM – 13* Continue to support bat inventories, if Conservation Initiative-Round 5 funding is not successful. (*PLMA Development*) [**upland**]

\* **Funded through the National Park Service, Lake Mead**

\*\***Studies to be conducted by a research institution, not BLM.**

The following are actions that would be useful to BLM and would perhaps be conducted by NDOW with BLM as a cooperator:

*BLM – 14* Assess and enhance habitat for Southwestern willow flycatcher and native desert fishes in Clark County.

*BLM – 15* Inventory and assess habitat for Gila monster and burrowing owls. (*PLMA Development*)

## USFWS

### NWRRefuges

The following project suggestions, including the explanatory text and headings are from the U.S. Fish and Wildlife Service National Wildlife Refuges (USFWS). The initials USFWS, the number and the bold habitat category in brackets were added by the Science Advisory Team for convenience of reference.

## **Conservation Priorities**

### **Moapa Valley NWR**

*USFWS-1* Water quality (temperature, d.o., pH, etc.), quantity, and velocity tolerance levels for Moapa dace [**riparian**]

*USFWS-2* Habitat requirements of Muddy River endemic invertebrates (substrates, flow, temps, etc...) [**riparian**]

- These two are important for the whole valley, since we would like to restore habitat and reintroduce all of them to the Refuge.

*USFWS-3* Reproductive requirements, spawning water quality/quantity/flow and habitat characteristics for Moapa dace [**riparian**]

*USFWS-4* Effects of habitat restoration for Moapa dace on thermal endemics (pre- and post restoration) [**riparian**]

*USFWS-5* Distribution of Muddy River native invertebrates [**riparian**]

*USFWS-6* Effects of temperature change on Moapa dace distribution [**riparian**]

*USFWS-7* Comparative water quality/life history studies for imperiled native inverts and

fishes (for ecosystem management, not single species). **[riparian]**

USFWS-8 Effects of palms on water quality and channel morphology **[riparian]**

USFWS-9 Methods to remove valisneria and prevent cattail spread **[riparian]**

USFWS-10 Determine origin of palms in Warm Springs area by studying packrat middens **[riparian]**

USFWS-11 Development of an upland restoration plan to benefit pollinators and rare plants, develop list of local native pollinators **[riparian]**

USFWS-12 Gravel flow and replenishment of stream systems **[riparian]**

### **Desert Range**

USFWS-13 Fire regime study of entire range, implications to native rare plants **[upland]**

USFWS-14 Use of specific upland habitats by MSHCP evaluation or watch list birds (e.g. pinyon juniper, knowledge used for management, such as prescribed fire) **[upland]**

USFWS-15 Effects of population growth on desert/urban interface **[upland]**

USFWS-16 Air quality impacts to Sheep Mts. on moss, lichens, etc... **[upland]**

USFWS-17 Distribution and habitat requirements for reptiles on the Desert NWR (chucks, snakes, etc.) **[upland]**

USFWS-18 Distribution and habitat needs of *Pyrgulopsis fausta* at Corn Creek **[riparian]**

USFWS-19 Any bird surveys on Sheep Mts. (Should already be addressed through GBBO bird monitoring, could be part of # 2) **[upland]**

USFWS-20 Bat species use of Corn Creek area **[upland]**

USFWS-21 Habitat requirements of rare plants, especially on the north portion of the Sheep Mts. **[upland]**

USFWS-22 Importance of Corn Creek to migratory birds **[riparian]**

USFWS-23 Use of native vs. Russian olive habitat by MSHCP listed birds Or, species use of Russian olive vs. native woody vegetation **[riparian]**



## NDOW

The following project suggestions, including the explanatory text and headings are from the Nevada Department of Wildlife (NDOW). The Science Advisory Team for convenience of reference added the initials NDOW, the number and the bold habitat category in brackets.

### **MSHCP Priorities for 2005-2007 Biennium**

#### **Reptiles**

*NDOW-1* Gilbert Skink (Western Red-tailed Skink) inventory, status and monitoring in Clark County. **[upland]**

Little published data and information is available regarding the status of this species in Clark County, Nevada. The Nevada Department of Wildlife would like to pursue a proposal to the legislature to reclassify this species from State Unprotected Reptile to State Protected Reptile, however, additional support information and data is needed, regarding the current status of this species, in order to justify the proposal. Survey efforts would focus on preferred habitats (primarily pinyon-juniper) of mountain ranges in Clark County.

*NDOW-2* Inventory of all reptiles found on and near Overton Wildlife Management Area, via pitfall/drift fence arrays and other survey methods. **[upland]**

Through the installation and operation of pitfall/drift fence arrays and implementation of other survey methods, conduct an inventory of all reptile species in the vicinity of the Overton Wildlife Management Area, and northern portion of Lake Mead National Recreation Area.

*NDOW-3* Herpetofauna inventory of the Virgin Mountains, Clark Co, Nevada. **[upland]**

Initiate herpetofauna survey and inventory in the Virgin Mountains. This unique area contains some extremely diverse habitat assemblages. According to field guides, as many as 46 or more reptile and amphibian species may be found in this particular area. Many of these species are CCMShCP covered or evaluation species, and/or rare or uncommon species, including the Sonoran Mountain Kingsnake, Utah Banded Gecko, Eastern Fence lizard, and the Pacific Tree Frog.

*NDOW-4* Development of Reptiles of Nevada compact field guide and/or pamphlet. **[upland]**

Develop, produce and make available a handy pocket-sized reptile reference guide and/or pamphlet containing reptile species accounts, including natural and

life history information, range maps and identification information, for all reptiles species native to Nevada.

### **Birds and Mammals**

*NDOW-5* Inventory of Prairie Falcon, Golden Eagle and other cliff nesting raptors in Clark County. [**upland**]

Raptors are impacted by human use activities. The Nevada Department of Wildlife surveys, and maintains a database of raptor nesting sites throughout Clark County. When land use actions occur this information is available for use by agencies to evaluate effects of those land use actions to nesting raptors.

*NDOW-6* Monitoring of Peregrine Falcon Nest Sites in Clark County. [**upland**]

The Nevada Department of Wildlife monitors peregrine falcon nest sites annually throughout Nevada, including Clark County. The peregrine falcon was de-listed in 1999, and a post de-listing monitoring effort (plan) was required by the USFWS and completed in 2003. The Monitoring Plan requires monitoring of randomly sampled sites in each state commencing in 2003 to 2015. Three sites have been chosen in Nevada, all of which are in Clark County. Further, Clark County is extremely important in this effort given all but one of the total known nest sites in Nevada, are in Clark County (NDOW and NPS 2003).

*NDOW-7* Breeding Status and Surveys of the Southwestern Willow Flycatcher (SWFL) and Yellow-billed Cuckoo (YBCU) in southern Nevada. [**riparian**]

The Nevada Department of Wildlife monitors breeding SWFL's and YBCU's in southern Nevada. The SWFL is a Federal Endangered Species and the YBCU is a candidate species for listing. These survey efforts are coordinated with the USBOR and SNWA. One of the key areas and the only known nesting site for the YBCU is along the upper Muddy River, at Warm Springs, in Clark County. NDOW has 4 years of monitoring data for this site. Both species are key Covered Species in the Clark County MSHCP.

*NDOW-8* Raven distribution and telemetry movements in Clark County (cooperative project with USDA-Wildlife Services) [**upland**]

Use banding and telemetry to better determine migratory patterns of ravens at landfills and breeding sites in Clark County.

*NDOW-9* Impacts of trails (i.e., hiking and mountain biking) on desert bighorn sheep near the urban interface (McCullough Range, Spring Mountains, River Mountains). [**upland**]

*NDOW-10* Long-term Acoustical Monitoring of Bats in Clark County (need to expedite analysis of large number of acoustical records of bats). **[upland]**

Clark County is one of only a few areas in the United States, to begin implementing long-term acoustic monitoring for bats (first efforts at monitoring are in the Spring Range and Las Vegas Wash in 2003). Unfortunately, the analysis of the large number of acoustic 'Anabat' files can only be accomplished by qualified bat biologists, reviewing a large number of files, with considerable cost and time associated with the effort. Anabook currently allows the user to develop software filters, which can be applied to each Anabat file to determine how many calls in the file match the characteristic specified in the filter. At present, this can only be done one filter at a time. In order to produce a viable system for automated analysis of large datasets, the following are required:

1. An automated scanning program, which can work with large directories in a Windows based environment.
2. Expanded filters to better facilitate recognition of a wider range of call types than presently possible.
3. Development of filter sets appropriate to areas where the system will be used, so that the scanning program can automatically identify the species in those areas.

*NDOW-11* Inventory, Status and Distribution Surveys of the Hidden Forest Chipmunk and other species in the Sheep Range. **[upland]**

Determine the current status of the Hidden Forest Chipmunk in the Sheep Range, as the sub-species is suspected as possibly being extinct. The H.F. Chipmunk is known only from the Hidden Forest of the Sheep Range, yet no surveys have been accomplished in other areas of the Sheep Range. Inventories will also assess other special status species of wildlife including bats, birds and reptiles.

*NDOW-12* Continue Population Monitoring trends of the Palmer's Chipmunk in the Spring Range. **[upland]**

The Palmer's chipmunk is a lead species in the CCMSHCP and the Spring Mountains Conservation Agreement. The Nevada Department of Wildlife has monitoring stations at sites in the Spring Mountains to document trends of this unique species (1994-95 and 1999-2000). Population trends and associated land use effects are essential to the goals of the CCMSHCP and Spring Mountain CA.

### **Amphibians**

*NDOW-13* Relict leopard frog; inventory and monitoring of extant populations and translocation efforts **[riparian]**

Assistance to NPS and other cooperators for monitoring of extant RLF populations within LAME including sites subject to ongoing translocation efforts.

*NDOW-14* Relict leopard frog; assessment of historic habitat site suitability and potential new translocation sites. **[riparian]**

Evaluation of potential sites for additional RLF translocations within historic range outside of LAME, cooperative with BLM and others.

*NDOW-15* Relict leopard frog Conservation Team; participation in program administration, coordination and implementation monitoring. **[riparian]**

Implementation of RLF CAS through the RLFCT as cooperator/signatory to the conservation agreement. This includes work program coordination, funding assistance for conservation actions and program and implementation monitoring and evaluation.

### **Fish**

*NDOW-16* Muddy River endemic fish monitoring **[riparian]**

This includes ongoing monitoring and inventory efforts for Moapa dace, Moapa White River springfish, Virgin River chub and speckled dace in the Muddy River coordinated through the Muddy River RIT.

*NDOW-17* Muddy River invasive species control efforts (tilapia etc.) **[riparian]**

Implementation of control and monitoring activities for nonnative invasive fish species focusing on control of tilapia in upper Muddy River head spring tributaries through the Muddy River RIT.

*NDOW-18* Virgin River chub refugium development **[riparian]**

Continue development and management of a refugium site for Virgin River chub on the Muddy River cooperatively with Nevada Power Company and the USFWS.

*NDOW-19* Muddy River RIT and TWG participation and coordination **[riparian]**

Continue coordination and evaluation of conservation actions and strategy development for Muddy River projects.

*NDOW-20* Clark County springs TWG participation and monitoring/assessment implementation **[riparian]**

Cooperative participation in the Springs TWG effort through the CCMSHCP.

*NDOW-21* Virgin River endemic fish population monitoring and inventory **[riparian]**

Continue monitoring and inventory activities for woundfin, Virgin River chub and flannelmouth sucker in the Virgin River in coordination with the Virgin River RIT and recovery program.

*NDOW-22* Virgin River invasive species control (tilapia, shiners) including development and implementation of fish movement barriers for nonnative species exclusion. **[riparian]**

Continue physical invasive species removal efforts and implementation of LIP funded grants for fish movement barriers in the Mesquite area, focusing on tilapia and red shiner.

*NDOW-23* Virgin River RIT and Recovery Team coordination and recovery action implementation **[riparian]**

Continue cooperative participation in Virgin River RIT, Virgin River RT, Virgin River partnership and other programs to assist with development of conservation strategies for Virgin River endemic species.

## **PROJECT SUGGESTIONS FROM WORKING GROUPS**

Two working groups submitted written recommendations for future projects, and several other working groups have had ongoing discussions that informed the management agency lists, above. The written suggestions from working groups are below.

### Weeds Working Group

The Weeds Working Group made a number of recommendations on projects, questions, issues and concerns that should be addressed in the BAMR. Those recommendations included the following:

BAMR Input on Weeds priorities from last meeting:

- Projects should include a cost benefit assessment (Hunt)
- Need predictive capabilities about risk posed by weeds based on some environmental parameter (e.g. soil types, hydric regimes, etc.), this might lead to modeling (Ryan)
- A tamarisk removal technique and restoration monitoring project for the entire county (Schreiber)
- Rarer habitats need more recognition (e.g., sandy habitats), perhaps raising them to ecosystem status, so that they receive more monitoring and management attention
- Spectral analysis for remote sensing particularly with respect to weeds in at-risk habitats

- Attention paid to the urban interface with the desert as a source of spread of invasive species
- Develop a monitoring program for nurseries as a source of escapes of invasives (perhaps nurseries “up-stream” from habitats), this may include aerial reconnaissance
- Develop a County-wide system of monitoring plots (transects?) for tracking weedy invasion (is this the Weed Sentry program)
- Long-term study plots should be considered, does BLM have any
- Identify infiltration routes for invasive plants and noxious animal pests, can such events be anticipated.

Input from this meeting

- How do species behave in this environment as compared to other environments, Are the control methods from other environments applicable here? Has anyone got research needs to investigate weed biology in this environment? Such species might include: (Wallenmeyer)
  - Johnson grass,
  - Sahara Mustard,
  - Russian Knapweed, are there better control methods, best chemical, application time,
  - Australian pine
  - Camelthorn
  - Pampas grass (is it spreading here?) Deuser - not known to be a problem
  - Arundo (is it spreading here?) – Deuser – this is in the Muddy River
- We need a better understanding of how successful restorations can be after weed removal. What are appropriate restoration strategies? What are reasonable restoration expectations? What constitutes a successful restoration? What is our desired outcome?

Low Elevation Plant Working Group

The Low Elevation Plant Working Group made a number of recommendations on projects, questions, issues and concerns that should be addressed in the BAMR. Those recommendations included the following:

- a. The Status of Covered Species should include a distribution map though distribution is not necessarily a map of habitat.
- b. Prioritization should include the recognition that some actions may capture more than one species.
- c. Surveys need to address likely distribution of species across administrative boundaries (FWS)
- d. Pollination studies need to be continued (pollinators as well pollination mechanisms) (BLM)
- e. Seed collections and germination studies (BLM)

- f. BLM supports the Weed Sentry program
- g. Sahara mustard inventory and control (BLM)
- h. Sahara mustard seed bank, germination, dormancy, etc. research (BLM)
- i. survey the status of the suite of plant species from sandy habitats for which there is little information and some level of threat or uncertainty(FWS)
- j. Continue restoration in rare habitats and high elevations

## **COMMENTS BY THE SCIENCE ADVISORY TEAM**

The remainder of this chapter is the commentary of the Science Advisory Team on the Management Agency and Working Group suggestions for future MSHCP projects.

### Management Agency Suggestions

The 131 new suggested project topics from the Federal Land managers and NDOW have been sorted into categories, including species, taxon, habitat and project type (Appendix 12) to better inform discussion. This categorization is currently not complete because that information was not extractable from the preliminary lists provided.

### Categories of projects

1. Among the agency project topics there are 37 inventory, 40 monitoring, 39 research topics, 24 implementation, and one planning proposal. Many of the inventory, monitoring and research project topics are for species or environments that are currently the subject of Conservation Management Strategy development (bats, low elevation plants, springs, riparian sites) in which priorities for inventory, monitoring and research are to be formalized.
2. Only 23 of the project topics identify a Covered Species. Other project descriptions refer to taxonomic groups that include Covered Species, but a Covered Species focus was not called out.
3. The project topics are heavily weighted toward riparian and riverine environments. This is particularly true in NPS, FWS, and NDOW lists, and less so for BLM and USFS lists.
4. Some agencies did not identify project topics to support necessary on-going management actions such as GIS support and staffing needs. We assume these are oversights rather than a change in the agency priorities.
5. Some of the project topics addressed species that are not on MSHCP lists.
6. There are multiple project suggestions for taxonomic groups. For example, there are 22 bird project topics and seven bat project topics. These and projects for fish and relict frog seem uncoordinated and redundant in many cases.
7. Some project descriptions state that they are collaborative with other agencies.

### Questions and Issues for Discussion

1. The suggested research project topics would, if funded require research staff and research institutional support to accomplish.
2. Many of the projects suggested by the agencies for implementation and some that they inadvertently omitted (law enforcement, weed eradication, restoration, GIS, administrative staffing, burro control, road restoration, etc.) are appropriate, necessary and possibly important.
3. Many of the project topics recommended as inventory, monitoring and research for taxonomic groups or habitat types are currently being addressed through the developing conservation management strategies (CMSs). Those projects need to be justified on the basis that not proceeding with them would irreparably harm or delay the planning effort. The CMS process may also provide a means to avoid redundancy.
4. The many apparently duplicative project descriptions suggest many opportunities to collaborate on inventory and monitoring projects that cross administrative boundaries. The lack of coordination could waste funds and personnel. This is an important area of concern.
5. Monitoring or inventory projects that are continuations of previous projects should not go forward until all data have been analyzed and made available to inform management decision-making and species status assessment.
6. Finally, there are only a few project topics that explicitly address management of some of the known threats to upland species, such as the proliferation of off-road travel and the habitat destruction it causes, the spread of upland weeds, and other management actions. Projects for these kinds of critical activities need to be solicited in order to mitigate for “take.” Inventory, monitoring and research are essential to informing management but they are not mitigation. This is critical to keeping the permit.

#### Comments on Working Groups Suggestions

The working group suggestions and recommendations are largely overlapping with the Manager priorities, but reveal a more detailed understanding of knowledge gaps in subject areas and MSHCP needs. Many of these Working Group suggestions were incorporated into our recommendations in Chapter 6. Many Working Groups offered a good forum for encouraging cross-jurisdictional collaborations and project topics reflecting MSHCP priorities.

#### Comments on Working Group operations

During the 2003-2005 budget process, working groups were used as venues for vetting and prioritizing proposals. This exercise fostered competition and hostility among Working Group members and undermined the Working Group as a forum for developing collaborative relationships.



Some Working Groups have advanced MSHCP goals, objectives and priorities well. The Fencing Working Group, The Tortoise/Translocation Working Group and the Planning Working Group have records of accomplishment. The Weeds Working Groups has produced a detailed outline for a weeds management strategy. The PIE Subcommittee, our oldest working group, also has a record of keeping the program in the public eye and supporting productive collaborations with MSHCP partners, such as the BLM Red Rock Mojave Max program that recently won a National award. Several other Working Groups are now operating in the context of developing the Conservation Management Strategies required by the permit. The Planning Working Group is developing and overseeing the implementation of Conservation Management Strategies for several areas and species groups. In general, the activities of Working Groups are more focused on MSHCP requirements than they were two years ago.

To maintain the good collaborative forum required for countywide conservation, Working Group function should be reviewed consistent with direction from the IMC and MSHCP administrative staff to maintain focus on MSHCP objectives.

## **Chapter 6**

### **Science Advisory Team Recommendations**

#### **PROGRAM RECOMMENDATIONS**

The MSHCP proposed an Adaptive Management Process (AMP) to gauge the effectiveness of existing conservation measures and to propose additional or alternative conservation measures to deal with changed circumstances that could include new information. The MSHCP identified the BAMR as the vehicle for communicating the recommendations of the Science Advisory Team to the Implementation and Monitoring Committee, Clark County, the agencies, and the Fish and Wildlife Service. The recommendations presented here are built on past and ongoing projects, recommendations for improvements or changes to ongoing projects, new projects and administrative and procedural advice. The recommendations attempt to address the program deficiencies outlined in Chapter 4.

#### **FOCUS ON PRIMARY PROGRAMS AND SPECIES**

##### Primary Programs

The MSHCP originated from an HCP for desert tortoise that was then, and remains today, a listed species under the ESA. It made a great deal of sense to fold other species into the “tortoise” HCP as desert tortoise was considered to be an “umbrella species.” Thus, many of the other species that were folded into the multiple species HCP were upland species (associated with desert tortoises) and species from upland ecosystems in the Mojave Desert. Indeed, the FWS argued that riverine and aquatic species would have to be covered under a different HCP or a “**phase two**” of the current MSHCP. The permit only with the development of more information can cover some riverine species in the MSHCP, conservation plans and secured habitat. This separation acknowledged that the problems of riverine species and habitats are entirely different from, and in some ways more difficult to deal with than, problems with upland habitats and species. Thus, goals for upland ecosystems, and for riparian or riverine ecosystems, can be competing with respect to the personnel resources required for managing each ecosystem. We recommend that the MSHCP consider separate initiatives for upland and riverine species so that efforts for each system can be monitored separately and effectively and with the necessarily different standards for each program.

##### **An initiative for the Desert Tortoise and Upland Species**

The desert tortoise is a desperately troubled species. The desert tortoise recovery plan prescribed reducing the number of unpaved roads in the desert as a necessary action for species recovery. The DTRPAC has shown that this single impact (unpaved roads and all that is associated with the presence of unpaved roads) in California has caused the extirpation of desert tortoises from more than half of two DWMA's in the West Mojave Recovery Unit. Furthermore, tortoises in the Eldorado Valley (the responsibility of our DCP) have been almost extirpated for similar reasons. Tortoises are rare and may be

going extinct in parts of Nevada. Diverting attention from the tasks required for the Desert Tortoise represents competition for expert attention that dangerously delays the recovery of the desert tortoise and upland species.

We propose an upland initiative for the MSHCP for the 2005-2007 biennium consisting of projects that address the PIE, inventory, monitoring, research, implementation and administrative needs of upland species, including springs, spring species. This arrangement recognizes the desert tortoise is the primary Listed species to which the DCP and its preceding plans were directed. These projects also capture many other Covered Species.

### **Recommended Project Areas:**

#### **Public Information and Education (PIE).**

The current PIE program is focused primarily on school children using the Mojave Max Emergence Contest. The contest has had some success in capturing the attention of the local and national media, and currently enjoys substantial support from educators, school children, meteorologists and the general public. The planned expansion of the program (MSHCP 2003-2005 projects) includes using annual phenomena of other DCP species to promote awareness of our natural environment. The planned expansion of the program beyond the County borders addresses a current deficiency in the DCP by facilitating better integration of conservation efforts across a wider landscape through education. Specifically, it seems likely that an important target of outreach and information for a conservation program in Clark County must include the primary visitors to Clark County (viz., Californians). Additionally, the conservation efforts in California are gaining momentum, and discussions among programs likely will benefit all involved.

PIE projects are among the instruments of land use and wildlife policy identified by all the management agency cooperators in the Clark County DCP. PIE projects are thus assumed to provide indirect conservation benefits by eventually modifying behavior, and thus reducing anthropogenic threats. However, this assumption has not been tested. PIE projects, like all other implementation projects, need to be monitored for effectiveness and conservation benefits that are measurable. Because the conservation effects of PIE projects are likely to be indirect, and may be difficult to measure immediately, a reasonable approach for the next biennium is to take one step toward effectiveness monitoring by developing a monitoring framework for PIE using the four elements of effectiveness monitoring: 1) clearly stated goals and objectives for management actions, 2) well-defined conceptual models, 3) good justification of the selection of indicators, and 4) sampling designs that adequately address scope and resolution.

The PIE program is currently undergoing review and assessment (see PIE Assessment reports by Strategic Solutions, Appendix 10). The Assessment is intended to work with the PIE strategic plan to inform project priority and program direction.

We recommend continuation and expanding the Mojave Max Program as outlined in the 2003-2005 PIE proposals, following the guidance of the PIE Assessment and the PIE Strategic Plan.

We recommend that an effectiveness-monitoring framework for PIE be developed according to the principles provided in this document.

**Inventory.**

The Species Status Report requires current inventory data for all Covered Species. Very few Covered have been subjects of adequate inventory (see Species Knowledge Gaps, Appendix 6 and Risk/Uncertainty Analysis, Appendix 7). Inventories must be hypothesis driven, spatial based, include sufficient metadata and across administrative borders. Appendices 6 and 7 provide some priorities for species inventories. Some species are currently the subjects of planning that will prioritize inventory needs. Inventories for those species should be undertaken only if the planning process will be hindered by a lack of inventory data. Inventories for species that are not the subject of planning for which uncertainty is high and where there are knowledge gaps should have a high priority.

Among the current inventory projects are several addressing low elevation plant species that are the subject of a planning effort. To the extent that these inventory efforts will inform the planning process we recommend their continuation provided that they are hypothesis based, they are not confined by administrative boundaries and the reporting addresses the appropriate elements of effectiveness monitoring.

The Nevada Division of Wildlife and the Science Advisory Team have at different times proposed a countywide inventory for Covered reptiles. The distributional data, habitat relationships and population status for most of these species are poorly understood. We recommend that a countywide inventory of Covered and other reptile species be conducted. That inventory should be hypothesis based, not confined by administrative boundaries, and the reporting should address the appropriate elements of effectiveness monitoring.

**Monitoring**

All implementation projects need to demonstrate effectiveness and conservation benefits through monitoring or research. Monitoring is the means to assess this, and hypothesis-based monitoring is focused to be very direct in assessing the effectiveness of management actions. It is not necessary or efficient to demonstrate effectiveness through individual experiments for every implementation project, but every project must demonstrate directly or indirectly that the project is resulting in conservation benefits. Major implementation areas, such as fencing, weed eradication and restoration, law enforcement and PIE need effectiveness monitoring, and properly designed hypothesis-based monitoring can identify the sources of inefficiency, sources of error in interpretation, and sources of success needing further fostering.

Properly designed monitoring is hypothesis-based monitoring, and is really research to assess the effectiveness of management. The importance of monitoring of implementation projects for effectiveness depends on the cost of the action and the extent to which the action has been demonstrated to provide species conservation benefits. The DCP must establish through research or monitoring that expensive implementation projects result in species conservation benefits where there is not a well-established documentation of such benefits.

All Covered Species must be monitored for measurable biological goals “ no net unmitigated loss or fragmentation of habitat in IMAs and LIMAs “ and to “maintain stable or decreasing population numbers” (MSHCP Appendix B). This does not necessarily mean that every Covered Species must have a monitoring project for populations. The MSHCP discusses the utility and economy of indicators and indirect measures of habitat and population trends. However, the demonstration that the measurable biological goals are met must be based on research. The species for which the risk due to threats is high and uncertainty is great are ranked high (Appendix 6). Those species ranking high require population monitoring to provide the Fish and Wildlife Service assurances that they are not experiencing declines.

Among the current monitoring projects we recommend the continuation of:

- Desert tortoise population monitoring within a rangewide context. Further the density monitoring should address the efficacy of highway barriers and areas receiving weed eradication and restoration projects. In addition, there must be a special effort in the Boulder City area to correspond to the Boulder City Conservation Easement Initiative.
- Las Vegas bear poppy populations have been monitored for the last few years. This monitoring should continue if the conditions described in Chapter 1 of this document, and those developed in the Monitoring Workshop are met.
- Some effort has been expended on monitoring relict leopard frog populations. There is debate within the amphibian conservation community on how best to monitor anuran populations. In addition, because the relict leopard frog is so vulnerable, threats and habitat need to be monitored. We recommend that population, habitat and threat monitoring be developed and implemented providing it meets the conditions described in Chapter 1 of this document, and those developed in the Monitoring Workshop. Such monitoring should take place in the context of the developing Conservation Strategy for the Relict Leopard Frog.
- The Desert Tortoise Recovery Plan and the DTRPAC Report recommend monitoring threats and habitat as well as monitoring populations. We recommend an upland desert threats monitoring program be developed and implemented. Further, we strongly recommend that the Boulder City Conservation Easement be the subject of a very intensive and focused assessment of current threats and an ongoing threats monitoring effort. In addition, an intensive effort to assess the status of all Covered Species in the BCCE and the level of threats posed by current and past mismanagement.

## Research

As mentioned above, properly designed monitoring is difficult to distinguish from research insofar as some monitoring requires research approaches to develop needed answers about management. However, in some cases, so little is known about some species that management cannot be intelligently directed. Thus, for example, we know too little about the importance of disease in desert tortoise to make good management decisions about translocation of tortoises as a management action. Thus, more research is needed to accumulate the background to formulate proper management prescriptions. Thus, research should follow planning processes (including the DTRPAC report) that point out the areas of ignorance that hampers developing management prescriptions. Numerous specific areas of ignorance are pointed out in the DTRPAC report. Additionally, interconnectedness of ecosystem processes and species in ecosystems are distinctly areas of ignorance for the HCP. Dividing programs into upland and riverine systems allows us to focus research needs onto more focused accumulation of truly pertinent knowledge required for developing management plans.

Among the current research projects we recommend continuation of the following:

- Investigation techniques and technologies for the study of the survivorship, mortality and movements of hatchling and juvenile desert tortoises.
- The epidemiology of Upper Respiratory Tract Disease in the desert tortoise.
- Developing experimental approaches to improving density monitoring techniques for the desert tortoise and establishing large experimental pens and developing a predictive tortoise behavioral model for testing density monitoring techniques.
- Developing and implementing remote sensing techniques of habitat monitoring, including expanding and focusing on tortoise habitat monitoring.
- Health and density assessment of translocated tortoises in the LSTS
- Further analysis of Red Rocks To The Summit current data set, expansion of sampling for additional springs using additional taxa. Assessment of plants and animals at managed and unmanaged spring locations, and focused studies of spring utilization patterns by feral equids are necessary.
- Pollinator studies focusing on endemic bees and rare plants
- Characterize the habitat requirements, including identifying physiological tolerances for *Rana onca*, *Bufo microscaphus* and other anuran species, develop laboratory models for and experimental nursery population for reintroductions and genetically characterize wild populations.

We recommend the following research projects to address management and uncertainty concerns for the next biennium

- Investigation into the effectiveness of tortoise barriers, the conservation value and effective design of tortoise culverts and effective corridors.
- Define through genetic markers the boundaries of Distinct Population Segments of the desert tortoise and develop the methods for conserving unique genetic strains of tortoises
- Developing techniques for understanding, monitoring and mitigating threats to desert tortoises, including the recognition the threats network identified in the DTRPAC Report (Appendix 9) can involve complex threat interaction to cause mortality
- Define through genetic markers the boundaries of distinct Distinct Population Segments of the chuckwalla
- Test the habitat model for the distribution and habitat requirements of the Gila monster.
- Synthesize available information on invertebrate species of concern and develop a strategy for dealing with terrestrial invertebrates of concern

### **Implementation**

The DCP has funded a wide range of projects that purported to address threats and convey conservation benefits. These implementation projects are part of normal management actions typically performed by agencies (law enforcement, rehabilitation and restoration, fencing, etc.). The following implementation project areas are based on past projects and indications from the management agencies that they saw these project areas as important. Implementation projects are assumed to provide direct or indirect conservation benefits by directly addressing threats or eventually modifying behavior and thus reducing anthropogenic threats. However, this assumption must be tested. Implementation projects need to be monitored for effectiveness and conservation benefits that are measurable using the four elements of effectiveness monitoring: 1) clearly stated goals and objectives for management actions, 2) well-defined conceptual models, 3) good justification of the selection of indicators, and 4) sampling designs that adequately address scope and resolution.

#### *Fencing.*

Fencing roads to prevent tortoises from being killed by traffic is identified in the MSHCP as a required conservation action. Clark County has fenced approximately 200 mi. of road and is proposing to aggressively expand fencing during the current year. Fencing is known to effectively prevent individual tortoise mortality. It has not been established that tortoise populations have benefited from the fencing program. There is not a specific project to establish the species benefits of fencing but there is a tortoise density-monitoring program. The current density monitoring effort could be modified to address this question. Fencing projects should complete the high priority roads during 2005-2007.

*Other fencing projects*

Other fencing projects to restrict access to sensitive areas have been proposed and funded by the DCP. Many of these have provided what seemed to be significant conservation benefits by addressing a direct localized threat. These actions should have a high priority.

*Law Enforcement.*

Most management agencies stress that law enforcement is a critical part of resource management. The Law Enforcement Needs Assessment (Appendix 11) has identified the agency projected law enforcement needs. Law enforcement, like PIE, provides indirect conservation benefits by modifying behavior and thus reducing anthropogenic threats. The problem in demonstrating conservation benefits is to accurately identify the threats for which law enforcement is the identified management action. The statement has been made that law enforcement bestows intangible benefits. If that was the case then urban police forces could not show that increased enforcement results in a decrease in crime. Law enforcement is important for conservation because many of the threats are anthropogenic and law enforcement is directed at human behavior. The recent standardization of law enforcement reporting can assist in defining what enforcement activities are addressing species threats. All law enforcement projects need to coordinate and cooperate with a law enforcement monitoring project that addresses the four programmatic elements listed above. In addition, the law enforcement-monitoring program should research the historical literature on State and Federal wildlife law enforcement programs and on the National Park law enforcement programs.

*Weed Eradication and Restoration.*

Weeds (plants and animal) represent a threat to many of the Covered Species and ecosystems of Clark County. The management agencies have recognized this threat and have mature eradication programs as well as restoration programs to follow on eradication efforts and other sources of disturbance. The Southern Nevada Restoration Team (SNRT), a multi-agency organization that operates primarily on public lands has received part of its funding from the DCP. The conservation benefits of weed eradication and restoration vary depending on the weed or disturbance and the species presumed to benefit. In addition, the method of eradication and restoration may influence the how species experience the benefit. The current effort should be focused on public lands being managed for conservation benefits and on public lands with permanent conservation easements. Weed eradication activities need to be prioritized on the basis of the threat posed to a Covered Species.

*Burro Removals.*

The removal of burros and horses from upland areas is presumed to benefit many species by removing grazing pressure on plants and ecosystems, reducing competition with other herbivores and damage to soils and riparian areas due to trampling. The documentation of species and ecosystem benefits from these removals may exist in the range conservation literature. The limited management options for dealing with burros and horses makes removal necessary where herds can not be entirely



eliminated. The conflicts between land management agency policies should be resolved to favor reduction of horse and burro impacts on Covered Species and ecosystems. Resolution of these conflicts should be a high priority as should be removals.

**Desert tortoise research facility.**

The Desert Tortoise Conservation Center (DTCC) was constructed to meet the research needs for conservation and recovery research projects conducted to meet the terms of a lawsuit settlement, and the Desert Conservation Program. The Howard Hughes Corp. and several other developers funded the buildings and infrastructure. The land is administered by the BLM. The DCP funds the operation of the facility for the Clark County desert tortoise pick-up service. Southern Nevada Environmental manages the facility on contract to the DCP. The current facility is inadequate to meet the needs of current and proposed research. In addition, the current management and ownership of the land by BLM makes efficient and timely research responses to management concerns problematic. For example, SNEI as facility manager does not have the authority to authorize many normal activities associated with experimental research such as construction or alteration of pens. Getting authorization change experimental treatments can take months to years and can delay research. Several approved and proposed projects cannot be accommodated at the DTCC. In recent years the encroachment of development up to the boundaries of the DTCC and the resulting vandalism has made this a less secure research facility. We believe that the current facility will become less suitable for research and a new site needs to be identified. The current facility can serve the County pickup service and can be developed into an education facility. We recommend that the DCP staff, the Science Advisory Team, the FWS and agency biologists develop options and a proposal to establish a Desert Tortoise Research Center that is adequate to meet the research needs of the DCP.

**Tortoise Biology, Conservation and Management Conference.**

The Desert Tortoise Recovery Plan, the DTRPAC Report and the Fish and Wildlife Service have recommended the regular but infrequent meetings of tortoise and other experts to discuss and debated issues relation to species conservation and management are extremely important is assessing progress and identifying problems and issues. We think that Clark County, the Nevada Fish and Wildlife Service, the Las Vegas BLM and Lake Mead National Recreation Area cooperating in the management and conservation of the desert tortoise have produced a significant record of accomplishments that deserves international recognition. We recommend that Clark County, USFWS, BLM, NPS and UNR host in Las Vegas an international conference and workshop on the Biology, Conservation and management of tortoises. UNR will organize the conference and invite the participants in the DCP and the members of the IMC and local, national and international experts in the science, conservation and management of tortoises so that local tortoise biologists and managers can benefit from the visiting expertise and the visiting experts can learn

from the Clark County experience. Further we recommend that UNR publish the results of the conference, including the local reports for the benefit of the DCP.

**Boulder City Conservation Easement Initiative.**

We have discussed in Chapter 4 the critical situation in the Boulder City Conservation Easement. It appears that the Boulder City Conservation Easement Grant, which was purchased from Boulder City by Clark County, is not providing the required conservation benefits. The cost of the Grant was equal to the cost of the land and Boulder City used Clark County's money to purchase from BLM the 85,000 acre Easement and more. The terms of the Easement appear to have been ignored by Boulder City. Assurances offered verbally by Boulder City officials at the time of the purchase of the Easement have been disregarded. The violations of the terms of the Easement and of the provisions of the MSHCP and the terms and conditions of the permit by Boulder City, a Permittee, seems to be, at least in part, a causal factor in the observed decline of tortoise populations in the BCCE and the loss of conservation benefits in the area. If the BCCE is not to be managed for the conservation benefit of desert tortoise then Clark County and the other Permittees will need to mitigate the loss of this 85,000 acres to the Piute/Eldorado Valley Distinct Population Segment (DPS).

We propose an immediate emergency meeting of the US Fish and Wildlife Service, Clark County, Boulder City, BLM, the Science Advisory Team and IMC members to determine:

- The number, extent and routes used for illegally permitted events in the BCCE since the Grant was finalized
- Necessary administrative measures to mitigate the situation that allowed these violations to occur
- A rapid inventory and monitoring program to assess the extent of the damage to the species and environments in the BCCE caused by the violations.
- Species and habitat mitigation measures to be taken by the violators.

**An Initiative for Riverine and Aquatic Species (not including upland springs and spring species)**

Weeds ravage natural systems in the wetter parts of the County. Habitat is lost and fragmented in the already tiny riparian ecosystems. The birds, butterflies, bats, and amphibians in riverine systems are now troubled species in troubled ecosystems. Placing riparian birds, riparian weeds, and ecosystem processes driven by discharge rates of water into a consolidated and integrated subdivision of MSHCP effort will allow resources to be appropriately focused on common ecosystem needs.

We propose a riverine initiative for the MSHCP for the 2005-2007 biennium consisting of projects that address the PIE, inventory, monitoring, research, implementation and administrative needs of riverine species and environments including the edge of Lake Mead and the Las Vegas and Meadow Valley Washes. These species and environments were to be addressed in "phase two" of the MSHCP and are currently the subjects of large planning efforts. Another concern that resulted in riverine species and environments

being addressed in “phase two” was the likelihood that conservation actions would be much more expensive than the upland phase and that the regulatory complexity would require significantly greater time to negotiate. Since the expensive and complicated planning efforts for these species and environments has been initiated or will soon be initiated our recommendations are primarily for projects that will inform the planning process. Large implementation projects seem to be premature.

### **Recommended Project Areas:**

#### **Public Information and Education (PIE).**

The PIE Subcommittee has discussed the need to begin an educational program related to the threats posed by weeds, primarily in riverine riparian areas and adjacent to the Las Vegas Wash. The Cooperative Extension has proposed several outreach projects to address these issues. These projects would inform or assist private property owners in managing weeds. Pilot projects in these areas could address the need for information in managing weeds and the effectiveness of such a project. The Virgin River, the Muddy River and the Meadow Valley Wash are the subjects of current or future planning efforts that include elements on PIE. If the planning efforts identify PIE projects that will significantly enhance the planning effort then these should be high priority.

#### **Inventory.**

The Species Status Report requires current inventory data for all Covered Species. Very few Covered Species have been subjected to adequate inventory (see Species Knowledge Gaps, Appendix 6 and Risk/Uncertainty Analysis, Appendix 7). Inventories must be hypothesis driven, spatial based, include sufficient metadata and across administrative borders. Appendices 6 and 7 provide some priorities for species inventories. Some species are currently the subjects of planning that will prioritize inventory needs. Inventories for those species should be undertaken only if the planning process will be hindered by a lack of inventory data. Inventories for species that are not the subject of planning for which uncertainty is high and where there are knowledge gaps should have a high priority. The Virgin River, the Muddy River and the Meadow Valley Wash are the subjects of current or future planning efforts that include elements on Inventory. If the planning efforts identify inventory projects that will significantly enhance the planning effort then these should be high priority.

#### **Monitoring**

All implementation projects need to demonstrate effectiveness and conservation benefits through monitoring or research this includes any project purporting to address threats or convey conservation benefits. Monitoring is the means to assess this, and hypothesis-based monitoring is focused to be very direct in assessing the effectiveness of management actions. It is not necessary to demonstrate effectiveness experimentally for every implementation project but every project must demonstrate directly or indirectly that the project is effective, resulting in conservation benefits. Major implementation areas, such as fencing, weed

eradication and restoration, law enforcement and PIE need effectiveness monitoring, and properly designed hypothesis-based monitoring can identify the sources of inefficiency, sources of error in interpretation, and sources of success needing further fostering. Properly designed monitoring blurs the distinction between monitoring and research as hypothesis-based monitoring is really research to assess the answer to particular questions about effectiveness of management. The importance of monitoring of implementation projects for effectiveness depends on the cost of the action and the extent to which the action has been demonstrated to provide species conservation benefits. The DCP must establish through research or monitoring that expensive implementation projects result in species conservation benefits where there is not a well-established documentation of such benefits.

All Covered Species must be monitored for the measurable biological goals of “no net unmitigated loss or fragmentation of habitat in IMAs and LIMAs” and to “maintain stable or decreasing population numbers” (MSHCP Appendix B). This does not mean that every Covered Species must have a monitoring project for populations. The MSHCP discusses the utility and economy of indicators and indirect measures of habitat and population trends. However, the demonstration that the measurable biological goals are met must be based on hypothesis-based research. The species for which the risk due to threats is high and uncertainty is great are ranked high (Appendix 6). Those species ranking high require population monitoring to provide the Fish and Wildlife Service assurances that they are not experiencing undetected declines.

### **Research**

As mentioned above, properly designed monitoring is difficult to distinguish from research insofar as some monitoring requires research approaches to develop needed answers about management. However, in some cases, so little is known about some species that management cannot be intelligently directed. The Virgin River, the Muddy River and the Meadow Valley Wash are the subjects of current or future planning efforts that include elements on research needs. If the planning efforts identify research projects that will significantly enhance the planning effort or if there are management uncertainties that require research to resolve in order to advance planning then these should be high priority.

### **Implementation**

The DCP has funded a several projects that purported to address threats and convey conservation benefits in the riverine environments. The following implementation project areas are based on past projects and indications from the management agencies that they saw these project areas as important.

#### *Weed Eradication and Restoration.*

Weeds (plants and animal) represent a threat to many of the Covered Species and ecosystems of Clark County. The management agencies have recognized this

threat and have mature eradication programs as well as restoration programs to follow on eradication efforts and other sources of disturbance. The Southern Nevada Restoration Team (SNRT), a multi-agency organization that operates primarily on public lands including along the Virgin and Muddy Rivers, Meadow Valley Wash and along the shores of Lake Mead and has received part of its funding from the DCP. MRRIAC is a rural-based organization that contracts for Division of Forestry supervise prison crews to perform weed eradication efforts on the Muddy River. The conservation benefits of weed eradication and restoration vary depending on the weed or disturbance and the species presumed to benefit. In addition, the method of eradication and restoration may influence the how species experience the benefit. The Virgin River, the Muddy River and the Meadow Valley Wash are the subjects of current or future planning efforts that include elements on PIE. If the planning efforts identify PIE projects that will significantly enhance the planning effort then these should be high priority. The current efforts should be focused on public lands being managed for conservation benefits and on private lands on which permanent conservation easements have been obtained. Weed eradication activities need to be prioritized on the basis of the threat posed to a Covered Species.

#### Species Status Reports

Species status reports are necessary for all covered organisms recognized in the HCP, and those found to be in at-risk status since the HCP was published. Those reports should be based on the best available scientific information and should be further informed from surveys of select likely habitats in the county (a stratified random sampling scheme for surveys may be necessary for species with suspected wide ranges and sparse distributions, or species that are otherwise especially difficult to inventory). All new records should be provided in a GIS-appropriate format (preferably with GPS-generated coordinates), and should be accompanied with information on the widest possible array of abiotic and biotic correlates of habitat occupancy – including such variables as soil types, hydrological conditions, vegetation (composition and structure), co-occurring species, disturbance types and intensities, and other species-specific circumstances of concern. A goal will be to develop baseline status assessments from empirical field data, to predict species status in suitable areas not subject to surveys, and to create a common information base from which trend assessment may be made through subsequent surveys. An inventory techniques guidebook should be developed to bring consistency and rigor to survey efforts that target the wide diversity of species of concern in Clark County.

We propose a Species Status Report initiative for the MSHCP for the 2005-2007 biennium consisting of inventory, monitoring, research and analysis of the current status of all Covered Species and selected at-risk Evaluation and other species. The species status report for each species must at a minimum:

- summarize the known distribution
- review current taxonomic status
- create an habitat model that predicts the possible distribution in order to guide inventory efforts
- summarize known natural history and autecology of the species

- analyze all available inventory, monitoring and other data to describe population status and trend
- summarize the known threats to the species
- identify gaps in our knowledge of this species and propose projects to fill those gaps
- summarize the conservation and other actions taken to benefit this species
- identify needed actions to address threats
- list and archive all information resources (published, peer-reviewed papers, reports, locality information, implementation project description, etc.)

The species status reports need regular review and update as information becomes available but at least every two years as a key component of the BAMR to provide Clark County, the Fish and Wildlife Service and the IMC with evidence of the progress made in conserving species or to identify where additional action is required. The analysis and summary of the threats monitoring, population trend monitoring, and research are scientific functions and in some cases may require assembling experts for workshops, seminars, symposia or conferences. The species status reports should be made available to all on the MSHCP database. The responsibility to produce species status reports falls within the charge made in the MSHCP to the Science Advisory Team, but such reports have not yet been specific assignments or budgeted tasks. It should be a priority for the next biennium.

## **MONITORING**

A decoupling of management action and program monitoring appears to be necessary because of capacity and capability. With some exceptions, the land management agencies generally are not sufficiently staffed to carry out the level of monitoring required by the HCP. As a result the majority of monitoring efforts for natural resources in Clark County do not produce data that can inform next management actions. The current situation can be addressed in several ways - - 1) the land management agencies can hire staff trained in the techniques of science-driven resource assessment, 2) the agencies can use the technical expertise available through the U.S.G.S. Biological Resources Division, the entity created specifically to serve that and related management, or 3) the agencies can seek independent assistance from private sources, including academic scientists and environmental consultants.

We recommend the creation of programmatic monitoring capabilities, in which monitoring “teams” are engaged to take on assessments of key resources and management programs countywide. Teams to assess select taxonomic groups of concern, or to measure the efficacy of weed eradication and ecological community restoration in riparian areas, would potentially serve the monitoring needs of multiple projects by multiple agencies (or other managers) with far greater efficiency than project-by-project assessments could.

Informal discussion of consolidation of effort have started taking place among representatives of SNRT, USGS, BOR, Cooperative Extension and UNR in relation to monitoring programmatically for weed eradication and restoration projects. Similarly, efforts to assess the likely outcomes from programmatic monitoring data, are taking place in discussions about tortoise density monitoring in areas with different management applications.

The upcoming Monitoring Workshop will be another opportunity to advance the dialogue between managers and monitoring specialists. The requirement that the demonstration of effectiveness and conservation benefits be a part of proposals in the upcoming budgeting process will do a great deal to advance the adaptive management program.

Beyond the suggestions offered in this document, a primer or monitoring plan structure will be developed immediately after the Monitoring Workshop. That primer will describe the obligatory steps in the design of a prospective monitoring program, including but not limited to: 1) characterization of anticipated stressors and disturbances, 2) listing of ecological processes and resources affected by those stressors or disturbances, 3) ranking of stressors according to their potential impact, 4) development of conceptual models to out-line pathways from stressors to ecological effects on resources of concern, 5) selection of system condition indicators, 6) determination of detection limits for condition indicators, 7) establishment of critical decision values or triggers for the indicators, and 8) establishment of explicit connections between monitoring outcomes and management decisions.

We recommend that all implementation projects demonstrate effectiveness whenever possible through citation of scientific studies documenting conservation benefits. If such evidence of conservation benefits is unavailable then effectiveness needs to be established by research or monitoring. Large, expensive or complicated implementation projects should not go forward without a parallel project for monitoring or research conducted independent of the implementing entity. For multiple projects involving the same activities such as weed eradication or law enforcement we recommend programmatic monitoring projects.

## **THE PROPOSAL AND REPORTING PROCESSES**

### Proposals

Much discussion has followed the arduous, working-group-based proposal vetting process that extended for most of the second half of 2002. Many participants agree that the process did an inadequate job of distinguishing between proposals that warranted funding and those that did not, and provided no capacity to prioritize those found worthy. Many proposals with only limited pertinence to the goals of the DCP were considered and funded. Lack of explicit guidance to applicants resulted in proposals that provided little detailed explanation of how proposed activities would be carried out, and few substantive measures to assess conservation benefit. The lack of detail extended to

project objectives, rationale for actions, measurable milestones, and monitoring assessment tools.

Attention has been paid to these shortcomings in discussions of a future proposal solicitation process, although a full response in the form of a detailed step-down outline to provide explicit guidance for proposal structure and substance has not yet been created. The proposal solicitation should:

- (1) Clearly define the areas and issues that are appropriate for funding, including a list of directed actions which could result, in at least some cases, in competing proposals that would allow the program to select among the best applicants.
- (2) Provide an explicit outline of proposal elements and a description of levels of required detail in technical explanations and justifications required for proposed management actions.
- (3) Be followed by a technical review process to identify proposals that are most likely to serve the needs of the HCP. At a minimum, some level of independent external review (by parties not directly in the proposed program) should be carried out under a sufficient level of anonymity to assure frank appraisal.
- (4) Differentiate in the proposal process, for purposes of review criteria, among three legitimate types of projects -- a) new projects in response to identified program priorities (directed actions), b) ongoing projects that require further activity and funding, and c) new proposed actions that have not specially been solicited. Worthy proposals should be considered in each of these categories.

Proposed actions should go through a preliminary sorting, to identify those proposals that are clearly articulated and supported by competent technical information are separated from those that are not. The former proposals put into one of three categories -- 1) full-scale implementation of proposed management action (for those projects with proven or high likelihood of success as proposed), 2) pilot projects (projects for which a pilot or demonstration action and effectiveness assessment should precede full implementation), and 3) targeted research (actions or data gathering that should be carried out within an experimental frame before moving to pilot or full implementation).

However, there is no way to discern the relative importance of proposed projects without very explicit proposals. Proposals must relate to MSHCP goals and must have anticipated outcomes explicitly stated so that it is possible to rank proposals relative to the goals for the MSHCP. In some cases (for example), the blend of proposals from agencies is lopsided by not proposing to manage the land as much as to search for new locations to find rare plants or to monitor a species in ways that do not test a management action. The County needs the agencies **to manage the land and manage threats** to recover the desert tortoise and to conserve Covered Species, and if projects to survey for locations of species compete with needs to manage the land, then the MSHCP will not meet its goals.

The IMC with science advice sets goals, and projects proposed to accomplish those goals are projects that should be considered as part of the MSHCP.



## **TEMPORAL SCOPE OF PROJECTS**

For many years the DCP has funded programs such as law enforcement, fencing, desert tortoise monitoring, the PIE Mojave Max program, weed eradication by SNRT, various research projects and the Science Advisory Team to implement consistent actions at consistent levels each biennium. The agencies that have law enforcement programs supported by the DCP and the FWS have recommended that funding commitments for longer than the 2 year budgeting cycle the DCP uses would make planning, recruiting and keeping qualified staff and maintaining consistent effort more efficient. We believe that this makes good sense. Many projects require more than two years to complete and those should propose the real temporal scope of the project. For example a research project that will require two field seasons to collect data and one year for analysis should ask for three years of support. A programmatic weed eradication project that uses a crew of known and predictable size that will address a predictable annual workload should propose a temporal scope of up to six or eight years. Ongoing projects or those that require more than two years to complete could be renewed based on the original proposal and a determination that appropriate progress has been made. To insure accountability projects that significantly change scope or cost would submit a proposal addressing the required change and that request would be evaluated and approved or rejected. We recommend that this change would simplify and streamline the biennial budgeting process and conserve agency staff and IMC time. The IMC would have the option of requesting that any project submit a new proposal if circumstances warrant or the IMC directs.

## **REPORTING AND INFORMATION SHARING**

Current methods of reporting on funded and other activities that support the HCP are inadequate to judge program effectiveness. Information provided in reports should be spatially explicit, in GIS format whenever possible. Maps should document geographic areas subject to management action. More explicit details of treatments, and ecosystem or species responses to treatments should be presented when such representations are relevant to the documentation of species or habitat benefit.

We recommend that all inventory, monitoring, and research projects fully document activities so that the scientific standard that the effort can be replicated independently is met. Original data needs to accompany inventory and monitoring reports, but the intellectual property rights must be protected and inappropriate revealing of sensitive information must be avoided. Such issues need to be addressed through explicit data-sharing agreements that will assure that all information relevant to determinations of status of Covered Species is archived for future analysis.

## **PLANNING**

The extensive list of MSHCP Conservation Actions should be revisited and amended to reflect the changing understanding of target resources, emerging previously unidentified needs, new priorities, inconsistencies among listed actions, and apparent contradictions or

conflicts between stated actions and to develop policies into actions. Amendments can be based on information from the land and resource management agencies, working groups, and other competent sources; should be designed to best meet explicit permit requirements; and should be articulated so as to allow evaluation of compliance and effectiveness.

In the 2003-2005 BAMR a hotspot analysis was conducted in order to direct actions toward areas supporting significant diversity. This product should be refined to provide a basis for identifying and prioritizing geographic areas for management action planning and project implementation for inclusion in the development of CMSs for geographic areas and taxonomic groups. As new information becomes available it may be necessary to review and revise conservation strategies to assure that all resources of concern under the county's permit are addressed and that duplication of target resource strategies is minimized.

We recommend that the identified planning efforts be advanced following the Elements of a Conservation Management Strategy developed by the Planning Working Group. We support that the Planning Working Group continue to supervise the planning efforts to insure adherence to the Elements.

The failure to adequately manage the Boulder City Conservation Easement is a program failure. The Easement was obtained specifically to provide conservation benefits for desert tortoise and other species. Clark County has expended several million dollars to accomplish conservation and that effort seems to have been nullified by contradictory actions. We propose that a BCCE CMS be developed to address the special problems of the BCCE and restore to it some conservation value. This action is the highest priority action.

Finally, the DTRPAC Report has identified a previously unrecognized desert tortoise Distinct Population Segment (see Appendix 9) that generally occurs in the northern Ivanpah Valley, the Pahrump Valley extending around the north end of the Spring Mountains onto the Fish and Wildlife Service Desert Game Range. This area needs to have a Conservation Management Strategy that follows the Elements outline. In addition, this area needs identified management actions and protection through appropriate land use designation generally consistent with a Desert Wildlife Management Area.

## **COORDINATION AT THE LANDSCAPE LEVEL ACROSS ADMINISTRATIVE BOUNDARIES**

In order to meet the permit requirement to quantify mitigation to balance take, the CC MSHCP needs to gather very high-resolution effectiveness monitoring data across the entire County landscape. Because of the many governmental entities administering that landscape, the Clark County MSHCP must become a program that causes the contributions from agencies, academics, consultants, contractors, and citizens to be more than the sum of the individual parts. This will happen only when there is a working

system of reporting that (1) allows all partners to access information from other partners, and (2) provides information that can be analyzed to assess programmatic needs. We recommend that the County the agencies and the Science Advisory Team and other interested partners develop a data sharing agreement that protects the intellectual property rights of the scientists, the security concerns of the managers and the Clark County's requirement that all information relevant to the determining the status of all Covered Species be available in the Species Status Report. The agreement should identify mechanisms for information transfer, timelines, GIS standards, security measures, archiving protocols and access criteria.

Coordination is certainly required within the program among program partners, but coordination and information sharing is also required above the program level to address local, state or federal government agency/entity initiatives that might impact the ability of the MSHCP to reach its goals. Such initiatives could include Federal legislation (such as the Clark County Lands Act that released Wilderness Study Areas), possible HCPs for satellite developments in sensitive areas (such as the Coyote Springs Valley and Mesquite) and water rights allocations and water mining that could affect our springs and rivers, as well as expansions of roadways and utility corridors that fragment and degrade habitat. Recognizing that our limited administrative staff cannot be everywhere, we recommend that the MSHCP contract for a cumulative impacts analysis of all actions not covered by our permit and subject to separate regulatory action that could affect the ability of the MSHCP to reach its goals.

## **NETWORKING WITH SIMILAR EFFORTS**

The Clark County DCP has not formally sought guidance from similar efforts across the west. Maturing multiple-species conservation plans in Arizona, southern and central California, and the Pacific Northwest have ample pertinent information available for harvesting. Successful and, in cases, less successful HCP efforts now can be assessed, especially in program areas such as milestone development, public participation, adaptive management, data archiving and retrieval, and many more key HCP features. The use of science advisors in program implementation has been the subject of much consideration in the CALFED Bay-Delta Environmental Restoration Program, for example.

Data sharing opportunities are available with other HCPs and public lands planning efforts in California and Arizona. At the least, information sharing can assist the Clark County effort in assessing its own HCP effectiveness (using neighbor efforts as standards for comparisons). Importantly many focal species in the Clark County HCP are species shared with lands to the west and east; the success of Nevada conservation efforts is dependent on the fates of those species in adjacent regions. Formal agreements for data sharing, especially for listed species, should be encouraged. Furthermore, periodic (not frequent) meetings of plan managers (and associated people helping in the program such as Science teams or advisors) of major HCPs would likely help in generating ideas important to solve sticky problems in conducting an HCP.

We recommend that the Fish and Wildlife Service take the lead in facilitating an on-going dialogue among the large multispecies HCPs and for HCPs with adjoining areas or similar problems.

### **BUILDING CAPACITY -- GIS.**

Clark County, the agencies and the Science Advisory Team have all established GIS projects to support the DCP with DCP funding. The GIS Working Group is establishing standards, defining pathways for information flow and coordinating to support DCP activities. Despite these efforts and the DCP support the DCP GIS capability is inadequate to meet the needs. In addition, the DCP needs an increased data management capacity. Clark County, the agencies and the Science Advisory Team need to assess the GIS and data management needs, and request support for necessary adjustments in GIS capacity. This is a high priority.

### **ADMINISTRATION.**

The Clark County DCP administration is a necessary component of the conservation program. MSHCP agency partners also face increased administrative costs as the program expands. The coordination demands on County and agency staff have been burdensome. Consolidation of monitoring into fewer larger programs that encompass the entire landscape, and increasing the length of some contracts will reduce some administrative burden, but increases in staffing may still be needed to address competing project-type, or program function expertise requirements. The DCP needs to address program expertise/experience requirements in many areas, including, but not limited to: contracting, compliance, public information and many kinds of clerical and technical support. The agencies, similarly, need biologists, outreach specialists, restoration and rehabilitation specialists, and others. Increasing staff as appropriate to meet the real demands of a changing program is a high priority.

### **CONCLUSIONS**

We believe that our recommendations cover the breadth of potential projects that might implement, inform, or monitor conservation actions but we certainly have not identified every possible project and may have missed some that are important. Our emphasis has been conservative, proposing those implementation projects that have been funded before and for which there can be presumed some benefit, even if it has yet to be demonstrated. We have followed the MSHCP in requiring demonstration of effectiveness where that is lacking. Finally, we have been concerned about significant gaps in our knowledge and have proposed an aggressive program to fill those gaps.

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