SPECIES
at
RISK REPORT
for
New Mexico and Arizona

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Others participating in this effort included the Arizona Game and Fish Department Natural Heritage Program, New Mexico Game and Fish Department, and the New Mexico Natural Heritage Program.

Species at Risk Report

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Scope of Work

The purpose of this effort was to finalize a Species at Risk (SAR) list that has been under development by a group of federal and state agency biologists and threatened and endangered species Program Managers from Arizona and New Mexico over the last few years. In addition to finalizing the SAR list, a Species at Risk (SAR) Report was to be prepared. The SAR report was to include the SAR list and conservation and management recommendation papers for a number of the species found on the list. As a final step, the SAR Report was to be made available to state and federal agency biologists in Arizona and New Mexico to be used as a tool to assist them in becoming aware of the species at risk in the two states and to assist them with conserving and managing for these species when opportunities arise.

Background Information

In late FY 2001, as the result of interest by various state and federal agencies to engage in an effort to develop a consistent and comprehensive Interstate/Interagency SAR list for the states of Arizona and New Mexico, a coordination group was formed. This group was composed of state and federal agency biologists and threatened and endangered species Program Managers from the Arizona Game and Fish Department (AZG&F), Bureau of Land Management (BLM), Department of Defense (DOD), National Park Service (NPS), New Mexico Game and Fish Department (NMG&F), New Mexico Natural Heritage Program, U.S. Fish and Wildlife Service (FWS), and the U.S. Forest Service (FS). By 2004, a draft list had been prepared; however, it became difficult for the members of the group to remain active on the project and the list was never finalized.

In 2004, the Southwest Strategy Endangered Species Act Team (SWESA)[1], who were aware of the on-going effort to compile a sensitive species list for the two states, applied for and received a Legacy Grant from the DOD to complete the list and prepare a SAR Report. Funds were transferred to the FS for completion of the Grant in 2005.

Methodology

Species at Risk list

The Interstate/Interagency coordination group began the process of developing a comprehensive sensitive species list for New Mexico and Arizona by agreeing upon a set of criteria (Appendix A). Specifically, the criteria developed required the inclusion of federally proposed and candidate species, as well as those species which have been federally delisted within the last 5 years. Furthermore, other species could be added if they had Nature Conservancy Conservation Status rankings of G1-3 or S1-3 (Appendix

[1] The Southwest Strategy Endangered Species Act Team is composed of individuals from the Army Corps of Engineers, Bureau of Indian Affairs, Bureau of Land Management, Bureau of Reclamation, Department of Defense, Forest Service, Fish and Wildlife Service, National Park Service, and the Natural Resource Conservation Service. The Team provides training and develops actions to improve implementation of the Endangered Species Act with focus on the section 7 consultation process.

B). A species could also be included if current knowledge indicated a high level of concern, if the species was state listed as threatened or endangered, if the species could be highly sensitive to indirect or cumulative effects of actions on the ground, or it could be demonstrated that the species had importance at the periphery of its range and that was the situation in New Mexico and/or Arizona for the species. For invertebrates, due to the large number of species, it was necessary to primarily limit the criteria to only those species which had Conservation Status rankings of G1 and S1, unless information was provided by a species expert that justified inclusion based on other factors.

From the Interstate/Interagency Coordination group a Species Subgroup was formed. Species group leaders were chosen from the subgroup to represent the following species groups: Amphibians, Birds, Clams, Crustaceans, Fish, Insects, Mammals, Reptiles, and Snails. The species group leaders were fish and wildlife biologists from both the FS and FWS. Each group leader was responsible for developing a draft list of species for their particular species group by consulting with various experts (state and federal agencies, universities, and others) and databases (primarily NatureServe, Arizona Natural Heritage and Bison-M), or other sources as necessary. A draft SAR list was completed in 2004.

The completion of the SAR list was accomplished by contacting the original Interstate/Interagency coordination group subgroup leaders to obtain the most current copy of their work on the 2004 draft SAR list. The list was reviewed for accuracy using information gathered from databases (primarily NatureServe, Bison-M, Arizona Natural Heritage Program and New Mexico Natural Heritage Program). In addition, habitat and management recommendation information were added for as many species as possible.

Species Papers

In order to determine which species on the SAR list could be considered priority for completing species papers; suggestions for inclusion were solicited from the species group leaders who were involved in originally developing the draft SAR list. From this effort, 25 species came forward as priority species (Appendix C; plants not included). It was quickly realized that, due to time and funding constraints, completing 26 species papers was unreasonable for this effort. Therefore, the SWESA Team developed the following set of criteria to narrow the number of species papers to those of highest priority for this effort:

1. Species with multiple land jurisdiction, especially those including Department of Defense lands;
2. U.S. Fish and Wildlife Service Proposed/Candidate species or State listed species; and, or
3. Species for which information is not readily available to field biologists.

In addition, an effort was made by the SWESA Team to try to include species from as many of the species groups as possible. Six species were chosen based upon the criteria and the interest in having a wide representation of species.

A format for the species papers was developed by the SWESA Team (Appendix D). The format included a variety of information on the species, including a species description, life history, distribution and abundance, threats and range maps, and habitat management recommendations.

The species papers were written based on information gathered from a variety of sources including NatureServe, Bison-M, Arizona's Natural Heritage Program: Heritage Data Management System, New Mexico Heritage Program, and scientific journals and other scientific literature. Furthermore, the papers were sent to the species group leaders for their review.

Species at Risk List (SAR)

Appendix E contains the 2006 final SAR list for the states of Arizona and New Mexico. The list includes information on the species state and global status, state and federal listing status, land jurisdiction of occurrence, limiting factors and justification for inclusion on the list. For a large number of species on the SAR list columns with information on habitat requirements and management recommendations have also been included. These columns were added during this effort; however, it was not possible to complete these columns for all species at this time. Currently, the SAR list contains 448 (plants are not included[2]) (Table 1).

Table 1. Number of species by Species Group on the 2006 SAR List.

Species Group	Number of Species
Amphibians	14
Birds	62
Clams	7
Crustaceans	9
Fish	31
Insects	47
Mammals	133
Reptiles	48
Snails	97
Total	**448**

Species Papers

Based on the criteria above (Methodology section), the following 6 species were identified as priority species:

Baird's sparrow

Land ownership of occurrence: FWS, FS, BLM, DOD, NPS, state and private.

[2] It should be noted that there is a separate ongoing effort to complete a similar list for sensitive plants species in Arizona and New Mexico; however, at this time that list is still in draft form.

This species has a restricted range, spotty distribution, and recent rapid and long-term population and range declines. Although considered secure globally (G4), the species is considered imperiled in both Arizona and New Mexico and NM (S2). In Arizona it is designated a Species of Special Concern and it is listed as threatened by the state of New Mexico. The species also occurs on the FWS List of Birds of Conservation Concern and is a Species of Concern for the New Mexico FWS Ecological Services field office.

Rio Grande sucker

Landownership of occurrence: BLM, FWS, FS, and state lands. If not on DOD, it occurs close.

Range-wide this species is considered vulnerable (G3), in New Mexico it is considered imperiled, (S2), and in Colorado it is considered critically imperiled (S1). Although current distribution information is lacking, it appears that this species is decreasing in the northern portion of its range. Species of Concern for the New Mexico FWS Ecological Services field office.

Poling's hairstreak

Landownership of occurrence: FS, DOD, possible BLM.

Only know from New Mexico and Texas, this species is considered imperiled globally (G2) and the rounded global status is critically imperiled (T1). The species is currently on the FWS New Mexico Ecological Services Species of Concern list.

Western red bat

Landownership of occurrence: FS, FWS, BLM, DOD, NPS and state.

This species is a good indicator of healthy southwestern riparian woodlands. Although considered secure globally (G4), in New Mexico and Arizona it is considered imperiled (S2). In New Mexico the species is listed as threatened by the state and in Arizona is on the Wildlife of Special Concern list.

Mexican garter snake

Landownership of occurrence: FS, FWS, BLM, NPS, DOD, and state.

Documented declines in New Mexico and Arizona with substantial range contractions in both state. Threats are high and on-going in the United States. Globally the species is considered vulnerable (G3) and is considered vulnerable (S3) in New Mexico and imperiled (S2) in Arizona. It is also state listed as endangered in New Mexico. The FWS recently published a 90 day finding for this species which found that there is substantial

scientific and commercial data indicating that a listing may be warranted. The FWS is now in the process of conducting a status review for this species.

California Floater
Landownership of occurrence: FS, State, private

Likely found only in the Black river of Arizona. Declining populations range-wide. May be extirpated from the majority of the Colorado River basin in Arizona. Globally vulnerable to extirpation or extinction (G3); state ranked in Arizona as critically imperiled (S1).

Species papers were completed for all species. The species papers developed for this report can be found in Appendices F-K.

Conclusions and Summary

The development of a SAR risk list is a challenging task, particularly for the southwestern United States where the diversity of species is very high (Arizona 3rd and New Mexico is 4th in U.S. for diversity; NatureServe 2002). In addition, gathering even basic information for many of the species (e.g., insects/snails) can be very difficult. Furthermore, it should be realized that the SAR list needs to be frequently updated because of continual changes in scientific knowledge, to account for changes in state and federal status, and to account for changes in information that occurs when the various databases used (Bison-M, NatureServe, Arizona HDMS) are updated.

This SAR report will be made available to state and federal agency biologists in Arizona and New Mexico through the distribution of hard copies and cd's. Furthermore, the document will be made available to agency employees and the public through various agency websites.

Literature Cited

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APPENDIX A

Criteria used to Develop the Arizona and New Mexico Species at Risk (SAR) list

Consider all species that meet one or more of the criteria below:

A. Species will be secured on the list if they are:

1. US Fish and Wildlife Proposed and Candidate species,

2. Species that have been federally de-listed within the last 5 years, or

B. Species which do not meet these absolute criteria may be retained or added to the list if they meet at least one of the following indications of concern:

3. Rated as GTN 1 or S1 (critical rarity or vulnerability),

4. Rated as GTN 2 or S2 and TNC factors of declining abundance and distribution,

5. Rated as GTN 3 or S3 and TNC factors of declining abundance and distribution as well as high vulnerability to human disturbance due to biology or geography (restricted or disjunct distribution and habitats, low numbers, and other biological factors).

Note that viability concerns are enough in cases of limited distribution and/or rarity (i.e. GTN1 or S1). Downward trends need not be demonstrated.

C. Other species may be included on the list if there is justification of:

6. More up to date information that increases the level of concern to equate to the above Natural Heritage Database and TNC criteria.

7. State listed (threatened or endangered).

8. Species that are occupying habitat in New Mexico or Arizona; however, that habitat is on the peripheral of the range of the species. In these cases it will be necessary to evaluate the following:

    a. Species status in the core of their range
    b. Species status within the two states of Arizona and New Mexico
    c. The historical status/occupancy of the species in Arizona and New Mexico

APPENDIX B

NatureServe Conservation Status Rankings

Determining which plants and animals are thriving and which are rare or declining is crucial for targeting conservation towards those species and habitats in greatest need. NatureServe and its natural heritage member programs have developed a consistent method for evaluating the relative imperilment of both species and ecological communities. These assessments lead to the designation of a conservation status rank. For plant and animal species these ranks provide an estimate of extinction risk, while for ecological communities they provide an estimate of the risk of elimination. There are currently no conservation status ranks determined for Ecological Systems.

Conservation status ranks are based on a one to five scale, ranging from critically imperiled (G1) to demonstrably secure (G5). Status is assessed and documented at three distinct geographic scales-global (G), national (N), and state/province (S). These status assessments are based on the best available information, and consider a variety of factors such as abundance, distribution, population trends, and threats.

Interpreting NatureServe Conservation Status Ranks

The conservation status of a species or community is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global), N = National, and S = Subnational). The numbers have the following meaning:

1 = critically imperiled
2 = imperiled
3 = vulnerable to extirpation or extinction
4 = apparently secure
5 = demonstrably widespread, abundant, and secure.

For example, G1 would indicate that a species is critically imperiled across its entire range (i.e., globally). In this sense the species as a whole is regarded as being at very high risk of extinction. A rank of S3 would indicate the species is vulnerable and at moderate risk within a particular state or province, even though it may be more secure elsewhere.

Extinct or missing species and ecological communities are designated with either an "X" (presumed extinct or extirpated) if there is no expectation that they still survive, or an "H" (possibly extinct or extirpated) if they are known only from historical records but there is

a chance they may still exist. Other variants and qualifiers are used to add information or indicate any range of uncertainty. See the following conservation status rank definitions for complete descriptions of ranks and qualifiers.

- Global Conservation Status Definitions
- National and Subnational Conservation Status Definitions

Global, National, and Subnational Assessments

The overall status of a species or ecological community is regarded as its "global" status; this range-wide assessment of condition is referred to as its global conservation status rank (G-rank). Because the G-rank refers to the species or community as a whole, each species or community can have just a single global conservation status rank. The condition of a species or community can vary from one country to another, and national conservation status ranks (N-rank) document its condition in a particular country. A species or community can have as many N-ranks as countries in which it occurs. Similarly, status can vary by state or province, and thus Subnational conservation status ranks (S-rank) document the condition of the species or community within a particular state or province. Again, there may be as many Subnational conservation status ranks as the number of states or provinces in which the species or community occurs.

National and Subnational status ranks must always be equal to or lower than the global rank for a particular species or community (in this sense a "lower" number indicates greater risk). On the other hand, it is possible for a species or community to be more imperiled in a given nation or state/province than it is range-wide. As an example, a species may be common and secure globally (G5), vulnerable in the United States as a whole (N3), yet critically imperiled in Florida (S1). In the United States and Canada, the combination of global and Subnational ranks (e.g., G3S1) are widely used to place local priorities within a broader conservation context.

Global conservation status assessments generally are carried out by NatureServe scientists with input from relevant natural heritage member programs and experts on particular taxonomic groups. NatureServe scientists similarly take the lead on national-level status assessments in the United States and Canada, while state and provincial member programs assess the Subnational conservation status for species found in their respective jurisdictions.

Status assessments ideally should reflect current conditions and understanding, and NatureServe and its member programs strive to update these assessments with new information from field surveys, monitoring activities, consultation, and scientific publications. NatureServe Explorer users with significant new or additional information are encouraged to contact NatureServe or the relevant natural heritage program.

To ensure that NatureServe's central databases represent the most current knowledge from across our network of member programs, data exchanges are carried out with each natural heritage program at least once a year. The Subnational conservation status ranks

(S-ranks) presented in NatureServe Explorer are therefore only as current as the last data exchange with each local natural heritage program, coupled with the latest web site update (shown in the "small print" at the bottom of each NatureServe Explorer report). Although most Subnational conservation status ranks do not change frequently, the most current S-ranks can be obtained directly from the relevant local natural heritage program (contact information available at http://www.natureserve.org/visitLocal/index.jsp).

Status Assessment Criteria

Use of standard criteria and rank definitions makes NatureServe conservation status ranks comparable across organism types and political boundaries. Thus, G1 has the same basic meaning whether applied to a salamander, a moss species, or a forest community. Similarly, an S1 has the same meaning whether applied to a species or community in Manitoba, Minnesota, or Mississippi. This standardization in turn allows NatureServe scientists to use the Subnational ranks assigned by local natural heritage programs to help determine and refine global conservation status ranks.

Status assessments are based on a combination of quantitative and qualitative information. Criteria for assigning ranks serve as guidelines, however, rather than arithmetic rules. The assessor's overall knowledge of the species or community allows them to weigh each factor in relation to the others, and to consider all pertinent information. The general factors considered in assessing species and ecological communities are similar, but the relative weight given to each factor differs.

For species, the following factors are considered in assessing conservation status:

- total number and condition of occurrences (e.g., populations)
- population size
- range extent and area of occupancy
- short- and long-term trends in the above factors
- scope, severity, and immediacy of threats
- number of protected and managed occurrences
- intrinsic vulnerability
- environmental specificity

For ecological communities, the association level generally is the classification unit assessed and ranked (see Classification of Ecological Communities for an explanation of the classification hierarchy). Only global conservation status ranks are currently available for ecological communities on *NatureServe Explorer*. The primary factors for assessing community status are:

Species known in an area only from historical records are ranked as either H (possibly extirpated/possibly extinct) or X (presumed extirpated/presumed extinct). Other codes, rank variants, and qualifiers are also allowed in order to add information about the element or indicate uncertainty. See the lists of conservation status rank definitions for complete descriptions of ranks and qualifiers.

- total number of occurrences (e.g., forest stands)
- total acreage occupied by the community.

Secondary factors include the geographic range over which the community occurs, threats, and integrity of the occurrences. Because detailed information on these factors may not be available, especially for poorly understood or inventoried communities, preliminary assessments are often based on the following:

- geographic range over which the community occurs
- long-term trends across this range
- short-term trend (i.e., threats)
- degree of site/environmental specificity exhibited by the community
- imperilment or rarity across the range as indicated by Subnational ranks assigned by local natural heritage programs.

Relationship to Other Status Designations

NatureServe conservation status ranks are a valuable complement to legal status designations assigned by government agencies such as the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in administering the U.S. Endangered Species Act (ESA), and the Canadian Wildlife Service in administering the Species at Risk Act (SARA). NatureServe status ranks, and the documentation that support them, are often used by such agencies in making official determinations, particularly in the identification of candidates for legal protection. Because NatureServe assessment procedures-and subsequent lists of imperiled and vulnerable species-have different criteria, evidence requirements, purposes, and taxonomic coverage than official lists of endangered and threatened species, they do not necessarily coincide.

The IUCN Red List of threatened species is similar in concept to NatureServe's global conservation status assessments. Due to the independent development of these two systems, however, minor differences exist in their respective criteria and implementation. Recent studies indicate that when applied by experienced assessors using comparable information, the outputs from the two systems are generally concordant. NatureServe is an active participant in the IUCN Red List Programme, and in the region covered by *NatureServe Explorer*, NatureServe status ranks and their underlying documentation often form a basis for Red List threat assessments.

Global Conservation Status Definitions

Listed below are definitions for interpreting NatureServe global conservation status ranks (G-ranks). These ranks reflect an assessment of the condition of the species or ecological community across its entire range. Where indicated, definitions differ for species and ecological communities.

NatureServe Global Conservation Status Ranks

Basic Ranks

Rank	Definition
GX	**Presumed Extinct** (species) — Not located despite intensive searches and virtually no likelihood of rediscovery. **Eliminated** (ecological communities)—Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.
GH	**Possibly Extinct** (species) — Missing; known from only historical occurrences but still some hope of rediscovery. **Presumed Eliminated**— (Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut Forest.
G1	**Critically Imperiled**—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	**Imperiled**—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	**Vulnerable**—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	**Secure**—Common; widespread and abundant.

Variant Ranks

Rank	Definition
G#G#	**Range Rank**—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
GU	**Unrankable**—-Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Whenever possible, the most likely rank is assigned and the question mark qualifier is added (e.g., G2?) to express uncertainty, or a range rank (e.g., G2G3) is used

	to delineate the limits (range) of uncertainty.
GNR	**Unranked**—Global rank not yet assessed.
GNA	**Not Applicable**—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

Rank Qualifiers

Rank	Definition
?	**Inexact Numeric Rank**—Denotes inexact numeric rank (e.g., G2?)
Q	**Questionable taxonomy**—Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority.
C	**Captive or Cultivated Only**—At present extant only in captivity or cultivation, or as a reintroduced population not yet established.

Infraspecific Taxon Conservation Status Ranks
Infraspecific taxa refer to subspecies, varieties and other designations below the level of the species. Infraspecific taxon status ranks (T-ranks) apply to plants and animal species only; these T-ranks do not apply to ecological communities.

Rank	Definition
T#	**Infraspecific Taxon** (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status. At this time, the T rank is not used for ecological communities.

National and Subnational Conservation Status Definitions

Listed below are definitions for interpreting NatureServe conservation status ranks at the national (N-rank) and Subnational (S-rank) levels. The term "Subnational" refers to state or province-level jurisdictions (e.g., California, Ontario).

Assigning national and Subnational conservation status ranks for species and ecological communities follows the same general principles as used in assigning global status ranks. A Subnational rank, however, cannot imply that the species or community is more secure at the state/province level than it is nationally or globally (i.e., a rank of G1S3 cannot occur), and similarly, a national rank cannot exceed the global rank. Subnational ranks are assigned and maintained by state or provincial natural heritage programs and conservation data centers.

National (N) and Subnational (S) Conservation Status Ranks

Status	Definition
NX **SX**	**Presumed Extirpated**—Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
NH **SH**	**Possibly Extirpated** (Historical)—Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
N1 **S1**	**Critically Imperiled**—Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
N2 **S2**	**Imperiled**—Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
N3 **S3**	**Vulnerable**—Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

N4 **S4**	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
N5 **S5**	**Secure**—Common, widespread, and abundant in the nation or state/province.
NNR **SNR**	**Unranked**—Nation or state/province conservation status not yet assessed.
NU **SU**	**Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
NNA **SNA**	**Not Applicable** —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
N#N# **S#S#**	**Range Rank** —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
Not Provided	Species is known to occur in this nation or state/province. Contact the relevant natural heritage program for assigned conservation status.

Contact information for individual natural heritage programs is available at http://www.natureserve.org/visitLocal/index.jsp.

Breeding Status Qualifiers

Qualifier	Definition
B	**Breeding**—Conservation status refers to the breeding population of the species in the nation or state/province.
N	**Nonbreeding**—Conservation status refers to the non-breeding population of the species in the nation or state/province.
M	**Migrant**—Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the nation or state/province.

Note: A breeding status is only used for species that have distinct breeding and/or non-breeding populations in the nation or state/province. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the nation or state/province, and/or a migrant-status S-rank if the species occurs regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. The two (or rarely, three) status ranks are separated by a comma (e.g., "S2B,S3N" or "SHN,S4B,S1M").

Other Qualifiers

Rank	Definition
?	**Inexact or Uncertain**—Denotes inexact or uncertain numeric rank. (The ? qualifies the character immediately preceding it in the S-rank.)

Rounded Global Status: This value uses an algorithm to evaluate Conservation Status Ranks and systematically produces easier to interpret values without qualifiers or ranges (e.g. G2G4 becomes G3, G4T1? becomes T1). *For more information see NatureServe Conservation Status*.

APPENDIX C

Priority Species for Species Papers

(Species are not listed in order of priority)

Amphibians

Recommendation:	Relic Leopard Frog (*Rana onca*) (occurs in Arizona only)
Location:	Bureau of Land Management, National Park Service
Justification:	As of 2001, there were roughly 12 extant occurrences in Nevada and Arizona with less than 1000 adults. Threats include water developments, non-native predators and fungal disease. U.S. Fish and Wildlife Service Candidate species; National Heritage ranked as critically imperiled globally (G1). Population status is unknown for Arizona.
Recommendation:	Ramsey Canyon Leopard Frog (*Rana subaquavocalis*) (occurs in Arizona only)
Location:	Forest Service, Bureau of Land Management, Department of Defense, State, and private lands.
Justification:	Only known from area within 10 kilometer radius of the Huachuca Mountains. Only two sites in Arizona have a history of sustained successful breeding. Populations appear to be declining and recruitment is low at all known localities except for one. Globally and State National Heritage ranked as critically imperiled (G1, S1).

Birds

Recommendation:	Yellow-billed cuckoo (*Coccyzus americanus occidentalis)* (occurs in Arizona & New Mexico)
Location:	Forest Service, U.S. Fish and Wildlife Service, Bureau of Reclamation, Bureau of Land Management, Department of Defense, National Park Service, state and private lands.
Justification:	Breeding Bird surveys indicate population declines of 1.6% per year in North America. Overall declining in western United States. Globally secure (G5): however, is vulnerable to extirpation or extinction in Arizona and New Mexico (S3). The species is a U.S. Fish and Wildlife Service candidate for federal listing and is considered a Species of Special Concern in Arizona.

Recommendation:	Arizona bell's vireo (*Vireo bellii arizonae*) (occurs in Arizona and New Mexico)
Location:	Forest Service, U.S. Fish and Wildlife Service, Department of Defense, National Park Service, state (?), and private.
Justification:	Globally the species is considered widespread, abundant, and secure and apparently secure in Arizona. However, in New Mexico it is considered imperiled and is state listed as threatened. Breeding Bird Survey data indicate significant survey wide declines averaging 3.2 % per year and the species is listed by the U.S. Fish and Wildlife Service as a Bird of Conservation Concern. It is also a species of concern for the New Mexico Fish and Wildlife Service Ecological Services office.
Recommendation:	Baird's sparrow (*Ammodramus bairdii*) (occurs Arizona and New Mexico)
Location:	Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, Department of Defense, National Park Service, state, and private.
Justification:	Apparently secure globally; however, imperiled in both Arizona and New Mexico. It is a considered a species of special concern in Arizona, is state listed as threatened in New Mexico, and is a U.S. Fish and Wildlife Service New Mexico Field office species of concern. It is also on the U.S. Fish and Wildlife Service list of Birds of Conservation Concern.
Recommendation:	California black rail (*Laterallus jamaicensis coturniculus*) (occurs in Arizona only)
Location:	U.S. Fish and Wildlife Service, Bureau of Land Management, Department of Defense (?), and state.
Justification:	Populations are relatively small and trend is downward. Apparently secure globally (G4); however, critically imperiled (S1) in the state of Arizona. It is a Species of Special Concern in the state of Arizona.

Clams

Recommendation: California floater (*Anodonta californiensis*) (occurs in Arizona)

Location: Forest Service, state, and private (?)

Justification: Likely found only in the Black River in Arizona. Declining populations range-wide. May be extirpated from the majority of the Colorado River basin in Arizona. Globally vulnerable to extirpation or extinction (G3); state ranked in Arizona as critically imperiled (S1).

Recommendation: Sangre de Cristo Pea clam (*Pisidium sanguinichristi*) (occurs in New Mexico only)

Location: Forest Service

Justification: Globally ranked as critically imperiled; also ranked as imperiled in New Mexico. State of New Mexico listed as threatened. Is also a U.S. Fish and Wildlife Service species of concern for the New Mexico Ecological Service Field Office.

Crustaceans

Recommendation: Gammarus spp. No common name (occurs in New Mexico only)

Location: Department of Defense (White Sands Missle Range)

Justification: Endemic to Eddy County New Mexico. Recommended by species experts for inclusion.

Fish

Recommendation: White Sands pupfish (*Cyprinodon tularosa*) (occurs in New Mexico only)

Location: Department of Defense, National Park Service

Justification: This species is listed as threatened by the State of New Mexico, is a species of concern by the American Fisheries Society, and is considered critically imperiled range-wide (G1) and within New Mexico (S1). It is also considered a species of concern by the U.S. Fish and Wildlife Service New Mexico Ecological Services office.

Recommendation: Headwater chub (*Gila nigra*)
(occurs in Arizona and New Mexico)

Location: Forest Service, state, private.

Justification: Globally vulnerable to extirpation or extinction. Critically imperiled in Arizona and New Mexico. Has been petitioned for federal listing, status review in process.

Recommendation: Roundtail chub (*Gila robusta*)
(occurs Arizona and New Mexico)

Location: Bureau of Land Management, Forest Service.
If not on Department of Defense lands, it occurs close.

Justification: This species is declining significantly in abundance in many areas. It is considered imperiled (S2) in both New Mexico and Arizona and is listed as endangered by the State of New Mexico. Species of Concern for the U.S. Fish and Wildlife Service New Mexico Ecological Services. It is also a species of concern for the State of Arizona. It is likely that the species has been extirpated from the Zuni and San Francisco River drainages in New Mexico.

Recommendation: Rio Grande sucker (*Catostomus plebeius*)
(occurs New Mexico only)

Location: Bureau of Land Management, U.S. Fish and Wildlife Service, Forest Service, and state lands. If not on Department of Defense lands, it occurs close.

Justification: Rangewide this species is considered vulnerable globally (G3), in New Mexico is considered imperiled (S2), and in Colorado is considered critically imperiled (S1). Although current distribution information is lacking, it appears that the species is decreasing in the northern portion of its range.

Insects

Recommendation: Huachuca giant skipper (*Atrytonopsis cestus*)
(occurs in Arizona only)

Location: Forest Service, Department of Defense, private

Justification: Very limited distribution and small population size. Globally imperiled (G1). State rank unknown.

Recommendation: Poling's hairstreak (*Fixsenia polingi*
(occurs in New Mexico only)

Location: Forest Service, Department of Defense, Bureau of Land Management (?)

Justification: Only know from New Mexico and Texas. Globally imperiled (G2). State of New Mexico rank unknown; however ranked as critically imperiled in Texas. Is a U.S. Fish and Wildlife Service New Mexico field office species of concern.

Recommendation: Stephan's Heterelmis riffle beetle (*Heterelmis stephani*)
(occurs in Arizona only)

Location: Forest Service

Justification: Narrow endemic with high sensitivity to pollution. U.S. Fish and Wildlife Service Candidate species. Globally and Sub-nationally critically imperiled (G1, S1).

Mammals

Recommendation: Arizona shrew (*Sorex arizonae*)
(occurs in Arizona and New Mexico)

Location: Department of Defense, Forest Service, and private.

Justification: Globally the species is ranked as vulnerable to extirpation or extinction (G3). State ranked as critically imperiled in Arizona (S1) and imperiled in New Mexico (S2). The species is listed as endangered by the State of New Mexico.

Recommendation: Western red bat (*Lasiurus blossevillii*)
(occurs in Arizona and New Mexico)

Location: Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, Department of Defense, National Park Service and state.

Justification: This species is globally abundant and secure (G5); however, at the state level it is ranked imperiled for both New Mexico and Arizona (S2). The Western Bat Working Group has rated this species a high conservation priority species throughout most of the southwestern United States.

Recommendation: Spotted bat (*Euderma maculatum*)
(occurs in Arizona and New Mexico)

Location: Forest Service, U.S. Fish and Wildlife Service, Bureau or Land Management, Department of Defense, National Park Service and state.

Justification: State of New Mexico listed as threatened. Globally secure (G4); however, sub-nationally ranked as vulnerable to extirpation or extinction (S3) in Arizona and critically imperiled (S1) in New Mexico.

Reptiles

Recommendation: Maricopa leaf-nosed snake (*Phyllorhynchus browni lucidus*) (occurs in Arizona only)

Location: Forest Service, Bureau of Land Management, Department of Defense, National Park Service, State, and private.

Justification: Species appears to be declining or possibly disappearing in areas with heavy urban development such as Tucson and Phoenix. They are also believed to be affected by agriculture particularly in the Avra Valley. Globally abundant and secure (G5); however, they are considered imperiled (S2) in the state of Arizona.

Recommendation: Mexican garter snake (*Thamnophis eques megalops*)
(occurs in Arizona and New Mexico)

Location: Forest Service, Fish and Wildlife Service, Bureau of Land Management, National Part Service, Department of Defense, State.

Justification: Documented declines in New Mexico and Arizona with substantial range contractions in Arizona, New Mexico, and likely Mexico. State of New Mexico listed as endangered. Globally vulnerable to extirpation and extinction (G3). Considered imperiled (S2) in Arizona and vulnerable to extirpation or extinction in New Mexico (S3). FWS has recently published a 90 finding, currently conducting a status review on the species.

Recommendation: Sand dune lizard (*Sceloporus arenicolus*) (occurs in New Mexico only)

Location: Bureau of Land Management, state, and perhaps Department of Defense (?)

Justification: U.S. Fish and Wildlife Service Candidate for federal listing. Proposed for uplifting from Threatened to Endangered status in the state of New Mexico. Globally imperiled (G2) and critically imperiled (S1) in the state of New Mexico.

Snails

Recommendation: *Juturnia tularosae* (occurs in New Mexico only)

Location: Department of Defense

Justification: Globally and sub-nationally critically imperiled. Narrow endemic found in two highly restricted sites known on same creek in close proximity. Occurs in same habitat as the White Sands Pupfish.

Recommendation: Organ Mountains woodlandsnail (*Asmunella organensis*) (occurs in New Mexico only)

Location: Department of Defense

Justification: Globally and sub-nationally imperiled. U.S. Fish and Wildlife Service New Mexico field office species of concern. Limited distribution.

Recommendation: Huachuca springsnail (*Pyrgulopsis thompsoni*) (occurs in Arizona only)

Location: Forest Service, Department of Defense, and private (including Nature Conservancy)

Justification: Globally and sub-nationally ranked as imperiled (G2, S2). U.S. Fish and Wildlife Service candidate species. Only known from 16 sites.

APPENDIX D

Species at Risk Species Papers

Format

1. Species description and taxonomy;
2. Habitat requirements and life history;
3. Distribution and abundance (including maps if possible);
4. Threats;
5. Habitat/Species management recommendations; and,
6. Literature cited/Information sources

APPENDIX E

Species at Risk List
(attached)

SPECIES AT RISK (SAR) LIST FOR ARIZONA AND NEW MEXICO - September 2006

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
AMPHIBIANS												
SACRAMENTO MOUNTAIN SALAMANDER	*Aneides hardii*	SOC	T	0	G3	S3	NM	FS, BLM	Very limited distribution, highly vulnerable to desiccation and exposure due to habitat alteration. Negatively impacted by opening of mature forest canopy and by destruction or removal of downed logs. Intensive logging, slash removal, and burning probably are detrimental, as are improper grazing and high-intensity wildfire.	Occurs in only 3 mountain ranges in NM. Susceptible to fires. NMG&F threatened species.	Douglas-fir, Engelmann spruce, and white fir forests. Prefer stands with high densities of large fir and all size-classes of spruce. Typically found on north- and east-facing slopes; often found in rotting logs, rock crevices, or under forest litter in canyons. Spends much of its life underground. Females with eggs have been found in cavities in Douglas-fir logs. Feeds on invertebrates, especially ants and beetle larvae.	Create defensible space by restoring fire to forests bordering potential Sacramento Mountains salamander habitat. Minimize soil disturbance during timber management operations; when possible, harvest when soils are frozen. Lop and scatter after thinning rather than pile burning to conserve soil moisture. Monitor to ascertain whether BMPs and mitigations can maintain populations. Any surveys should be conducted during summer rains between late June and August which is when this species usually emerges and is most active.
JEMEZ MOUNTAINS SALAMANDER	*Plethodon neomexicanus*	SOC	T	0	G2	S2	NM	FS, NPS, private	Very limited distribution and is/has been limited by timber harvest, reduction in ground and canopy cover, and catastrophic wildfire.	Considered imperiled both globally and within the state of NM and is susceptible to fire. Over 90% of Jemez Mountain salamander populations are believed to occur on lands administered by the SF NF. Vulnerable to habitat destruction due to restricted range. NMG&F threatened species and is currently proposed for endangered status.	Found in moss-covered rockslides, especially on steep north-facing slopes in and near mixed-conifer and spruce-fir forests above 7,200 ft; also associated with aspen and maple. Occurs underground except during period of warm season rains when it can be found under bark and beneath logs. Preferred microhabitat is generally characterized by relatively high humidity and soils with specific rock structure. Active at night.	Follow recommendations of 2000 Conservation Agreement.
SONORAN DESERT TOAD (a.k.a. Colorado River toad)	*Bufo alvarius*	SOC	T	0	G5	S5, S2	AZ, NM	FS	Habitat modification, overcollecting, and urban development.	This species occurs from extreme southeastern California, southern AZ and extreme southern NM in the U.S. and has nearly been extirpated in California. It has declined in western AZ where it has not been observed on the Colorado river since 1986. This species is very rare and/or very limited in distribution in NM. Globally, the species appears to be secure.	The Colorado River toad is primarily a Sonoran Desert species, but ranges from arid mesquite/creosote bush lowlands (including closed chaparral), arid grasslands, cottonwood-willow and mesquite bosque, to oak/sycamore/walnut groves in mountain canyons. In NM, most observations of the species have typically been at elevations between 1250 and 1500 m . Usually near permanent water, but also found near temporary water or far from water. They may take refuge in rodent burrows and have been found in a cattleguard. They breed and lay eggs in ponds, slow-moving streams, etc. Most active during the breeding season, May-July. Activity stimulated by rainfall, but not dependent on rainfall for breeding . They are nocturnal and feed on insects, spiders, lizards, and other toads.	The critical need for the species is breeding habitat, where they congregate at temporary pools and other bodies of water. Habitat has been affected by diversion, rapid runoff/sedimentation, and pollution. Also affected by activities such as road construction and housing development which can increase diversion of roadside silt and runoff into known breeding ponds, overcollecting (a known threat in NM), and some toads had been killed by automobiles. Draining or filling in of stock tanks also poses a threat to the species.
BOREAL TOAD (a.k.a. Mountain toad)	*Bufo boreas boreas*	SOC	E	0	G4T4	SH	NM	FS	Habitat loss, environmental contaminants, disease (chytrid fungus) and ozone layer depletion. Crown fires reduce shade and surface humidity, thereby decreasing active daylight time toads have after fire. Fires during early spring could affect egg masses by reducing shade and increasing water temperatures. Any substantial change in runoff rates, erosion, or water tables caused by fire could degrade breeding sites.	Recently, this species has experienced large declines within their range in many areas of the Rocky Mountain region. These declines may be related to one or a combination of limiting factors. Populations have not been detected in NM since 1986. Reintroduction efforts will take place on the CAR NF sometime after 2005. NMG&F endangered species.	Boreal toads inhabit areas near springs, streams, meadows, woodlands, and moist subalpine forest to 3,200 m. Beaver ponds with abundant riparian vegetation appear to be its preferred habitat. Increases in UVB light may also be contributing to their downfall.	In NM, the chief threat may be destruction of beaver ponds. Beneficial management actions include: managing for beavers within boreal toad habitat; protection and restoration of springs, streams and meadows at higher elevations; and reduction of fire threat and avoiding prescribed burns in spring.

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
ARIZONA TOAD	*Bufo microscaphus*	SOC	0	0	G3G4	S3S4, S2?	AZ, NM	FS, FWS, BLM, State, Private	Riparian habitat loss, including construction of impoundments; non-native predators, improper grazing in riparian areas, displacement and hybridization with Woodhouse toad. Other factors, including acid rain, air quality, stress-related bacterial infections, and habitat changes related to damming watercourses have been suggested as threats.	Occurs in scattered locations and absent from historic localities. The status of the species in NM is mostly unknown and appears to be declining, at least locally, in AZ. Although apparently stable in some areas, documentation is poor.	Rocky stream courses in pine-oak zone in AZ and NM, including small streams, rivers, and temporary woodland pools between 6000 and 9000 ft elevation. Lays eggs among gravel, leaves, or sticks, or on mud or clean sand, at bottom of flowing or shallow quiet waters of perennial or semipermanent streams or shallow ponds. They have also been found in closed chaparral, mixed broadleaf riparian, cottonwood-willow riparian, and mesquite bosque habitat types.	The species should benefit from protection and restoration of riparian areas. Newly metamorphosed individuals can be surveyed during daylight hours. Adults are primarily nocturnal except during the breeding season.
WESTERN BARKING FROG	*Eleutherodactylus augusti cactorum*	SOC	0	WSCA	G5T5	S1	AZ	BLM, NPS, FWS FS	Habitat loss and degradation due to road building and development. Occur in small, isolated populations, some of which consist of 4-20 individuals.	Small, isolated populations are vulnerable to human activities and also to extirpation due to climatic fluctuation, disease, chance, or other factors. For long-term persistence, the small populations in distinct habitat patches likely must depend on occasional movements of juveniles among patches. Differences in call structure, coloration, and mtDNA sequences strongly suggest that barking frogs in AZ are reproductively isolated from those in NM and TX.	In AZ, this frog is strongly associated with limestone or rhyolitic outcrops, living in rocky areas in oak woodland; some individuals were found in holes in the back of a wet mine; in NM and far western TX barking frogs have been found living in rodent burrows in desertscrub.	Management needs include: determining the extent of habitat; monitoring known populations; gathering information on ecology and life history; and monitoring collection potential at known occurrences. Habitat needs should be considered when deciding on access management in occupied and potential habitat.
GREAT PLAINS NARROW-MOUTHED TOAD	*Gastrophryne olivacea*	SOC	E	WSCA	G5	S3, S1	AZ, NM	FS, BLM, NPS, State, Private	Stream/river modification, water table drawdown, improper livestock grazing, road development. Tobosa grass (a principal historic vegetation type) still occurs in patches, such as along roadsides, or in a few large areas protected from erosion, but is no longer a significant vegetation community in the study area due to farming and cattle ranching.	Agriculture has replaced much of this species habitat. Populations in AZ and NM represent the northern-most portion of range. In NM the species is very localized and apparently of very low population density. Recent studies indicate that the species is declining in the state.	This species inhabits semi-arid and arid lowlands such as mesquite and shrublands. They are found near permanently wet areas of dense grass within semidesert grassland and oak woodland (in Maricopa, Pima, Pinal, and Santa Cruz counties in AZ and Union county, NM); they have also been reported in grasslands, rocky wooded hills, marsh edges, near springs, streams, rain pools, river floodplains, scrub desert, and cultivated fields. One of the principal historic vegetation types in southern Luna County was tobosa grassland or tobosa swales within desert-grassland. They reproduce in water and hide in decomposing logs and stumps, burrows, and under rocks and other cover when inactive. Eggs and larvae develop in temporary pools formed by heavy rains and larger ponds that dry up in some years. Found in supposed mutualistic association with tarantulas in some areas. Metamorphosed toads almost exclusively eat ants.	Tobosa grass still occurs in patches, such as along roadsides, or in a few large areas protected from erosion, but is no longer a significant vegetation community due to farming and cattle ranching. Roadside sloughs with dense grass are often suitable breeding sites; preventing grazing within these habitats may retain habitat availability. Meeting management needs while protecting natural drainage channels and swales may sustain habitat (these habitats have been filled in or modified in the past for agriculture and to protect roads from flooding). Surveys of artificial water sources such as irrigation and stock ponds may identify suitable breeding sites.
LOWLAND BURROWING TREEFROG	*Pternohyla fodiens*	0	0	0	G4	S1S2	AZ	BLM	Not much information available , although they are considered rare in AZ and do not occur in NM. Busy, paved roads and urban development dominated by pavement and lacking suitable refugia present barriers to movements.	Population trends unknown in AZ. Potential threats include non-native predators at breeding sites; breeding sites in favorable condition to allow successful reproduction and development of tadpoles to adult life stage	This frog lives in open mesquite grassland, including grassland/herbaceous, savanna, and shrubland/chaparral habitats. They occur from near sea level to about 1,490 m in Maricopa and Pima counties, AZ, south into MX. It is a terrestrial burrowing species and is common in temporary pools formed by rains where it also breeds. Migrates between breeding and nonbreeding habitats. It seems unlikely that occupied locations separated by a gap of less than several kilometers of suitable habitat would represent independent occurrences over the long term.	Maintain breeding sites in favorable condition to allow successful reproduction and development of tadpoles to adult life stage by: defer livestock access in dry years to maintain water levels; addressing habitat connectivity by limiting expansion of paved roads or providing movement corridors across paved roads and limiting use of cattle guards, open trenches, or other pitfalls in occupied areas and nearby suitable habitat that may potentially be occupied.

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
PLAINS LEOPARD FROG	*Rana blairi*	SOC	0	WSCA	G5	S1, S4	AZ, NM	FS, FWS, State, Private	Suggested causes of declines or extirpations of local populations include: habitat loss or alteration; dewatering of natural aquatic habitats resulting from groundwater pumping; predation by bullfrogs and nonnative fishes; water pollution; agricultural development; increased aridity/drought; toxicants; and competition with *R. landieri* . Plains leopard frog larvae are vulnerable to predation from, and generally do not coexist with, predatory fishes. Bullfrogs predate on, compete with, and/or inhibit larval development.	Local declines and extirpations have occurred. Only a few breeding populations are known; population trends unknown for AZ and NM. The status of R.blairi had not been assessed in NM, but declines had been reported in other parts of its range. AZ Species of Special Concern and critically imperiled in the state.	Generally in or near water, but may range into surrounding terrestrial habitat in wet weather. Usually in the vicinity of: streams, intermittent streams, ponds, creek pools, reservoirs, irrigation ditches, and marshes in areas of prairie and desert grassland; flooded prairies, farmland, and prairie canyons; and in oak and oak-pine woodland. When disturbed, they often seek refuge in vegetation surrounding bodies of water. Burrow into mud and leaves of pond and stream bottoms in winter. Disjunct populations in southeastern AZ, and an apparently introduced population at Ashurst Lake, Coconino County, north-central AZ . Occur at elevations up to around 1800 m in AZ and CO, 1000-2250 m in NM.	Where present, exotic species (e.g., fishes, bullfrogs) should be removed or controlled if possible and further introductions prohibited. Frequent monitoring is recommended in areas where exotic species may invade and detrimentally impact frogs. Long-term monitoring is needed to determine whether reported declines are only temporary. Re-establish breeding populations through translocation of eggs, tadpoles, or young frogs from thriving populations.
RELICT LEOPARD FROG	*Rana onca*	C	0	WSCA	G1	SU	AZ	BLM, NPS	Extremely limited distribution. Loss or alteration of aquatic habitat due to dams (including the Hoover dam that inundated and fragmented habitat), agriculture, marsh draining, water developments; introduced predators, including nonnative bullfrogs, crayfish, and sport fishes; and the spread of the fungal disease chytridiomycosis.	Range is currently restricted to a few small areas in Nevada and AZ; previously believed to be extinct, rediscovered in the early 1990s; occupies about 10-20 percent of the presumed historical range. Population trends unknown in AZ. As of 2001, there were roughly a half dozen known extant occurrences in Nevada and AZ.	Historically, this frog probably occupied a variety of habitats including springs, streams, and wetlands characterized by clean, clear water, in both deep and shallow water, and cover such as submerged, emergent, and perimeter vegetation. At higher elevations, organic muck and overhanging banks may have been important habitat features for overwintering. The 5 recently extant populations inhabit spring systems with largely unaltered hydrology and no introduced American bullfrogs or game fishes.	Habitat restoration/preservation, with priorities on improving habitat connectivity where possible, is needed. Control of introduced species (including bullfrogs, many species of exotic fishes, and red swamp crayfish) while expanding populations and increasing population numbers would address immediate threats. Habitat conditions required for long-term survival have yet to be determined. Population and life history characteristics not well understood. Bighorn sheep and burros may affect habitat. If surveys are adopted, they should be done at night, at least twice weekly during expected periods of breeding (fall and late winter).
NORTHERN LEOPARD FROG	*Rana pipiens*	SOC	0	WSCA	G5	S2, S1	AZ, NM	FS, BLM, FS, NPS, State, Private	Threats include habitat loss, non-native predators (particularly crayfish), and disease. AZ: Two of the main threats to this species are habitat destruction and pollution. Also they are collected for biological supply houses and fishermen use them for bait.	Rapid population declines throughout range across AZ and NM with many local populations extirpated. It is a Species of Special Concern in AZ and critically imperiled in both NM and TX. In 1994, northern leopard frogs were documented in the A-S, COC, KAI, PRE, and TON NFs in AZ. Northern leopard frogs have since disappeared from the KAI NF, but ADGF has initiated a reintroduction effort in cooperation with the Forest.	Habitat includes springs, slow streams, marshes, bogs, ponds, stock tanks, canals, flood plains, reservoirs, and lakes; usually permanent water with rooted aquatic vegetation; about 3500 to 11000 feet elevation. These may be surrounded by a large variety of terrestrial habitats. In summer, commonly inhabits wet meadows and fields. Takes cover underwater, in damp niches, or in caves when inactive. Typically, eggs are laid and larvae develop in shallow, still, permanent water in areas well exposed to sunlight. Generally, eggs are attached to vegetation just below the surface of the water. Usually overwinters underwater. During a study of distribution and habitat associations of herpetofauna in AZ, Rana pipiens was found in cottonwood-willow habitat.	Preserve/restore/develop aquatic habitats that can be occupied by this species. Restrict/control presence of introduced fish and bullfrogs in localities occupied by leopard frogs. FWS Contaminant Hazard Review (CHR) series mentions this species. Pesticide use may be deleterious if substances enter frog habitat.

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
RAMSEY CANYON LEOPARD FROG	*Rana subaquavocalis*	0	0	0	G1Q	S1	AZ	FS, BLM, DOD, Private	Occurs in a few sites in the Huachuca M	Distribution limited to a few drainages on the eastern slope of the Huachuca Mountains, AZ; only two sites have a history of sustained successful breeding. Probably fewer than 100 breeding adults. Populations appear to be declining and recruitment is low at all known localities (except for a transplanted population at Miller Canyon). Chytrid fungus has been found in dead frogs. This fungus has been implicated in the declines of amphins around the world and may play a role in the decline of R. subaquavocalis. Captive rearing of larvae and release of juveniles began in 1995.	Occurs primarily in impoundments in oak-woodland and grasslands. Apparently extirpated from the type locality (Ramsey Canyon). Animals released in Miller Canyon in 1999 produced at least 28 egg masses in 2000 and the population appears to be doing well. Recent data indicate that this frog does not warrant recognition as a distinct species but rather should be included in R. chiricahuensis. AZ Game and Fish Department (AGFD) is attempting to mitigate threats and enhance populations of Ramsey Canyon leopard frogs through captive rearing programs and translocations in the Huachuca Mountains of southeastern AZ.	Suitable habitat should be surveyed for reintroductions. Eradication of bullfrogs in potential habitat. Restoration/protection of riparian, riverine, lacustrine, and lowland riparian (i.e., sycamore and cottonwood trees) habitats. An attempt to eradicate bullfrogs from Lower Garden Canyon Pond was unsuccessful. Alteration of riparian vegetation by livestock grazing to be an important factor in the decline of ranid frogs in California. Elimination of beavers, which create favorable habitat, and diversion of water for irrigation, likely contributed to the decline of populations that may have existed in the San Pedro River (about 8 km east of Ramsey Canyon).
TARAHUMARA FROG	*Rana tarahumarae*	SOC	0	WSCA	G3	SXS1	AZ	FS	Tarahumara frog numbers declined seriously in the late 1970's; the last individual in AZ was found dead in the Santa Ritas in 1983. Cause(s) of decline unknown, but may be related to heavy metal toxicity and/or to stochastic extirpations typical of small populations at the edge of a species' distribution (AGFD, 1996). Some healthy populations still remain northwestern Mexico, although 3 populations extirpated from northern Sonora.	Previous to recent reintroductions, no Tarahumara frogs, larvae, or eggs have been seen in AZ since May 1983 (Hale and May 1983, Hale and Jarchow 1988, Hale 1992, Sredl et al. 1997, AZ Game and Fish Department unpublished data). In northern Sonora, at least four of nine populations have been extirpated (Hale and Jarchow 1988, Hale et al. 1998).	This species inhabits rocky/gravelly streams and banks in areas of oak or pine-oak woodland or Sinaloan thornscrub and tropical deciduous forest on the edge of the desert (Rorabaugh and Humphrey 2002); typically associated with canyons and deep plunge pools; found on banks of plunge pools or in riffles. During the dry season it is found at quiet pools and springs. It is usually in or near water, but may take cover under rocks or in cliff crevices. Favorable breeding sites include areas with low mean flows (less than 0.2 cfs) and relatively steep gradients (more than 160 feet/mile); permanent water is probably necessary for metamorphosis (Rorabaugh and Humphrey 2002). The Tarahumara frog was reported in the COR NF, AZ (Patton, 1994).	Restoration plans calls for reestablishing the frog in at least two of its historical localities in AZ (Big Casa Blanca Canyon in the Santa Rita Mountains, Sycamore Canyon in the Pajarito Mtns.) (Rorabaugh and Humphrey 2002). As of late 2002, several hundred captive-reared frogs and larvae were available for eventual release (Rorabaugh and Humphrey 2002). There is a lack of information explaining cause(s) of extirpation, but possible actions could include water quality surveys to monitor acidification and presence of heavy metals, elimination/reduction of introduced species, including predaceous fish (green sunfish and bluegill) and bullfrogs. Efforts should coordinate with existing protection program (AGFD).

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
LOWLAND LEOPARD FROG	*Rana yavapaiensis*	SOC	E	WSCA	G4	S4, S1	AZ, NM	FS, BLM, FWS, BLM, NPS, State, Private	R. yavapaiensis is threatened by innumerable human uses of its aquatic habitats. Habitat fragmentation and water manipulation, including channelization and damming, can lead to local extirpation by disrupting the metapopulation dynamics of lowland leopard frogs in arid landscapes. They are negatively impacted by introduced bullfrogs, crayfish, and predatory fish. A chytrid fungus has infected populations of R. yavapaiensis as well as six other ranid frogs and two other amphins causing mass die-offs and local extirpations. Other prominent factors include water pollution (acid rain) and improper grazing.	Ranid populations have possibly been extirpated from NM -- need additional information. Large number of occurrences still exist in central AZ, but ongoing threats from habitat alteration and fragmentation and introduced species remain. The species is declining in southeast AZ and is extirpated from southwestern AZ (USDI, FWS 1991; Sredl et al. 1997b). Information not available for Mexico where it has been listed as rare in Mexico.	Lowland leopard frogs are aquatic and normally found at elevations below 3000 ft. elevation in permanent waters consisting of small to medium-sized streams and occasionally in small ponds (Platz and Frost 1984; Jennings 1987). They often concentrate near deep pools in association with root masses of large riparian trees. They are found around springs and ponds of the San Bernadino National Wildlife Refuge of southeastern AZ. In NM, they inhabited riparian areas in grasslands, chaparral, and evergreen woodlands (Jennings 1987). Associated vegetation includes the AZ sycamore (Platanus wrightii), seep-willow (Baccharis glutinosa), other trees and shrubs, and various forbs and graminoid plants.	The greatest relate to addressing habitat alteration and fragmentation and the introduction of non-native predatory and competitive fishes, crayfishes, and frogs (see Jennings and Hayes 1994, Sredl et al. 1997). Habitat alteration is the result of agricultural practices, livestock grazing, development, and reservoir construction (see Jennings and Hayes 1994). Damming, draining, and diverting of water have eliminated habitat and fragmented formerly contiguous aquatic habitats. In many areas, fragmentation has been accentuated by introduced predatory fishes, crayfish, and bullfrogs. R. yavapaiensis has been replaced by introduced *R. berlandieri* along the Colorado and Gila rivers, Arizona (Clarkson and Rorabaugh 1989). These factors result in the blockage of potential dispersal corridors for recolonization. Habitat restoration/preservation, with priorities on improving habitat connectivity, water quality, and control of introduced species is important. Captive rearing and translocations programs could be implemented.
BIRDS												
CLARK'S GREBE	*Aechmophorus clarkii*	SOC	0	WSCA	G5	S3/S3B, S5N	AZ, NM	FS, DOD, FWS, State, Private	Gregarious behavior makes it highly susceptible to oiling mortality in wintering areas. Vulnerable to disturbance of nesting colonies, especially water skiing in backwaters and coves along the lower Colorado. Colonies include tens to hundreds of nests.	This species is threatened by habitat degradation from recreational use of backwaters and coves used for breeding. Nests are relatively fragile. The species is considered imperiled in AZ and is an AZ Species of Special Concern. At this time it appears the species is a transient to all AZ and NM Forests, except the COC where breeding is known to occur.	Clark's grebes require large, secluded marshes for nesting. They nest among tall plants growing in water on edge of large areas of open water. As in western grebe, diet is fishes and aquatic invertebrates. Also use wetlands, bogs and, less frequently, rivers.	Minimize disturbance and protect breeding locations that include areas of historical breeding and current and likely recurring breeding. Reliable observations of one or more breeding pairs in appropriate habitat should minimally be used to identify important areas for this species. Be cautious about designating breeding areas based on observations that may represent single breeding events outside the normal breeding distribution.
NEOTROPIC CORMORANT	*Phalacrocorax brasilianus*	SOC	T	0	G5	S1N/S3B, S4N	AZ, NM	FS, DOD, FWS, State, Private	Loss or degradation of limited breeding sites, disturbance of breeding colonies, fluctuations in food supply, and persecution. Phalacrocorax brasilianus was listed under the Natural Heritage NM State Rank "S3B,S4N" ("S3" = "Rare or Uncommon", "B" refers to the breeding population; "S4" = "Apparently Secure", "N" refers to the nonbreeding or migratory population; two codes are necessary because certain birds occur in different biological capacities).	Limited distribution with small numbers in NM. Only 50 pairs or fewer have been found in any season in the State. Species is considered critically imperiled in AZ and is a NMG&F threatened species. Likely a passage migrant to the COR and GIL NFs.	Prefers shallow clear water of low elevation lakes and marshes. Nests on and around inland lakes, reservoirs, ponds; in living or dead trees or bushes, 1-7 m above water, mostly in tallest available trees or shrubs and in areas free from human disturbance . Also on rocks or bare ground where woody vegetation lacking. Expanse of open water is probably a major stimulus in attracting these birds. Apparently eats mainly fishes; also amphins and dragonfly nymphs. Raccoons and corvids have been identified as predators on eggs and young.	Habitat protection and enhancement are needed to perpetuate breeding populations, in particular is retention/development of stands of trees and shrubs in or near water. Managing for nesting substrate includes providing for large terrestrial snags through time or developing artificial structures in areas used by nesting colonies where natural habitat is decreasing. Avoid disturbing the species and habitat. Limiting factors include loss of habitat, pesticides, pollution and probably food and weather.

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AMERICAN BITTERN	*Botaurus lentiginosus*	SOC	0	WSCA	G4	S1S2/S3B, S3N	AZ, NM	DOD, FS, FWS, NPS, State, Private	Draining of wetlands, livestock grazing in riparian habitats, pesticides. The most serious factor limiting populations is availability of wetland habitat and over half the original wetlands in the conterminous U.S. have been destroyed. The most serious losses have occurred among palustrine emergent wetlands, of which about 4.75 million acres (1.92 million ha) were lost between the mid-1950s and mid-1970s. Inland, freshwater wetlands, the most important nesting and wintering areas, are among the most threatened habitats. Adults will abandon feeding areas and nests if unduly disturbed	Species is considered critically imperiled in AZ and is an AZ Species of Special Concern. Widespread distribution in the U.S., but populations are declining as a result of habitat destruction. Species is likely a passage migrant or transient to all Forests except the COC, where nesting has been documented. Larger wetlands (>10 ha) may support large portions of regional nesting populations, and loss of these wetlands can be critical to populations in many areas. Small wetlands (<5 ha) may serve as important alternate feeding sites and as "stepping stones" during movements between larger wetlands, but receive no legal protection in most states. Wetlands of ±2.5 ha may support nesting; smaller wetlands may serve as alternate foraging sites.	Before 1915 American bitterns were known to have bred in marshes above the Mogollon Rim. Mid-summer observations in lower Colorado River marshes reported in the 1970's and 1980's, but breeding not confirmed. Winters locally in large marshes in southern and western AZ with emergent vegetation and shallow water. Their entire life cycle is dependent on wetlands. They breed in southern NM and formerly central AZ.	Frequents wetlands created by impoundments at managed wildlife areas during the breeding and wintering seasons, thereby providing a good opportunity to manage habitat specifically for this bird. Point-counts using tape-recorded vocalizations could be used to survey wetlands across the region. Vegetative features of wetlands should include a high diversity of vegetative life forms and an abundance of emergent vegetation well-interspersed with patches of open water and aquatic-bed vegetation. Water levels should be less than 10 cm deep (Fredrickson and Reid 1986). Retaining dense, woody riparian vegetation may provide a visual barrier that reduces human disturbance of nesting bitterns and also filters wetland ecosystems against upland runoff (Gibbs and Melvin 1992). Wetland management for waterfowl usually benefits bitterns.
WESTERN LEAST BITTERN	*Ixobrychus exilis hesperis*	SOC	0	WSCA	G5T3T4	S3	AZ	DOD, FS, FWS, State	Degradation and destruction of marshlands through channelization, dredging, flood-control, improper grazing, stream diversions (desiccation), and wildfires; some recreational activities may also affect local occurrence.	Data too few to determine AZ state population status. The statewide status is poorly known. As of '87, fewer than 100 nesting pairs in interior AZ, where large losses of habitat had occurred.	Least bitterns in AZ have been confirmed breeding in dense cattail marshes along the lower Colorado River, a few localities along the Salt and Gila rivers, Picacho Reservoir, and Dankworth Ponds south of Safford.	Protection/restoration of marsh and wetland habitats. Delay grazing and prescribed fire until after young have fledged.
GREAT EGRET	*Ardea alba*	SOC	0	WSCA	G5	S1B,S4N/ S3B,S4N	AZ	BLM, FS, DOD, FWS, NPS, State, Private	Degradation and destruction of marshlands through channelization, dredging, flood-control, improper grazing, stream diversions (desiccation), and wildfires; some recreational activities may also affect local occurrence.	Amount of suitable nesting habitat is limited. Returns to the same colony sites year after year. FS Lands include the A-S NF, COC NF, and the COR NF.	Occurs at elevations where stream conditions provide sufficient permanent moisture for emergent plants, or for a narrow band of deciduous trees and shrubs; low elevations characterized by cottonwood and sycamore, at mid-elevation by alder and maple, and at high elevation by willow. Associated with cottonwood trees for nesting and roosting, often with other Ardeidae. Nests primarily in tall trees, usually with other colonial water birds; in woods or thickets near water. Feeding areas may be kilometers away from the colony	Retain/restore wetlands/marshlands and woody, deciduous riparian vegetation associated with these habitats, including cottonwood galleries. Re establish cottonwood where feasible. Limit disturbance to the species and habitat.

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SNOWY EGRET	*Egretta thula*	SOC	0	WSCA	G5	S1B,S4N/ S3B,S4N	AZ, NM	FS, DOD, FWS, NPS, State, Private	Clearing of flood plain forests and loss and degradation of wetlands. Reduced reproductive success in Idaho was attributed to pesticide residues accumulated in the nonbreeding season in Mexico. Colonial nesting behavior increases risk. Nesting sites are threatened by channelization, drying of marshes and some recreational activities. Human disturbance in nesting colonies can interfere with normal feeding, expose, young to predation and accidents such as drowning, and can lead to desertion of roosts. Disturbance can result from boating and water skiing.	Relatively secure at the global level, but threatened in some areas by loss/degradation of wetland habitat. Inadequate data on numbers at breeding sites make it difficult to judge abundance -- unknown whether any occurrences are appropriately protected and managed.	Generally occur in association with shoreline and marsh habitats bordering open water. Vegetation often consists of cattails and rushes, but other plant species, including occasional woody shrubs and trees, can frequently be present. Vegetative cover is often extensive, but interspersed with open sites. Suitable stream conditions occur where sufficient permanent moisture is available for emergent plants, or for a narrow band of deciduous trees and shrubs; low elevations characterized by cottonwood and sycamore, at mid-elevation by alder and maple, and at high elevation by willow. Nests over water or ground in trees or shrubs or, in some areas, on ground or in marsh vegetation, often with other colonial water birds.	Habitat protection and enhancement are needed to perpetuate breeding populations, in particular is retention/development of marshlands and adjoining stands of deciduous trees and shrubs in or near water. Managing for nesting substrate includes providing for large terrestrial snags through time or developing artificial structures in areas used by nesting colonies where natural habitat is decreasing. Avoid disturbing the species and habitat, especially during nesting.
WHITE-FACE-IBIS	*Plegadis chihi*	SOC	0	0	G5	UNK, S1	AZ, NM	FS, DOD, FWS, NPS, State, Private	Destruction to wetland habitats, including logging in or near riparian habitat, clearcut harvests, and pesticides in riparian zones; also limited by the number of breeding locations and vulnerable to fluctuating water levels.	Secure due mainly to large range; although locally common, protection is recommended because of the restricted number of breeding locations, the exposure of breeding colonies to fluctuating water levels, the risk of pesticide poisoning, and the bird's dependence on disappearing wetland habitats. Mortality rate is 54% the 1st year and 43% annual thereafter	Habitats include: River, Desert Riparian, Deciduous Woodland, Riparian Woodland, Marsh, and Subalpine Marsh. Occurs where stream conditions provide for emergent plants or for a narrow band of deciduous trees and shrubs; at low elevation characterized by cottonwood and sycamore, at mid-elevation by white alder and bigleaf maple, and at high elevation by willow. They forage in mud and shallow water. Nesting colonies are located in shrubs and low trees or in dense standing reeds and tules in or near marshes. May travel up to 5 miles to feed. Colonial nester: nest heights about 3 ft above ground.	Vulnerable to habitat alteration: retain/restore woody deciduous species in appropriate habitats; avoid fluctuating water levels during nesting season; also avoid human disturbance during nesting season. Adults will desert nests if disturbed early in incubation; nestlings can suffer from exposure, predation and accidents if colonies are disturbed. Populations of white-faced ibis may be affected by trophic concentration of pesticide residues. Eggs harmed by pesticides; colonies susceptible to breeding failure in areas of pesticide contamination.
OSPREY	*Pandion haliaetus*	SOC	0	WSCA	G5	S2B,S4N/ S2B,S4N	AZ, NM	FS, DOD, FWS, NPS, State, Private	Threatened by loss of nesting habitat and foraging perch sites and by human disturbance along shoreline in areas of heavy recreational use which can result in reduced nesting occurrence and lower reproductive success. Pesticides still a factor in some populations.	Benefiting from active management in many areas; pesticide-related problems still exist in some areas. Human-related causes of death include gunshots, steel traps, impact with or electrocution by high-tension wires, and being caught or drowned in nets. Also, organochlorines and other contaminants still are contributing to eggshell thinning and low hatching success.	Ospreys are generally found near water and are known to use lake, wetland and reservoir habitats. They are found primarily in coniferous forests along rivers and lakes. They use broken-topped trees and snags as roosting, loafing, and hunting perches. Snags and broken-topped trees are also used as nesting platforms and fledging sites. Artificial nest structures readily used. They nest in Douglas fir, ponderosa pine, lodgepole pine, fir-spruce, aspen, chaparral, and pinyon-juniper forest types. Eats almost exclusively fishes caught by feet-first plunge into shallow water, usually by flight hunting, sometimes from perch. Species composition of diet may vary greatly from one area to another. Sometimes eats rodents, birds, other small vertebrates, or crustaceans.	Management mainly involves erection of nesting platforms, creation of osprey management areas, and/or reintroduction via hacking; also protection of nesting sites in areas subject to logging. Fire may affect the osprey's habitat and food supply by removing streamside vegetation, thereby increasing risk of streambank erosion and raising stream temperatures which can potenially reduce fish populations in streams. Long-term effects of selected mechanical or fire treatments could be beneficial to fish populations by thinning/removal of conifers along streams and stimulating deciduous vegetation; thereby promoting cover, providing shade, and supporting development of terrestrial insects important in the diet of fish. Recommend any vegetation treatments occur after nesting season and include protection of active nest trees. See Vahle et al. (1988) and Lefranc and Glinski (1988) for information on research and management needs in the southwestern U.S. See Martin et al. (1986) for specifications for the construction and placement of nesting platforms.

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WHITE-TAILED KITE	*Elanus leucurus*	SOC	0	0	G5	S2B,S2S3N/S2N	AZ, NM	BLM, State	Habitat loss and disturbance. Recent breeding in AZ; not known to breed in NM.	Accidental occurrence in NM, was nearly extinct in 1930, has since reoccupied its former range. May have declined in 80's and 90's due to habitat loss and disturbance.	Savanna, open woodland, marshes, partially cleared lands and cultivated fields, mostly in lowland situations. River, riparian woodland, and subalpine marsh habitats where conditions provide sufficient moisture for emergent plants or for a narrow band of deciduous trees and shrubs. Also found in Douglas-fir, ponderosa pine, and aspen forest types. Nest in trees, often near a marsh, usually 6-15 m above the ground in branches near the top of a tree. Generally builds a new nest for each clutch. Diet is almost exclusively voles and mice; secondary prey includes pocket gophers.	Restore/retain nesting and foraging habitats. Maintain adequate cover for mammalian prey species in grasslands. Evaluate potential for artificial roost structures where birds are present and nesting structure is lacking.
MISSISSIPPI KITE	*Ictinia mississippiensis*	SOC	0	WSCA	G5	S3/S2B,S3N	AZ, NM	BLM, State, Private	Human disturbance/conflicts. Loss of riparian woodland habitat. Major mortality factors include strong winds, usually associated with summer thunderstorms, that blow out nestlings and destroy eggs and nests; nestling predators including great horned owls and raccoons.	Seems to have become firmly established as a nester in NM only since the early 1960's. After the early 1970's the species declined as a breeder in the Rio Grande and Pecos valleys of that state and the bird is now very local and generally rare in those areas. The causes for this apparent decline are unknown. Eggshell thinning caused by chlorinated hydrocarbons was not found to be a significant factor contributing to population declines. However, several birds died after ingesting insects sprayed with parathion in OK. Persecution continues to be a possible threat, especially for aggressive birds in urban areas.	Primarily nest along riparian areas and in mesquite thickets and tree plantings such as shelterbelts, wind-breaks, farm woodlots, urban parks, and urban residential woodlots. Many nests occur in elm (Chinese or Siberian elms are frequently selected in the Southwest), cottonwood, willow, hackberry, oak, and mesquites trees. Specific tree selection is believed to be a function of availability and abundance rather than preference. Most nests, except for those in elm and cottonwood trees, are usually < 20 ft above the ground. In NM, most populations nest on golf courses where kites will attack golfers who venture near nests. They feed on insects, especially cicadas and grasshoppers, but supplement their diets with lizards, frogs, small turtles, rodents, small rabbits, and occasionally small birds. Kites are an aerial species to an extreme degree, spending most of their waking hours on the wing.	In AZ where kites have not yet begun to nest in urban areas, emphasis should be on maintaining riparian nesting habitat. Birds attacking people near nest sites is common enough to produce negative public responses. Increased public education should help. Parker (1980) Gennaro (1988) and Meyer (1990) offer specific education/prevention ideas (NatureServe). Management needs include: 1) increased efforts to determine impacts from habitat change and disturbance, especially in migration and winter ranges; 2) improved techniques for assessing and monitoring populations (despite their size and conspicuous flocks, kites can be difficult to detect); and 3) improved techniques for maintaining and increasing populations in peripheral areas (including AZ). Preservation of riparian woodland and other suitable nesting areas is basic to survival of this species in NM.
NORTHERN GOSHAWK	*Accipiter gentilis*	SOC	0	WSCA	G5	S3/S2B,S3N	AZ, NM	FS, BLM, DOD, NPS, State, Private	The principal threat to breeding populations is even-aged timber management and high-intensity forest fires. Excessive grazing and other negative impacts to prey habitat also act as limiting factors.	Trends are difficult to determine due to variety of methods used to track bird populations. Little historical information on goshawk densities exist. Fire suppression and insect and tree disease outbreaks can result in the deterioration or loss of nesting habitat. Increased shading from dense tree regeneration has reduced herbaceous and shrubby understories that provide important foods and cover for goshawk prey. Livestock and wildlife browsing and grazing have accentuated this loss. In addition to these changes, timber harvesting, which began in the 1800s, has traditionally focused on large trees, resulting in limited mature and old forest structure and associated habitat attributes. Identified on the FWS Birds of Conservation Concern National Priority list.	Nests in a wide variety of forest types including deciduous (aspen), coniferous, and mixed forests. Has a complexity of habitat needs in the breeding season. Nests are generally constructed in the largest trees of dense, old or mature stands with high canopy closure, but will occasionally nest in relatively open stands. Forages in both heavily forested and relatively open habitats; habitat requirements during winter are poorly understood. The small NM population occurs locally in mature, closed canopied coniferous forests of mountains and high mesas.	Large, landscape-level ecological units need to be identified and managed in such a way that all necessary habitat attributes, from nesting sites to foraging areas, are available to support the species at the population level (NatureServe). NatureServe describes implementation of the USFS RM-217 *Goshawk Guidelines* under "Management Requirements." Fire can be beneficial to northern goshawks by perpetuating forest seres, which provide habitat for prey. Prescribed fire in ponderosa pine and mixed-species forests can perpetuate northern goshawk habitat and reduce fuel loading. Adult birds are rarely killed by fire. Fires in the early spring, before fledging, could result in mortality of juveniles.

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NORTHERN GRAY HAWK	*Asturina nitida maximus*	SOC	0	WSCA	G5T4Q	S3, S2B	AZ, TX	FS, FWS, BLM, State, Private	Loss of nesting habitat to urbanization, conversion for agriculture, and improper grazing within riparian habitats.	In AZ, there were about 55 nesting pairs in the mid 1980's. Occasional occurrences in NM, although breeding population may have been extirpated. Identified on the FWS Birds of Conservation Concern National Priority list.	Usually found in riparian woodlands or marshes near open areas. In AZ, formerly common along wooded watercourses and in areas of mesquite before this habitat was lost to urbanization; at present, inhabits patches of thornscrub along rivers. Occurs in riparian deciduous forests and woodlands of the Santa Cruz and San Pedro drainages. Usually nests in trees along streams or rivers, about 20-40 feet from ground. Nests in groves, especially in cottonwoods; may also breed high in mountains. Principally feeds on lizards and small birds, also snakes, rabbits, squirrels, mice, fish, and beetles. Hunts from perch or while circling low.	Preserve mesquite bosques to prevent extirpation. Recent scrub invasion in AZ since the early 1900s along San Pedro has afforded increased habitat. Removal of livestock from riparian areas and adjacent mesquite habitat has allowed vegetation recovery and a hawk population increase. See Glinski (1988) and Lefranc and Glinski (1988) for management recommendations.
COMMON BLACK-HAWK	*Buteogallus anthracinus*	SOC	T	WSCA	G4G5	S3/S2B,S3N	AZ, NM	FS, BLM, NPS, State, Private	At least 95% of the riparian habitat in the southwestern U.S. has been lost, altered, or degraded. Vulnerable to disturbance, reduction/contamination of aquatic prey species.	Widespread in suitable habitat, however, there are concerns over long-term health of riparian and freshwater habitats due to clearing, water diversion, diking and damming, and lowering of the water table by underground pumping. In NM, rare with no current documentation of nesting. Identified on both the NMG&F threatened species list and the FWS Birds of Conservation Concern National Priority list.	Lowland forest in both moist and arid habitats, but generally near water (along rivers and streams); often forages in open woodland. Nests in tall gallery forest trees, mostly cottonwoods supported by flowing water, typically 4-30 m above ground. May reuse old nests.	Management recommendations include: protecting and enhancing frog and fish populations near nest sites and favoring regeneration of gallery forest trees by limiting or eliminating livestock grazing. See Lefranc and Glinski (1988) for information on research needs and management recommendations specific to the Southwest.
SWAINSON'S HAWK	*Buteo swainsoni*	SOC	0	0	G5	S3/S4B,S4N	AZ, NM	FWS, BLM, DOD, State, Private	Livestock grazing, pesticides in South America, habitat loss in breeding and nonbreeding areas.	Population numbers have declined over western U.S. Easily disturbed during nesting; often abandons nest if disturbed before the eggs hatch.	Forage in savanna, open pine-oak woodland and some cultivated lands (e.g., alfalfa and other hay crops, and certain grain and row croplands -- vineyards, orchards, rice, corn, and cotton are **not** suitable foraging habitat) with scattered trees. Typically nests in solitary tree, bush, or small grove; will also nest on old black-billed magpie nests and rock ledges. Readily nests in shelterbelts and other human-created habitats. In the Central Valley of California, they often nest within 1 mile of riparian habitat; Great Basin nests, usually in junipers, are not near riparian areas. Evidently often returns to previous year's nesting area. Hunts while soaring or from perch. Vertebrates (mainly mammals) dominate diet during breeding season; invertebrates (especially orthopterans) are common food in other seasons and sometimes for nonbreeders in summer. Swainson's hawks associate with prairie dog towns.	Prescribed fire can enhance habitat and increase prey base. Burning in grasslands where scattered trees are retained benefits Swainson's hawks, particularly in areas where nesting sites are limited. Prescribed burning plans should strive for creation of maximum interspersion of opening and edge, with high vegetation diversity. Reseeding of perennial grasses and rest from livestock grazing may improve results. Burning should be deferred until nesting is completed in areas where impact to breeding Swainson's hawk may occur. Fires that kill or otherwise alter unoccupied nest trees may disrupt reproduction if acceptable nest trees are scarce. Low-severity fires probably have little direct effect on Swainson's hawks. Management that benefits prairie dogs should also benefit Swainson's hawks.

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FERRUGINOUS HAWK	*Buteo regalis*	SOC	0	WSCA	G4	S2B,S4N/S2B,S4N	AZ, NM	BLM, FS, State, Private	Habitat loss due to agricultural development, poisoning of prey species, habitat fragmentation, expansion of cropland unsuitable for foraging and residential and commercial development in former agricultural and grassland areas.	Widespread and relatively common in where appropriate habitat occurs. Reports of local declines, continued loss of habitat, sensitivity to disturbance, and relatively low numbers show this species should be carefully watched and regularly re-evaluated. Identified on FWS Birds of Conservation Concern National Priority list.	Prefer open grasslands and shrubsteppe communities. Uses native and nonnative grasslands/pastures, also hayfileds, and croplands. Nests in tall trees or willows along streams or on steep slopes, in junipers (UT), on cliff ledges, river cut banks, hillsides, power line towers, sometimes on sloped ground in plains or on dirt or rock mounds in open desert. Generally avoids areas of intensive agriculture or human activity. May occupy rolling or rugged terrain, but high elevations, forest interiors, and narrow canyons are avoided. Primary prey in western shrubsteppe are jackrabbits, followed by ground squirrels and pocket gophers. White-tailed and black-tailed prairie dogs are also prey.	Protect large tracts of native prairie. Where possible, avoid seeding of exotic grasses and cultivating habitat. Leave scattered islands of shrubby vegetation in crested wheatgrass fields so that the islands make up a minimum of 20 percent of the total area. Improve prey habitat by providing native shrub vegetation and increasing edge. If brush is chained, windrow it to provide cover for prey. When converting land from sagebrush steppe to herbaceous grassland, create a mosaic of treated (chained or disced) and untreated areas. To attract small rodents, maintain or restore sagebrush-grass rangeland by removing/reducing invading pinyon pine /Utah juniper stands. Retention of some pinyon pine will benefit rodents.
AMERICAN PEREGRINE FALCON	*Falco peregrinus anatum*	SOC	T	WSCA	G4T3	S4/S2B,S3N	AZ, NM	FS, FWS, BLM, DOD, NPS, State, Private	By 1965, pesticide accumulation drove peregrines down to < 20 known pairs west of the Great Plains. Current factors that may continue to endanger peregrine populations include pesticide poisoning on the wintering grounds, low breeding densities and reproductive isolation, lack of gene flow between populations, reduced availability of foraging habitats and avian prey, and increases in wind energy development in peregrine habitat.	Productivity of adult pairs in NM increased substantially from 1979 to 1987, but has decreased by 29% since 1987, averaging 1.69 fledged young per adult pair during 1992-96. Productivity had fallen to near the estimated minimal maintenance level, further reductions will lead to declines in the NM population. Other threats include habitat alteration or destruction, disturbance, and taking that have made inroads on the population in NM. NMG&F threatened species. Delisted by FWS; however, identified on the Birds of Conservation Concern National Priority list.	Key habitat areas are nest sites (eyries) and their vicinities, including those that are currently occupied and historic ones that are still suitable; suitable habitat includes large high cliffs such as the Mogollon Rim, Grand Canyon, and the Colorado Plateau, where sufficient prey and water are available. They use selected isolated cliff ledges across habitats in AZ and NM, including cliffs occurring in Douglas-fir, hemlock-sitka spruce, redwood, ponderosa pine, larch/white pine, lodgepole pine, fir-spruce, hardwoods (aspen), chaparral, and pinyon-juniper forest types. They use a wide variety of habitats for foraging, feeding mostly on birds such as pigeons, doves, shorebirds, and waterfowl, and bats.	Incubating birds are generally silent, unobtrusive, and easily overlooked. When the nestlings are older or fledge, adults may boldly react to intruders. Humans should immediately vacate area under such conditions. Because peregrine falcons require open areas for hunting, fires could be beneficial provided burning led to an increase of prey species; early season fires near eyries could disturb young or nesting pairs. Burning objectives should include creating a mosaic of habitats and maintenance of abundant prey species. There are no known range-wide threats to the peregrine falcon in AZ. However, individual eyries are subject to disturbance by recreationists.
ARCTIC PEREGRINE FALCON	*Falco peregrinus tundrius*	SOC	T	0	G4T3T4	UNK	AZ, NM	FS, DOD	Habitat loss, human disturbance, pesticide poisoning on the wintering grounds, and illegal take may all affect the recovery of this subspecies.	Recovering from past population declines; little information available detailing habitat use and migrations of this subspecies.	Preferred hunting habitats include croplands, meadows, river bottoms, marshes and lakes. Likely a rare migrant in NM and AZ, but may occasionally overwinter in NM.	Research needs: determine affects from changes in food availability along migration routes and rate of habitat modifications on habitat use patterns of migrating and overwintering birds.
WHITE-TAILED PTARMIGAN	*Lagopus leucurus*	SOC	E	0	G5	S1B,S1N	NM	FS	Use of NM's limited alpine tundra habitat by livestock (particularly sheep), plus increased human use including wilderness hiking, ski area developments, construction of snow catchment fences, and microwave relay stations, are among the threats to the state's remnant ptarmigan population	Northern NM is southern-most range extension. Species is locally common over much of its range, but in NM the species became quite rare since the turn of the century. The species was reported only twice during the 5-year period between 1989-93. NMG&F endangered species.	Alpine tundra, especially rocky areas with sparse vegetation. Occurs in the Sangre de Cristo Mts., including Costilla, Latir, Wheeler, Truchas, and associated peaks (Taos and adjacent counties); these are key habitat areas for NM. Probably previously found on Gold Hill, Santa Fe Baldy, Tesuque Peak, and apparently Pecos Baldy and other peaks with extensive tundra in the Sangre de Cristo Mountains; there are also unverified reports from the San Juan Mts. Summer foods for adults and poults = leaves, flowers, seeds, and bulbs of short vegetation consisting mainly of sedges and herbaceous broad-leaved plants. By late summer, willow is an important component of the diet; in winter, willow buds and twigs are the primary food, but a variety of other plants are also consumed (e.g., alder catkins and buds and needles of conifers).	Protection of the limited alpine and tundra habitats within the state is essential to preservation of white-tailed ptarmigan in NM. In addition, trapping and releasing of birds into favorable habitat should help safeguard against stochastic events.

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LESSER PRAIRIE-CHICKEN	*Tympanuchus pallidicinctus*	C	0	0	G3	S2B S2N	NM	FS (historic and potential), BLM	The primary threat is habitat loss, fragmentation, and degradation, principally due to the conversion of native sand sagebrush and shinnery oak rangeland to cropland and "improved" pastures, also improper grazing, and brush control. Wind turbine developments are emerging as a potentially major threat to habitat (preliminary mapping in OK indicates a nearly complete overlap between proposed wind power sites and known leks). Telemetry research indicates prairie chickens exhibit strong avoidance of tall vertical features such as utility transmission lines. It is estimated that a single wind turbine may create a habitat avoidance zone that extends as far as one mile for greater prairie chickens.	FWS candidate species and they are identified on the Birds of Conservation Concern National Priority list. Overall trend is stable, following huge declines in the 90's. Precipitous declines within range in NM. Expansion of wind farms may significantly impact greater prairie chickens in the near future.	A mixture of tall, dense grass/shrubs and sparse, short vegetation provides optimal habitat. Management units of 20 square kilometers and 32-72 square kilometers have been recommended based on studies of spring-summer and fall-winter habitat use, respectively. Most researchers agree that contiguous areas of at least 32 square kilometers and having at least 63% good quality shrub/grassland is needed to support populations.	Mixed-grass communities with a high percentage of forbs and scattered low shrubs can be promoted and maintained with proper grazing management (utilization levels should be < 25-35% of annual growth) and careful use of herbicides or prescribed fire. High-quality nesting habitat has an abundance of ≥ 50 cm grasses. Careful use of herbicides can reduce shrub density and increase grass and forb density on overgrazed ranges. However, herbicides should not be applied unless perennial grasses are present, to avoid establishing grasses of little value to prairie chickens. Because of their importance as food and cover, retain 30-50% shrub cover distributed in a mosaic of treated and untreated areas. Herbicide treatment to control shinnery oak might adversely impact nesting lesser prairie-chickens. Prescribed burns should increase green forage, native annual forbs, and insect abundance. Burns should be limited to 20-33% of the management unit to preserve residual nesting cover. Buffer zones and other restrictions on activities should be set-up within 3 km of a lek (the usual distance to nests). Artificial
GOULD'S WILD TURKEY	*Meleagris gallopavo mexicana*	SOC	T	0	G3	UNK, S1	AZ, NM	FS , Private	The greatest threats to this subspecies in NM are: loss of habitat from timber harvest; improper grazing; lack of water; poaching; and introductions of non-native turkey subspecies within Gould's range. Fragmented distributions and population bottlenecks due to human activities appear to have increased genetic differentiation among populations.	Gould's were extirpated in AZ, although many reintroduction efforts have helped reestablish small populations. Small, relatively stable populations now occur in NM and AZ. NMG&F threatened species. In 1991, they were listed under the Natural Heritage NM State Rank as "S1B,S1N" ("S1" = "Critically Imperiled"; "B" refers to the breeding population while "N" refers to the nonbreeding or migratory population; two codes are necessary because different birds occur in different biological capacities). They were listed under the Natural Heritage AZ State Rank as "SHS1" ("SH" = "State Historic"; "S1" = "Very Rare") in 1995.	Forest and open woodland, scrub oak, deciduous or mixed deciduous-coniferous areas, especially in mountainous regions. Roosts in trees at night. Severe winters and/or lack of winter habitat can be important limiting factors. Normally nests on the ground, usually in open areas at the edge of woods; rarely nests in trees. Select nest sites with concealing vegetation immediately above the nest; nests were placed in habitats associated with high interspersion. Feeds on seeds, nuts, acorns, fruits, grains, buds, and young grass blades. During summer eats many insects; may also eat some small vertebrates (frogs, toads, snakes, etc). Usually forages on the ground.	Grazing by livestock should allow for adequate herbaceous biomass to support invertebrate foods and cover for young. Thinning and an interspersion of forest structure benefits turkeys in unnaturally dense forests. Protection of habitat, enforement to prevent poaching, avoiding excessive disturbance in nesting and roosting habitat, undue competition with livestock, and hybridization with non-native turkeys are essential to preserving this subspecies in the Southwest. Although populations continue to be small, they may be adapted to local conditions, hence augmentation with stock from elsewhere is not recommended. Prescribed fire can be used to stimulate the growth of food plants and promote early-spring green-up of grasses. Fire can also reduce litter, exposing seeds and insects, and reduce brush so that turkeys can spot predators. Fire can be used to create edges to increase nesting habitat and may reduce parasites such as ticks and lice. However, spring fires can destroy nests. Fast-moving fires may kill poults, but once wild turkeys can fly, fires are probably not much c

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CALIFORNIA BLACK RAIL	*Laterallus jamaicensis coturniculus*	SOC	0	WSCA	G4T1	S1	AZ	FWS, BLM, State	The major threat is loss and degradation of habitat. Negative impacts result from river channelization, water level fluctuations, wildfires, phreatophyte control (deep-rooted plants that obtain water from permanent ground supply), habitat loss, and excessive livestock grazing.	Populations continue declining. Breeding populations are confined to a few remaining patches of habitat in central and southern CA and western AZ. Declines are primarily due to human-caused loss and degradation of marsh habitat. Secretive habits and lack of information from most of range make status difficult to determine. This species has been reported in NM, but not verified; the "historic range" does not include NM according to the FWS federal register notice. However, this species is "possible" according to the NMG&F.	California black rails nest very locally in AZ, amongst sedge and cattail marshes along the lower Colorado River. They use areas of shallow water with relatively stable water levels and flat shoreline supporting dense stands of three-square bulrush. Nests in or along marsh edges, usually hidden in marsh grasses or at base or Salicornia; sometimes on damp ground, but usually on mat of previous year's dead grasses. It is possible that there are 2 breeding efforts in a season. Forages by probing into or picking food items from substrate surface. Reported food items include insects, isopods (crustaceans), and seeds of aquatic plants. Active and vocal on moonlit nights.	Protection/restoration of inland freshwater marshes and Colorado River marsh habitat is key to stopping population declines. Maintain water levels during nesting season: decreases in water levels can lead to increased predation when birds are flushed from marsh and increases in water levels may destroy nests.
WESTERN SNOWY PLOVER	*Charadrius alexandrinus nivosus*	SOC	0	WSCA	G4T3	S1/S2B,S4N	AZ, NM	Private	Poor reproductive success due to human disturbance, including off-highway vehicles and mechanical raking. Habitat is lost to development, including ground water withdrawals. Spread of introduced beach grass limits suitable nesting habitat. They are increasingly vulnerable to native and introduced predators.	Western populations scattered and declining in many areas due to habitat loss.	Ground nests where vegetation is sparse or absent (small clumps of vegetation are used for cover by chicks) on broad open beaches or salt or dry mud flats. Nests can be beside or under object or in open. Nests are often subject to flooding. Will use ephemeral lakes but only breed irregularly. Eats insects, small crustaceans, and other minute invertebrates. Forages by probing into or picking food items from substrate surface, including sand or mud in or near or shallow water where it sometimes uses foot to stir up prey.	Protect habitat from disturbance during nesting season; control introduced beach grasses and predators; manage water resources to maintain suitable habitat.
MOUNTAIN PLOVER	*Charadrius montanus*	SOC	0	0	G2	S1B, S2N /S2B,S4N	AZ, NM	BLM, DOD, FWS, NPS, Private	Large population declines in 50-90% of range; early decline probably related to "market" hunting. Conversion of shortgrass prairie to agricultural land, primarily for winter wheat, has destroyed nesting habitat, as has planting of taller grasse species in native prairie. Many nests were in prairie dog towns, which have declined 98% in landscape coverage since 1900.	Identified on FWS Birds of Conservation Concern National Priority list. In many areas, farms have switched to new crops in the past 25 years that remain fallow until early May, after plovers have begun nesting. Farm equipment then destroys many nests when fields are planted; many plovers renest, but later abandon nests when crops become too tall. Mountain plovers are residents in both AZ and NM. Migrants also overwinter in NM.	High quality nest sites have high proportion of poorly vegetated areas, such as large, flat, dry alkaline lake bed, dry shortgrass prairie, semi-desert landscapes, and "disturbed sites," especially those caused by livestock. Plovers may actually be attracted to cattle, sheep, and prairie dogs. Horned lark habitat is attractive to mountain plovers. Suggested requirements for brood-rearing areas: very flat, open, dry areas; > 28 ha with high (> 30) percent bare ground; vegetation generally < 5 cm tall.	Management should maintain short, sparse vegetation through protection of prairie dog towns, grazing by livestock/buffalo, and/or prescribed burning. Off-road vehicle access should be restricted between 1 April and 1 August in plover habitat. Areas of potential plover habitat should not be converted to agriculture nor have "range improvements" that increase forage for livestock (particularly planting exotic grasses). Efforts should be made to reduce the likelihood of invasion by non-native species such as, but not restricted to, cheatgrass, leafy spurge, and knapweed. Plovers are highly attracted to recent burns. Researchers use burning to attract birds for capture.
LONG-BILLED CURLEW	*Numenius americanus*	SOC	0	0	G5	S1B,S3,S4N /S3B,S4N	AZ, NM	DOD, FS, FWS, NPS, State, Private	Draining of wetlands, agricultural plowing during nesting season, reduced productivity associated with grazing, easily disturbed.	Limited distribution/restricted range, breeding range is reduced and shrinking, localized population declines. Breeds in NM, but numbers are decreasing. Need more information for AZ.	Ground nests in dry prairies and moist meadows, usually in flat areas with short grass although sometimes on more irregular terrain, often near rock or other conspicuous object. Occurs on beaches and mudflats in migration and winter. Feeds opportunistically on various insects (beetles, grasshoppers, caterpillars, etc.) berries, and eggs and nestlings of other birds. During migration will also feed on crayfish, crabs, snails, and toads. Grasshoppers and carabid beetles dominate the chick's diet. Forages by probing into or picking food items from substrate surface, including sand or mud in or near or shallow water.	Responds negatively to grazing in shrubsteppe habitats used for breeding. Hunting, agriculture, and livestock grazing are all linked to declines in abundance and need to be coordinated to avoid impacting nesting season in curlew habitat. Management activities that maintain prairie and meadow habitat should be considered; habitat manipulation should occur after August.

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BLACK TERN	*Chlidonias niger*	SOC	0	0	G4	S3S4M/S3N	AZ, NM	FS, DOD, FWS, NPS, State, Private	Draining of wetlands, disturbance of nesting sites, habitat alteration. The quality of some remaining wetlands may be reduced because of pollution and runoff associated with increased development in vicinity of wetlands	Widespread distribution; relatively abundant, but habitat alteration and degradation threaten the species. Although it is not federally listed, the black tern has special status in many of the states within its breeding range.	Will nest in marshes, along sloughs, rivers, lakeshores, and impoundments, or in wet meadows. Typically in sites with a mixture of emergent vegetation and open water. Cattails, bulrushes, burreed, and/or phragmites commonly present in nesting areas. The hemi-marsh stage, (open water and emergent vegetation are present in approximately equal amounts) is widely recognized as preferred nesting habitat. Nests are typically located in shallow water, close to open water or openings in stands of emergent vegetation. Black terns nest on floating plant matter -- instability of nests leaves them vulnerable to storms, wave action, and rapid water-level changes. Reproductive success fluctuates widely from year to year, depending on weather and water levels. Their success depends on relatively long lives, and flexibility in choice of nesting area. This makes protection difficult, because terns may use a particular marsh only occasionally, but when they do, it may be their only chance of success.	Protection of remaining wetlands is the most important action necessary to maintain this inland tern. Maintain "islands" of emergent vegetation (i.e., rushes, cattail, etc.) where terns may potentially nest. Because these sites are associated with larger, more open bodies of water, they may be used extensively for boating, fishing, and other forms of water-based recreation. Repeated disturbance and wave action may pose serious threats to reproductive success at these sites with waves caused by boats representing a major source of egg and chick mortality. Educational efforts and/or restricting access may be effective. Managed wetlands, where water levels and vegetative cover can be manipulated, allows for opportunities to reliably protect nesting habitat. The ability of terns to use artificial nesting platforms may facilitate restoration efforts. Management of wetlands should include maintaining 1 or more large impoundments in the hemi-marsh stage for as long as possible. Avoid changes in water levels by stabilizing impoundments from May-July to avoid flooding o
COMMON GROUND DOVE	*Columbina passerina*	SOC	E	0	G5	S4/S1B,S1N	AZ, NM	FS	Urban development, water diversion, flood control projects, grazing, and the spread of agriculture have destroyed much riparian habitat. Loss and degradation of desert riparian habitats due to livestock operations and improper water management will continue to threaten bird communities breeding in the Southwest. Citrus culture operations frequently cause disturbance to nesting, which increases nest desertion, particularly during nest building (March). Pesticides, herbicides and fungicides are routinely applied in citrus groves and have the potential to poison adults and nestlings. May be negatively impacted by hunters who misidentify this non-game species for the larger Mourning Dove.	Rare, no current documentation of nesting within NM. Survey-wide BBS trends show a significant decline of 1.8% per year from 1966-1999. More recent increases occurred in TX (4.8%). Non-significant declines during the same period occurred in AZ. NMG&F endangered species. Habitat destruction in NM is exacerbated by loss of the native shrublands, weedy areas, and riparian areas preferred by this species.	Habitat structure rather than species composition appears to be a the best predictor of suitable habitat. Open areas with plants producing small seeds and other early successional habitats tend to satisfy food and nesting requirements. Sites with ground-doves tend to be more open and have smaller diameter trees than sites without doves. In Sonoran Desert, they occur in desert scrub with open to dense shrub cover, low trees and succulents dominated by paloverde, prickly pear, and giant saguaro. In Chihuahuan Desert, they are found in open stands of creosote bush and large succulents. In the lower Colorado River region, they prefer agricultural edges, orchards and sparse riparian vegetation. Here nests can be found in almost any tree species where willows and mesquites are found near a water source. Occurs in suburban habitats in Yuma where it replaces Inca doves, the small suburban dove found elsewhere throughout most of central and southern AZ.	Conservation of existing habitat and restoration of degraded habitat are a priority for this species, including riparian zones where development, water management activities, grazing, and agricultural practices have had significant impacts. Developing alternatives to minimize disturbance and improve habitat in citrus orchards and other agricultural operations may be a management option. It has been suggested that expansion of this species in southern CA may have been due in part to a conversion from furrow to drip irrigation systems in lemon and avocado groves, thereby reducing ground disturbance. Efforts to minimize disturbance to nesting birds in orchards may lead to population increases. Hunter education may help to better identify common ground-doves from mourning doves. Clearing patches of thornscrub may help, but extensive habitat manipulation is likely to reduce nesting success.

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YELLOW BILLED CUCKOO	*Coccyzus americanus occidentalis*	C	0	WSCA	G5T3Q	S3/S3B,S3N	AZ, NM	FS, FWS, BLM, BOR, DOD, NPS, State, Private	The primary threat is the loss and degradation of habitat, particularly riparian forests: timber harvest, livestock grazing in riparian zones, invasive species, and pesticides have reduced, degraded, and fragmented riparian habitat.	Overall declining in western U.S. Breeding Bird surveys indicate population declines of 1.6% per year in North America. Riparian habitat has declined up to 90% in AZ and NM, negatively effecting this species. FWS candidate species for federal listing and on the Birds of Conservation Concern National Priority list.	In NM, the western race of this species is associated with lowland deciduous woodlands, willow and alder thickets, second-growth woods, deserted farmlands, and orchards. Great Basin Shrubsteppe: Open to dense stands of shrubs and low trees, including big sagebrush, saltbush, greasewood, or creosote bush. Sonoran Desert Scrub: Open to dense vegetation of shrubs, low trees, and succulents dominated by paloverde, pricklypear, and giant saguaro. Chihuahuan Desert Scrub: Open stands of creosote bush and large succulents in southern NM and southwest TX. River, Riparian Woodland, & Subalpine Marsh: Occurs at elevations where stream conditions provide sufficient permanent moisture for emergent plants, or for a narrow band of deciduous trees and shrubs; at low elevation characterized by cottonwood and sycamore, at mid-elevation by white alder and bigleaf maple, and at high elevation by willow. Desert Riparian Deciduous Woodland, Marsh. Woodlands: especially cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of trees and shrubs along the margins Mohave Desert	Protection/restoration of riparian gallery forests and deciduous woody shrubs is important for providing habitat for recovery of populations. Protection/restoration of riparian habitat, especially where past vegetation clearing, stream diversion, water management, agriculture, urbanization, overgrazing, and recreation has reduce habitat and habitat effectiveness. Controlling invasive plant species and re-establishing native species would improve habitat and potentially provide better invertebrate forage (primarily caterpillars).
WHISKERED SCREECH OWL	*Otus trichopsis*	SOC	T	0	G5	S4, S1	AZ, NM	FS, NPS, Private	Habitat loss or alteration.	Populations secure in Mexico and Central America where human activities are limited. Detected in NM in early 90's. NMG&F threatened species. FWS Birds of Conservation Concern National Priority list.	Small populations occur in Peloncillo and Animas mountains. NM and AZ are northern most part of range.	In New Mexico, the protection of habitat is the prime consideration in conserving the whiskered screech-owl -- particularly areas of pine-oak and oak woodlands in the Peloncillo and probably the Animas Mtns.. in Hidalgo County. Such protection should focus especially on preventing activities that might reduce the habitat suitability for this owl, such as the removal of trees and associated vegetation. In addition, the owl should be spared excessive exposure to playbacks of its vocalizations by birders, etc., as such could disturb the birds to the extent of reducing the survival ability of given populations
ELF OWL	*Micrathene whitneyi*	SOC	0	0	G5	S5, S3	AZ, NM	FS, DOD, NPS, Private	Principle threat is habitat loss, particularly of riparian forests due to habitat/hydrological alterations and subsequent invasion by salt cedar.	Declining in California and Baja California, and to a lesser extent in AZ.	Animas, Guadalupe, and Mogollon Mtns.	Maintain, restore, and manage riparian habitats in breeding range. Tolerates low-density development when native vegetation is left relatively intact; therefore, an effort should be made to incorporate native vegetation in housing developments. Nest boxes are also being used in some areas.
WESTERN BURROWING OWL	*Athene cunicularia hypugaea*	SOC	0	0	G4T4	S3, S4	AZ, NM	FS, BLM, DOD, FWS, NPS, Private	Habitat alteration/fragmentation, loss of edge habitat.	Widespread distribution in N. America; relatively common in appropriate habitat in some areas, but habitat alteration and other factors are causing population declines in many areas. FWS Birds of Conservation Concern National Priority list.	Often in colonies in West, in abandoned burrows of prairie dogs or ground squirrels or of woodchucks, foxes, badgers, armadillos. Regular breeder throughout New Mexico.	A negative response is expected where shrubsteppe habitats, used for breeding in the Intermountain West, are grazed. Poisoning and nest site loss results from human efforts to control squirrels and prairie dogs. When caught outside their burrows during fire, adult burrowing owls probably escape fire easily; some young that cannot yet fly may be injured or killed.

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BOREAL OWL	*Aegolius funereus*	SOC	T	0	G5	S1	NM	FS, State	Factors that potentially threaten boreal owl populations include extraction of snags during tree harvests or for firewood decreased abundance of mice due to timber cutting or natural causes and loss of old-growth forests due to clearcutting.	Widespread range, apparently large numbers and occurrences seem to make this species secure. Information may be lacking about the species in NM. Southwestern most distribution is in NM. NMG&F threatened species.	Spruce fir and similar habitats in the Sangre de Cristo, Jemez and San Juan Mtns.	In New Mexico, the protection of habitat is the prime consideration in conserving the boreal owl in the state -- especially areas of spruce-fir forest and associated habitats in the San Juan, Sangre de Cristo, and possibly the Jemez Mtns. Such protection should include setting aside areas wherever these owls have been found, with a particular emphasis on retaining forest habitat in its natural state.
BUFF-COLLARED NIGHTJAR	*Caprimulgus ridgwayi*	SOC	E	0	G5	S2, S1	AZ, NM	FS, FWS, NPS, State, Private	Livestock overgrazing, human disturbance.	In general, it appeared that the buff-collared nightjar was expanding as a summer resident in the U.S., centering on SE AZ. However, its progress has been slow, and the northern area of occupancy may prove to be temporary or one of irregular occurrence at best. The species was last reported in NM in 1985 at two locations; they were not found on regular surveys in Guadalupe Canyon during the period 1987-95. NM G&F endangered species.	This nightjar occurs almost exclusively in Guadalupe Canyon (Hidalgo Co.), which is the key habitat area for the species in the state of AZ. The only other place where the species has been reported was a bird in the Dona Ana Mtns. (Dona Ana Co.), which was presumably a vagrant. In AZ and NM, however, the species has generally been reported only in areas that support rather arid shrublands and woodlands--generally in canyons and washes.	Continue to search for this species in the state, and to work with public and private land managers to protect and enhance Guadalupe Canyon and similar habitats for this species.
BLACK SWIFT	*Cypseloides niger*	SOC	0	0	G4	S1	NM	FS	Draining of wetlands.	Large numbers occasionally are seen in migration and they breed over a large area. However, breeding sites are very localized. To little is know to call the species secure.	High inaccessible cliffs near permanent water. River, Riparian Woodland, Subalpine Marsh. Occurs at elevations where stream conditions provide sufficient permanent moisture for emergent plants, or for a narrow band of deciduous trees and shrubs; at low elevation characterized by cottonwood and sycamore, at mid-elevation by white alder (Alnus rhombifolia) and bigleaf maple (Acer macrophyllum), and at high elevation by willow	Protect the unique nesting habitat of this species.
BROAD BILLED HUMMINGBIRD	*Cynanthus latirostris*	SOC	T	0	G4	S5, S1	AZ, NM	FS, Private	Loss of riparian woodlands, predation up	Common in NM, small localized populations in AZ and NM. NMG&F threatened species. FWS Birds of Conservation Concern National Priority list.	Guadalupe Canyon. found primarily in riparian woodlands at low to moderate elevations (Baltosser et al. 1985). In Guadalupe Canyon, these woodlands are characterized by Fremont cottonwood (Populus fremontii), Arizona sycamore (Platanus wrightii), Arizona white oak (Quercus arizonica), and netleaf hackberry (Celtis reticulata).	Monitor the status of the breeding population in Guadalupe Canyon, to search for additional populations elsewhere, and to encourage public and private land managers to protect riparian woodlands favored by this species
WHITE-EARED HUMMINGBIRD	*Hylocharis leucotis*	SOC	T	0	G5	S1S2, S1	AZ, NM	FS, Private	Excessive livestock grazing, logging, road construction.	No declines have been reported in the larger portion of their range. Although habitat destruction may have reduced overall numbers. Small populations in both AZ and NM. NMG&F threatened species.		
VIOLET-CROWNED HUMMINGBIRD	*Amazilia violiceps*	SOC	T	WSCA	G5	S3, S1	AZ, NM	FS, State, Private	Urban development, loss of riparian habitat, excessive livestock grazing.	Limited distribution in AZ and NM. Need additional information.		
LUCIFER HUMMINGBIRD	*Calothorax lucifer*	SOC	T	0	G4G5	S2, S1	AZ, NM	FS, BLM, NPS	Habitat loss.	Limited distribution in AZ and NM. NMG&F threatened species. FWS Birds of Conservation Concern National Priority list.		
COSTA'S HUMMINGBIRD	*Calypte costae*	SOC	T	0	G5	S5, S1	AZ, NM	FS, DOD, FWS	Loss of native xeric hillside vegetation and adjacent riparian habitat in Southwest NM.	Limited distribution in NM. NM Game and Fish threatened species.		

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ELEGANT TROGON	*Trogon elegans*	SOC	E	WSCA	G5	S3, S1	AZ, NM	FS, DOD, Private	Degradation and loss of native riparian habitat through stream diversion, groundwater withdrawal, erosion, and overgrazing.	Limited range, casual occurrences in AZ and NM. NMG&F endangered species. FWS Birds of Conservation Concern National Priority list.		
BELTED KINGFISHER	*Ceryle alcyon*	SOC	0	WSCA	G5	S2B,S5N /S4	AZ, NM	DOD, FS, FWS, NPS, State, Private	Wetland loss and pesticides	Habitat loss.		
GILA WOODPECKER	*Melanerpes uropygialis*	SOC	T	0	G5	S5, S2	AZ, NM	FS, NPS, Private	Habitat loss and degradation/fragmentation.	Results from Breed Bird surveys indicate a non significant decline in AZ. Not enough monitoring in NM to determine population trends. NM Game and Fish threatened species.		
NORTHERN BEARDLESS-TYRANNULET	*Camptostoma imberbe*	SOC	E	0	G5	S4, S1	AZ, NM	FS, FWS, BLM, State, Private	Vegetation clearing, burning and overgrazing.	Very small and localized populations in the Southwest. NMG&F endangered species. FWS Birds of Conservation Concern National Priority list.		
OLIVE-SIDED FLYCATCHER	*Contopus cooperi*	SOC	0	0	G4	S4, S4	AZ, NM, TX	DOD, FS, NPS, State, Private	Loss of large frees and snags, fire, pesticides	Olive-sided flycatcher numbers have dropped by 40% in the last 25 years.		
GREATER PEWEE	*Contopus pertinax*	SOC	0	0	G5	S4, S3	NM	FS, Private	Habitat loss. Excessive livestock grazing.	Rare to fairly common in NM. Need additional information on species.		
NORTHERN BUFF-BREASTED FLYCATCHER	*Empidonax fulvifrons pygmaeus*	SOC	0	WSCA	G5T5	S1, SHB	AZ, NM	FS, Private	Loss of habitat.	Decreasing numbers, small localized populations in AZ and NM, reported stable in AZ (1995). FWS Birds of Conservation Concern National Priority list.		
THICK-BILLED KINGBIRD	*Tyrannus crassirostris*	SOC	E	WSCA	G5	S2,S1	AZ, NM	FS, FWS, State, Private	Logging, livestock grazing, water diversion.	Limited occurrence in NM. AZ and NM are northern most part of range. Population trends of this species are unknown. A rare bird that was first discovered in the US in 1958, the range of this Mexican species has expanded northward since the middle of the 20th century. NM Game and Fish endangered species.		
LOGGERHEAD SHRIKE	*Lanius ludovicianus*	SOC	0	0	G4	S4, S5	AZ, NM	FS, FWS, DOD, NPS, State, Private	Fire exclusion, pesticides, loss of wintering habitat/quality. Dependency on edge habitat which increases predation pressure.	Has been declining in N. Amer. since the 60's. Decline has been recorded in all regions of the country, even those areas with great amounts of habitat. Is considered moderately threatened throughout its range. FWS Birds of Conservation Concern National Priority List.		
ARIZONA BELL'S VIREO	*Vireo bellii arizonae*	SOC	T	0	G5T4	S4, S2	AZ, NM	FS	Livestock grazing, pesticides, habitat fragmentation, loss of riparian habitat.	BBS data indicate significant survey wide declines averaging 3.2% per year. The species is very limited in its distribution and is declining across its range. It is negatively impacted by riparian habitat loss from agricultural, water, road and urban development. NMG&F threatened species. FWS Birds of Conservation Concern National Priority list.		
GRAY VIREO	*Vireo vicinior*	SOC	T	0	G4	S4, S4	AZ, NM	BLM, FS	Even aged forest mgmt, habitat fragmentation, excessive livestock grazing, cowbird parasitism. Changes in fire regime that bring about an increase in fire extent or frequency may be detrimental.	Population declines in N. AZ and NW NM, yet increases in S and SW AZ. NMG&F threatened species. FWS Birds of Conservation Concern National Priority list.		

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GRAY CATBIRD	*Dumetella carolinensis*	SOC	0	WSCA	G5	S1, S4	AZ, NM	DOD, FS, NPS, FWS, state, private	Habitat loss, degradation and fragmentation. Nest parasitism	Population trends are unknown for AZ. For their entire range BBS data from 1991-1996 indicate that populations are declining in the SE and over the NE portion of the periphery of their range. Populations are relatively stable over remainder of breeding range. AZ is southern most portion of their range. Sensitive for AZ only.		
ROSE-THROATED BECARD	*Pachyramphus aglaiae*	SOC	0	WSCA	G4G5	S1, SR	AZ, NM	FS, FWS, State, Private	Livestock grazing, de-watering wetland habitats, habitat fragmentation, disturbance by birdwatchers, urban development.	Extirpated in the lower Rio Grande valley coincident with plant community changing. Decline of large trees attributed to long term lack of flooding. Breeding populations have fluctuated in the past in AZ. Very local breeding species on northern periphery of range in U.S. There are no trend info. or pop. estimates for AZ; however, total observed nesting pairs currently range from 2-7 annually in two locales; occurrences have been extirpated from other local areas.		
BENDIRE'S THRASHER	*Toxostoma bendirei*	SOC	0	0	G4G5	S4, S4	AZ, NM	FS, DOD, NPS, State	Clearing of desert scrub habitats and harvesting of large desert cacti.	Population status and trends poorly know. BBS survey shows significant survey wide decline.		
YELLOW WARBLER (SONORA SPP)	*Dendroica petechia*	SOC	0	0	G5	S4, S1N	AZ, NM	FS, DOD, FWS, NPS, State	Loss of habitat and brood parasitism.	This species is declining in several areas of the U.S., most seriously in AZ and California.		
SPRAGUE'S PIPIT	*Anthus spragueii*	SOC	0	WSCA	G4	S2N, S2N	AZ, NM	FS, DOD, FWS, Private	Livestock grazing, reduction in grassland and riparian habitats.	Within large range, has relatively large number of occurrences. Globally secure. No current data available for AZ or NM.		
AMERICAN REDSTART	*Setophaga ruticilla*	SOC	0	WSCA	G5	S1, S4N	AZ, NM	FS, DOD, NPS, FWS, State, Private	Excessive livestock grazing, degradation and fragmentation of habitat, cowbird parasitism.	Population trend is negative with most states experiencing net losses over the past three decades.		
ABERT'S TOWHEE	*Pipilo aberti*	SOC	T	0	G5	S5, S1	AZ, NM	FS, NPS	Livestock grazing, loss of riparian habitat, parasitism by cowbirds.	Small geographic range and extensive loss and modification of native riparian habitat indicate high rank; relatively high current densities with some protected areas and extensive use of exotic and human-created habitat suggest lower rank. NM Game and Fish threatened species.		
BOTTERI'S SPARROW	*Aimophila botterii*	SOC	0	0	G4	S1, S3	AZ, NM	FS, Private	Excessive livestock grazing.	Small localized populations have been detected in NM. The very small NM population of Botteri's sparrow is vulnerable to loss of its preferred sacaton grass habitat (Animas & Gray Ranch). FWS Birds of Conservation Concern National Priority list.		
GRASSHOPPER SPARROW	*Ammodramus savannarum*	SOC	T	0	G5	S3, S1	AZ, NM	FS, DOD, FWS, Private, State	Loss and degradation of native grassland habitat.	BBS data indicate a significant pop. decline (4.4% per year) in N. Amer. between 1966 and 1989 and 4.5% in western U.S. NM Game and Fish threatened species.		

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BAIRD'S SPARROW	*Ammodramus bairdii*	SOC	T	WSCA	G4	S2N, S2N	AZ, NM	FS, DOD, FWS, NPS, State, Private	Excessive livestock grazing, conversion of grasslands to agriculture, parasitism by cowbirds.	Restricted range, spotty distribution, recent rapid and long-term pop. and range declines, few protected occurrences, and habitat selectivity are cause for concern. NMG&F threatened species. FWS Birds of Conservation Concern National Priority list.	Open grasslands, overgrown fields, dense stands of grass; usually in extensive expanses of habitat. Appear to prefer areas of taller, denser grass in open, mixed short-grass prairie consisting of native grasses and forbs with small, widely scattered shrubs. They avoid areas with excessive litter and/or heavy shrub development. In NM, they range from prairies in the northeast and mountain meadows in the San Juan and Sangre de Cristo mountains, including elevation over 11,800 feet, to desert grasslands.	They respond to management: 2-3 years after fire Baird's sparrows are usually more abundant. Baird's sparrows do not like thick accumulations of litter. Occasional burning is suggested to maintain dense graminoid vegetation and reduce the number of shrubs, but not so often that the litter never accumulates. Moderate mowing is beneficial in wetter areas, but in arid habitat, mowing may be detrimental. Baird's sparrows have responded negatively to improper grazing practices in grasslands of the southwest and Mexico. Even moderate or lightly grazed pastures have fewer birds than undisturbed habitats and grazing could be detrimental in the more arid areas. Conserving and restoring larger patches of southwest grasslands should improve fitness and survival of migrant Baird's sparrows. Quantitative data on habitat requirements is needed, including the relationship between patch size and numbers of Baird's sparrows.
YELLOW-EYED JUNCO	*Junco phaeonotus*	SOC	T	0	G5	S3, S2	AZ, NM	FS, FWS, NPS, Private	Logging, deforestation, catastrophic fire.	Limited population numbers and range.		
McCOWN'S LONGSPUR	*Calcarius mccownii*	SOC	0	0	G5	S2N, S4	AZ, NM	FS, DOD, FWS, NPS, Private	Livestock grazing in riparian zones, nest predation.	Erratic fluctuations and unpredictable occurrences on breeding and wintering areas.		
VARIED BUNTING	*Passerina versicolor*	SOC	T	0	G5	S3, S1	AZ, NM	FS, DOD, NPS, Private	Reduction in dense shrubby habitat.	Small population occurs in NM (2-5 territories). Need information for AZ. NMG&F Mexico Game and Fish threatened species.		
CLAMS												
California floater	*Anodonta californiensis*	0	0	0	G3	S1S2	AZ	FS, State, Private	Deterioration of stream habitat quality through grazing, irrigation diversions, urbanization, and sedimentation. Loss of native fishes that were hosts for glochidia. Non-native species.	Declining populations range-wide. May be extirpated from Colorado River basin in AZ.	Shallow areas, less than 2 m deep in unpolluted lakes, reservoirs, and perennial streams are the preferred habitat for freshwater mussels. Adult mussels typically live in mud or sand and juveniles in loose sand. Needs a fish host for parasitic glochidia. Upper Black river.	Inventory is needed, particularly in drainages in the Great Basin, as is continued monitoring of known populations. Also identification of potential for restoration of original habitat. As the species is closely associated with species of fish, once the host or hosts are known, a total fish-molluscan management plan should be developed to avoid developing a habitat to improve one native species at the expense of another.
TEXAS HORNSHELL	*Oopenaias popei*	0	0	0	G1	S1	NM	Private	Loss of habitat, water pollution, exotic bivalves	Very limited distribution, NMG&F endangered species	Black river, Eddy County.	Maintain watershed health. Prevent water contamination and channel modification. Conduct surveys at high elevation aquatic habitats when possible.
LAKE FINGERNAILCLAM	*Musculium lacustre*	SOC	T	0	G5	S1	NM	Private	Pollution, dewatering, development, sedimentation	NMG&F threatened species.	High elevation, deep water lakes and marshes. Upper Cieneguilla Creek.	Maintain watershed health. Prevent water contamination and channel modification. Conduct surveys at high elevation aquatic habitats when possible.

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SWAMP FINGERNAILCLAM	*Musculium partumeium*	SOC	T	0	G5	S1	NM	Private	dewatering, pollution	NMG&F threatened species.	Occurs in a variety of water bodies over its range, from streams to swamps, ponds, and even margins of lakes. Waters in its habitats are generally perennial, but occasionally seasonal areas are also inhabited. Whatever the habitat, this clam is usually found in areas where current velocity is slow. This species is usually found embedded in soft substrates, such as mud bottoms. Overwintering clams probably burrow into wet or damp substrates, although some may occupy waters that do not freeze. Road Canyon creek.	Maintain watershed health. Prevent water contamination and stream modification. Conduct surveys when possible.
LONG FINGERNAILCLAM	*Musculium transversum*	SOC	T	0	G5	S2	NM	UNK	stream dewatering, flood scouring, pollution	NMG&F threatened species.	Occurs in a variety of habitat types, with sloughs, rivers, and large lakes being among the most frequently reported. This is the only species of the genus restricted to perennial, and most often running, waters. Substrates inhabited by this clam are variable, ranging from mud and sand to stones or rocks. In laboratory experiments, the species' preference was for mud over sandy mud or sand. As a rule, the animals burrow in the substrate. Conchas River, Dabra Springs, Ute Creek, Clayton Lake, Road Canyon Creek.	Prevent diversion of water from creeks, channel modifications, and water pollution. Maintain watershed health.
LILLJEBORG'S PEA-CLAM	*Pisidium lilljeborg*	SOC	T	0	G5	S1	NM	FS	pollution-contaminants, sedimentation, stochastic events,	NMG&F threatened species.	High elevation lakes. Nambe Lake.	Maintain watershed health. Prevent water contamination.
SANGRE DE CRISTO PEA-CLAM	*Pisidium sanguinichristi*	SOC	T	0	G1Q	S1	NM	FS	mining, fire mgmt, detwatering	NMG&F threatened species.	Middle Fork Lake--located in a glacial cirque at about 3320 m. This is a typical alpine lake of the area, with no submergent aquatic vegetation, and emergent grasses are only in sheltered embayments. This mollusk occurs in the mud among these emergent grasses, as well as in that at the lake outlet. Middle Fork Lake and a restricted reach of the lake outflow into Middle Fork Creek	Maintain watershed health. Prevent water contamination. Taxonomic status uncertain, needs further study.
CRUSTACEANS												
CLAM SHRIMP	*Eulimnadia follisimillis*	SOC	0	0	G2	S1	NM	FS	Ephemeral wetland loss from agricultural practices, livestock mgmt., point and nonpoint discharge, highway improvement, mosquito abatement.	only known occurrence of this species in the U.S. - it is endemic to South America.	Warm water pools which are low to moderate in dissolved solids, less predictable, and short-lived.	Protect ephemeral wetlands from agricultural development, overgrazing, contaminants, highway development, mosquito abatement projects, and other disturbances that will affect the structural integrity of the wetland or its water quality.
SPINYTHUMB FAIRY SHRIMP	*Streptocephalus moorei*	SOC	0	0	G1	S1	NM	Private	Ephemeral wetland loss from agricultural practices, livestock mgmt., point and nonpoint discharge, highway improvement, mosquito abatement.	only known extant populations occur in NM, IUCN listed as endangered (extirpated in MX).	Warm water pools which are low to moderate in dissolved solids, less predictable, and long lived. Only 4 know extant populations occur in NM.	Protect ephemeral wetlands from agricultural development, overgrazing, contaminants, highway development, mosquito abatement projects, and other disturbances that will affect the structural integrity of the wetland or its water quality.
FAIRY SHRIMP (new species)	*Streptocephalus henridumontis*	SOC	0	0	G1	S1	AZ, NM	FS	Ephemeral wetland loss from agricultural practices, livestock mgmt., point and nonpoint discharge, highway improvement, mosquito abatement.	endemic, Chiuhuahuan/Sonoran deserts (NM, AZ, MX)	Cold to warm water pools which are moderate to great in dissolved solids, predictable to less predictable, and long lived.	Protect ephemeral wetlands from agricultural development, overgrazing, contaminants, highway development, mosquito abatement projects, and other disturbances that will affect the structural integrity of the wetland or its water quality.

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FAIRY SHRIMP (new species)	*Streptocephalus thomasbowmani*	SOC	0	0	G1	S1	NM	FS	Ephemeral wetland loss from agricultural practices, livestock mgmt., point and nonpoint discharge, highway improvement, mosquito abatement.	narrow endemic, IUCN listed as endangered	Warm water pools which are low to moderate in dissolved solids, less predictable, and long lived.	Protect ephemeral wetlands from agricultural development, overgrazing, contaminants, highway development, mosquito abatement projects, and other disturbances that will affect the structural integrity of the wetland or its water quality.
FAIRY SHRIMP	*Phallocryptus (Branchinella) sublettei*	SOC	0	0	G1	S1	NM	BLM	Ephemeral wetland loss from agricultural practices, livestock mgmt., point and nonpoint discharge, highway improvement, mosquito abatement.	narrow endemic, playa lakes region of NM and TX.	Ephemeral alkali playas.	Protect ephemeral wetlands from agricultural development, overgrazing, contaminants, highway development, mosquito abatement projects, and other disturbances that will affect the structural integrity of the wetland or its water quality.
FAIRY SHRIMP	*Branchinecta packardi*	SOC	0	0	G3	S2	NM	FS, Private	Ephemeral wetland loss from oil and gas development, point and non-point discharge, alteration of drainage basin capture from road development associated with oil and gas exploration, agricultural practices, livestock management.	Populations on CAR NF Valle Vidal threatened by CBM development.	Tinajas, playas, grassland swales at low to high elevations.	Protect ephemeral wetlands from agricultural development, overgrazing, contaminants, highway development, mosquito abatement projects, and other disturbances that will affect the structural integrity of the wetland or its water quality.
NO COMMON NAME	*Gammarus sp. 1*	SOC	0	0	G1	S1	NM	UNK	Habitat modification from recreational site use.	Considered an undescribed endemic species.	Guadalupe Mountains, Sitting Bull Spring.	Protect spring from anthropogenic disturbances; dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality degradation, exotic species.
NO COMMON NAME	*Gammarus sp. 2*	SOC	0	0	G1	S1	NM	UNK	Lake of CWA protection.	Considered an undescribed species, endemic.	Malpai spring.	Protect spring from anthropogenic disturbances; dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality degradation, exotic species.
CONCHAS CRAYFISH	*Orconectes deanae*	SOC	0	0	G3	S1	NM	State, Private	O. rusticus, an introduced crayfish is a potential threat	thought to be narrow endemic however, new population may have been found in OK	Crayfish are found under small to large slab like rocks or shoreline debris of Conchas Lake. In canals and streams it is found in burrows.	Protect water quality of Conchas Lake. Implement measures to reduce the likelihood of introducing exotic crayfish. Maintain suitable habitat.
FISH												
ARKANSAS RIVER SPECKLED CHUB	*Macrhybopsis aestivalis tetranemus*	SOC	T	0	G1	S1	NM, TX	State, Private	The species has declined due to dewatering of streams and possibly pollution; low-water dams and other obstructions have fragmented habitat and blocked upstream recolonization.	The species is extant in only two river reaches representing about 10 % of historical range. It is considered critically imperiled throughout its occupied range, is listed as a species of concern by the American Fisheries Society, threatened in NM.		
BIGSCALE LOGPERCH	*Percina macrolepida*	SOC	T	0	G5	S2	NM	BLM	Stream dewatering, habitat degradation associated with water diversions	NM WCA threatened, BLM sensitive, and described as imperiled in NM.		
BLUE SUCKER	*Cycleptus elongatus*	SOC	E	0	G4	S1	NM	BLM	Stream dewatering, limited movement caused by diversion dams, and habitat destruction and degradation associated with reservoir construction and operation.	Listed as endangered by NM, considered threatened by TX, rare by the Republic of Mexico, and as a species of concern by the American Fisheries Society		
BLUEHEAD SUCKER	*Catostomus discobolus discobolus*	SOC	0	0	G4	S3, S2	AZ, NM	BLM, FS	Streamflow and thermal alteration. Non native competition and predation. Contaminants, sedimentation, habitat alteration.	Status of vulnerable (S3) in AZ and imperiled (S2) in NM. Although often common in the northern part of its range, the species has experienced a decline in abundance and distribution throughout the lower Colorado River basin.		

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DESERT SUCKER	*Catostomus clarki*	SOC	0	0	G3	S3, S2	AZ, NM	BLM, FS	Flow and thermal alteration. Non-native competition and predation. Dewatering, habitat alteration.	The desert sucker is listed as "species of concern" throughout its range as well as by the State of NM. NatureServe and The Nature Conservancy describe the status of the species as declining throughout its range. Additionally, the species conservation status is considered imperiled in NM and vulnerable in AZ.		
FLANNELMOUTH SUCKER	*Catostomus latipinnis*	SOC	0	0	G3	S2, S1	AZ, NM	FS	Flow and thermal alteration, non-native competition and predation, contaminants, sedimentation, habitat alteration.	Federal species of concern. Its global conservation status is considered vulnerable to local extirpation and extinction (G3). The species is in decline rangewide. It is listed by NatureServe as imperiled (S2) in AZ and critically imperiled (S1) in NM.		
FLATHEAD CHUB	*Platygobio gracilis*	SOC	0	0	G5	S4	NM	BLM	declining at the southern margin of the range, due in large part to the impacts of dams/reservoirs and stream channelization	Populations in the southern range have declined significantly and the American Fisheries Society has listed the flathead chub as a species of concern		
GRAY REDHORSE	*Moxostoma congestum*	SOC	T	0	G4	S1	NM	BLM		Small range (mostly in TX); reduced range and abundance, and locally declining, listed as threatened in NM, described as critically imperiled in NM, and as a species of concern by the American Fisheries Society.		
GREENTHROAT DARTER	*Etheostoma lepidum*	SOC	T	0	G3	S2	NM	FS	habitat alteration through groundwater mining, flow diversion, excessive sedimentation, modification of stream morphology, and pollution from industrial, agricultural, and domestic source	NM listed as threatened and considered imperiled in NM.		
HEADWATER CATFISH	*Ictalarus lupus*	SOC	0	0	G3	S1	NM	BLM, FS	Competition and/or hybridization with channel catfish in the greatly disturbed streams of NM has eliminated headwater catfish from most of original range (Sublette et al. 1990).	Critically imperiled (S1) in NM. Also has a status designation by the American Fisheries Society of "species of concern". There is a lack of status information on this species.		
HEADWATER CHUB	*Gila nigra*	SOC	0	0	G2	S2, SNR	AZ, NM	FS	Nonnative predation and competition. Habitat destruction and degradation, dewatering and diversions. Poor livestock grazing, channelization, sedimentation caused by roads and concentrated recreation. Disease, population fragmentation, isolation.	Information on this newly described species is lacking. Status is similar to that of the Gila chub and the roundtail chub from which the species was separated and described. Species has declined significantly in abundance in many areas, due to habitat alteration and exotic species.		
LITTLE COLORADO SUCKER	*Catostomus sp.3*	SOC	0	WSCA	G2	S2	AZ	BLM, FS	Habitat degradation, predation.	Listed as a "wildlife of concern" in AZ. The global status of the species is imperiled, while also considered imperiled in AZ, the only state in which it occurs.		
LONGFIN DACE	*Agosia chrysogaster*	SOC	0	0	G4	S3, SNA	AZ, NM	BLM, FS	Nonnative predation and competition. Habitat destruction and degradation. Dewatering and diversions. Poor livestock grazing, channelization, sedimentation, disease, population fragmentation and isolation.	Status of species in AZ considered vulnerable. Populations appear to be fluctuating up or down in some areas while stable in others. Species listed as threatened in NM. Threats are widespread and ongoing.		

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MEXICAN STONEROLLER	*Campostoma ornatum*	SOC	0	WSCA	G3	S1	AZ	FS	Habitat loss, nonnative predation, dewatering, sedimentation.	Global conservation status of vulnerable. Considered critically imperiled in AZ. American Fisheries Society species of "special concern". Endangered in Mexico.		
MEXICAN TETRA	*Astyanax mexicanus*	SOC	T	0	G5	SNA,S2	NM	BLM	In NM (where rare), apparently extirpated from Rio Grande drainage; probably negatively affected by habitat degradation caused by overgrazing, siltation, channelization, and water diversions; possibly also affected by severely cold winters of 1960s (Sublette et al. 1990).	Listed by NM as a threatened species and considered imperiled in NM.		
PECOS PUPFISH	*Cyprinodon pecosensis*	SOC	T	0	G1	S1	NM	BLM	Predation, competition, and hybridization with/by introduced species; habitat degradation; contaminants and dewatering.	Listed as Threatened in NM, has been proposed for federal listing, listed as threatened in TX, and is considered a species of concern by the American Fisheries Society.		
PLAINS MINNOW	*Hybognathus placitus*	SOC	0	0	G4	S3	NM	BLM	threatened by impoundments altering habitat and flow regimes	Considered vulnerable in NM, sensitive by BLM, and sensitive by the State of NM		
RIO GRANDE CHUB	*Gila pandora*	SOC	0	0	G3	S3	NM	BLM, FS	threats are stream dewatering and habitat modification due to channelization.	Vulnerable throughout its range. Range has been reduced in the Rio Grande and Pecos River basins and now restricted to headwaters and small rivers where cover, undercut banks, and aquatic vegetation. is susceptible to change; considered sensitive by NM.		
RIO GRANDE CUTTHROAT TROUT	*Oncorhynchus clarki virginalis*	SOC	0	0	G4T3	S2	NM	FS	Habitat degraded by overgrazing and timber harvest; hybridization and competition with various introduced salmonids; detwatering caused by irrigation diversion; poor winter habitat, stream intermittency, and deteriorating water quality resulting from drought; susceptible to habitat loss/degradation resulting from wildfires; highly vulnerable to replacement by non-native trout; more vulnerable to angling than are coexisting trout; habitat is fragmented, and most populations are isolated in headwater habitats, and gene flow among populations is virtually nonexistent.	Imperiled in NM (S2). American Fisheries Society considers the subspecies of special concern. Range of the subspecies if very restricted and believed to be as little as 5-7 % of the historical range.		

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RIO GRANDE SHINER	*Notropis jemezanus*	SOC	0	0	G3	S2	NM	BLM	Primary threats are dewatering and modification of natural flow regimes. Potential threats include contaminants and non-native competitors/predators. Irrigation withdrawals and the construction of mainstem dams altered the Rio Grande prior to 1930 and probably reduced populations. Drought and increased water withdrawal after 1950 periodically dried extensive reaches of the Rio Grande and probably eliminated the remaining small populations. Plans to reinstitute use of the conveyance-canal system may once again dry the Rio Grande	The species is considered vulnerable rangewide and imperiled in NM and is considered sensitive by BLM and the state of NM.		
RIO GRANDE SUCKER	*Catostomus plebeius*	SOC	0	0	G3	SNA, S2	NM	BLM, FS	hybridization with the introduced white sucker is the primary reason for decline in northern NM and southern CO; elsewhere, habitat modifications (elevated sediments and stream dewatering) have contributed to declines; some populations may have been extirpated by the introduction of predaceous northern pike.	Rangewide, the species is considered vulnerable (G3). In NM the species is considered imperiled (S2), and in CO critically imperiled (S1). Although pops are thought to be stable in the southern portion of their range, they appear to be decreasing in the north. Current distribution information is lacking.		
ROUNDTAIL CHUB	*Gila robusta*	SOC	E	WSCA	G3	S2, S2	AZ, NM	BLM, FS	aquifer pumping; stream diversion; reduction in stream flows; predation by and competition with nonnative fishes	Declining significantly in abundance in many areas. Considered imperiled (S2) in both NM and AZ. Has been extirpated from the Zuni and San Francisco River drainages in NM with probably		
SONORA SUCKER	*Catostomus insignis*	SOC	0	0	G3	S3, S2	AZ, NM	BLM, FS	threatened by water diversion, altered hydrology, and competition/predation from non-native fishes	Vulnerable in AZ and imperiled in NM. A decline in abundance is apparent for the southern part of its range with increasing threats from water diversion, altered hydrology, and competition/hybridization from/with nonnative species.		
SOUTHERN REDBELLY DACE	*Phoxinus erythrogaster*	SOC	E	0	G5	S1	NM	Near FS Boundary	subject to extirpation through habitat degradation (e.g., siltation, pollution, and/or bank destabilization) and dewatering; predation by introduced species	The species is listed in NM as endangered; it is considered critically imperiled in NM		
SPECKLED CHUB (PECOS RIVER)	*Macrhybopsis aestivalis aestivalis*	SOC	0	0	G3	S2	NM	BLM	Altered flow regimes, dewatering of riverine habitats	Considered to be vulnerable range-wide and imperiled in NM		
SPECKLED DACE	*Rhinichthys osculus*	SOC	0	0	G5	S3, S3	AZ, NM	BLM, FS	dewatering of springs, headwaters, and middle portions of major streams, water impoundment, channelization, diversion, regulation of discharges, and interactions with non-native species	The species is considered vulnerable in Gila River drainage of AZ and NM. Although locally abundant in areas, it has been extirpated from much of its historic range.		
SUCKERMOUTH MINNOW	*Phenacobius mirabilis*	SOC	T	0	G5	S2	NM	FS	Altered flow regimes, dewatering of riverine habitats	Although this species is widespread and secure throughout much of its range (G5), it is imperiled (S2) in NM through the western and southeastern portions. Threatened by the State NM.		

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VIRGIN SPINEDACE	*Lepidomeda mollispinis mollispinis*	SOC	0	WSCA	G1	S1	AZ	BLM	Much habitat has been lost due to human impacts, including habitat fragmentation, introduction of non-native fishes, and dewatering associated with agriculture, mining, and urbanization	The species is a FWS species of concern, listed as endangered by AZ, critically imperiled range-wide and within AZ.		
WHITE SANDS PUPFISH	*Cyprinodon tularosa*	SOC	T	0	G1	S1	NM	DOD	Restricted to a few sites in the Tularosa Valley, NM; abundant in extremely limited range; very specific habitat needs	The species is listed as threatened in NM; a species of concern by the American Fisheries Society; and is considered critically imperiled range-wide and within NM.		
YAQUI SUCKER	*Catostomus bernardini*	SOC	0	WSCA	G4	SH	AZ	UNK	aquifer pumping; reduction in stream flows; water diversion; drought; predation by nonnative fishes	State-listed as endangered by AZ; may be extirpated in AZ		
ZUNI BLUEHEAD SUCKER	*Catostomus discobolus yarrowi*	C	E	0	G4T1	S1, S1	AZ, NM	FS	Habitat loss, nonnative predation, dewatering, sedimentation.	Species of special concern by AZ, and the American Fisheries Society considerers them a species of concern. The historical range of the species is very limited to the Zuni River drainage.		
INSECTS												
SABINO CANYON DAMSELFLY	*Argia sabino*	0	0	0	G1	S1	AZ	FS	Use of fish toxicants to remove non native fish, mosquito abatement, exotic crayfish, non-native fish, stream drying, flash floods, channelization.	Narrow endemic, decrease in population size, drought.	Perennial deep rock bottomed pools of intermittent or perennial montane desert streams.	Remove non-natives, survey before applying fish toxicants, limit water withdrawals, maintain habitat.
BLEACHED SKIMMER DRAGONFLY	*Libellula composita*	SOC	0	0	G3	UNK	AZ, NM, OR, CA, UT, TX	FS	livestock grazing (trampling of habitat, eating emergent vegetation), possibly predation from fish or competition with other dragonflies.	limited distribution	Spring fed ponds in open arid country, ponds and streams with emergent vegetation. Also in warm/hotsprings in northern part of the range.	Protect habitat from overgrazing, remove exotic species, protect water quality and quantity.
SPOT-WINGED MEADOWHAWK	*Sympetrum signiferum*	SOC	0	0	G2G3	UNK	AZ, MX	UNK	overgrazing wetlands, pollution. Not necessarily rare. Emerges in Oct- much later than most odonates and so may be less frequently collected.	limited distribution	Slow flowing creeks, vegetated stream pools, sluggish pools.	Protect creeks from overgrazing and pollution.
ARROYO DARNER	*Aeshna dugesi*	SOC	0	0	G4	S1	AZ, NM	FS	Fires, Timber harvest, and grazing, especially removal of grass along streams, increase flash floods that may was away larvae. Streams may also be degraded by human use, for example, polluted by toxic chemicals, human sewage, and silt. Virtually no protection in Mexico.	limited distribution	Probably occurs in most if not all appropriate streams.	Provide buffers for timber harvest, protect streams from overgrazing, maintain water quality and quantity.
FOUR-STRIPPED LEAFTAIL	*Phyllogomphoides stigmatus*		0	0	G4	UNK	NM, TX	State	removal of salt cedar - loss of roosting habitat.	limited distribution	Ponds/lakes.	Maintain water quality, plant native vegetation for roosting habitat.
DASHED RINGTAIL	*Erpetogomphus heterodon*	SOC	0	0	G3	UNK	NM, TX	FS	timber harvest, overgrazing and fires that destabilize streamflow	limited distribution	Higher altitude rivers and streams with swift current and rocky or cobble bottoms.	Provide buffers for timber harvest, protect streams from overgrazing, maintain water quality and quantity.
ARIZONA SNAKETAIL	*Ophiogomphus arizonicus*	SOC	0	0	G3	S1	AZ, NM	FS	timber harvest, overgrazing and fires that destabilize streamflow, water quality degradation, water withdrawal.	limited distribution	Fairly swift rocky mountain streams in pine woodlands.	Provide buffers for timber harvest, protect streams from overgrazing, maintain water quality and quantity.
A MAYFLY	*Lachlania dencyannae*	0	0	0	G1	S1	NM	FS	loss of water or inundation from dam building, water quality degradation, sedimentation, increased water temperature	Narrow endemic	Stream	Provide buffers for timber harvest, protect streams from overgrazing, maintain water quality and quantity.
A MAYFLY	*Homoleptohyphes quercus*	0	0	0	G2	UNK	AZ	FS	stream degradation	Limited distribution.	Isolated montane streams.	Maintain healthy riparian corridors.

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A MAYFLY	*Leucrocuta petersi*	SOC	0	0	G2	UNK	NM	UNK	Stream degradation, low dissolved oxygen, water quality degradation.	Limited distribution.	Rocks in moderate current warm, medium sized streams that are in part sandy bottomed.	Maintain healthy riparian corridors.
A MAYFLY	*Hexagenia bilineata*	SOC	0	0	G5	S1	NM	UNK	siltation, pollution, damming, withdrawal of water	although widespread in US, it is found only in Black River in NM	Streams, springs, ponds. - Black River	Maintain buffers between agricultural land and Black River. Regulate activities that diminish water quantity.
A MAYFLY	*Baetodes arizonensis*	0	0	0	G2	UNK	AZ	UNK	siltation, pollution, damming, withdrawal of water	Limited distribution.	Montane streams.	Maintain healthy riparian corridors, limit water withdrawals.
A MAYFLY	*Cloeodes peninsulus*	0	0	0	G2	S1	AZ	UNK	siltation, pollution, damning, withdrawal of water.	Limited distribution.	Small streams.	Maintain healthy riparian corridors, limit water withdrawals.
ARIZONA GIANT SAND TREADER CRICKET	*Daihinibaenetes arizonensis*	0	0	0	G1G3	S1S3	AZ	FS	anything that damages dune systems, i.e. OHV use	limited distribution, more information needed. Systematics still unclear.	Sandy dunes, sandy washes.	Limit/regulate OHV use of sand dunes, maintain healthy dune systems.
NAVAJO JERUSALEM CRICKET	*Stenopelmatus navajo*	0	0	0	G1G3	S1S3	AZ	NPS	Grazing and OHV use that damages dune systems	limited distribution, may be more common than previously believed. Need more surveys.	Sand dunes, sandy washes in northern AZ Moenkopi to Petrified Forest National Park	Maintain healthy dune systems.
PINALENO MONKEY GRASSHOPPER	*Eumorsea pinaleno*	0	0	0	G1G3	S1S3	AZ	FS	logging, grazing, fire	endemic, very little is known about the species	High elevation (above 9,000) coniferous forest. Mt. Graham in Pinaleno Mtns.	Prevent overgrazing, uncontrolled wildfires.
SANTA RITA Mtns CHLOROCHROAN BUG	*Chlorochroa rita*	0	0	0	UNK	UNK	AZ	UNK	modification and destruction of montane riparian habitats	no individuals have been collected in last 20-30 years	Most likely associated with aquatic habitats, montane riparian areas, areas of flowing or stagnant water.	Maintain healthy montane riparian habitats.
CHEESE-WEED MOTH LACEWING	*Oliarces clara*	0	0	0	G1G3	SNR	AZ	UNK	Land development for agriculture and housing are threats to consider for this species.	none found	Found near bajadas, larvae appear to require creosote bush roots to feed on. Adults aggregate at local high topographic features to mate.	Avoid widespread loss of creosote bushes.
MARICOPA TIGER BEETLE	*Cicindela oregona maricopa*	SOC	0	0	G5T3	S3	AZ, NM	FS, BLM, State, City, Private.	Cattle grazing, sand and gravel operations, dam construction that robs downstream transport of sediment to river banks, OHVs.	Limited distribution	Most common on sandy stream banks and less common on gravels and clays along streambanks. May occur near seeps of reservoir banks. Substrate utilized by larval stages is a major factor determining presence, absence, and abundance of this subspecies throughout its range. Substrate appears to be a sand/silt material capable of holding together around a burrow throughout larval stage development, and capable of retaining sufficient moisture to prevent larval desiccation and capable of being burrowed into by larval stages.	Protection of sandy stream banks, reservoir banks, surveys before sand and gravel operations are permitted. A Habitat Conservation Assessment was completed for this species by the FS. (Pearson and Wisman 1995).
TIGER BEETLE	*Cicindela nevadica citata*	0	0	0	G5T4	S1	AZ	UNK	lowered water table, overcollecting	Narrow endemic	Playa. Willcox Playa, Cochise County	Protect/maintain water levels.
TIGER BEETLE	*Cicindela willistoni sulfontis*	0	0	0	UNK	UNK	AZ	UNK	lowered water table, overcollecting	Narrow endemic	Playa. Willcox Playa, Cochise County	Protect/maintain water levels.
TIGER BEETLE	*Cicindela fulgoris albilata*	SOC	0	0	G5T4	UNK	NM	UNK	lowering of groundwater due to irrigation, drought	limited distribution	Salt flats. TX and near NM/TX stateline north of Salt Flat.	Protect/maintain water levels.
TIGER BEETLE	*Cicindela nevadica tubensis*	SOC	0	0	G5T3	UNK	AZ, NM	UNK	increased agriculture and development, grading and drainage of playa	Narrow endemic with limited distribution	Saline playa, alkali flat or pond, water's edge. Type locality, Tuba City, AZ has been destroyed. Now know from northern NM.	Protect/maintain water levels, protect playa habitats.
ANTHONY BLISTER BEETLE	*Lytta mirifica*	SOC	0	0	G2	SH	NM	UNK	habitat disturbance (ground activities) that would affect solitary bees. Pesticide spraying. Plant associations unknown.		Typically in flister beetles, the first instar must find a bee host to mature on, so solitary bee populations may keep beetle numbers low.	Not enough is known of life history to suggest protective measures; however, insecticides should not be used in or around suspected habitat.
BONITA DIVING BEETLE	*Deronectes neomexicanus*	SOC	0	0	G2	UNK	NM, TX	FS	degradation of habitat	Narrow endemic	Streams. Bonita Creek.	Maintain water quality and quantity.
CHIRICAHUA WATER SCAVENGER BEETLE	*Cymbiodyta arizonica*	0	0	0	G2?	S2?	AZ	FS	Aquatic habitat duration, loss of water	not known, limited distribution?	Aquatic. Found most often along water's edge. Pupation occurs in moist soil at water's edge. Creeks, shallow lakes.	Maintain water quality and quantity.
ANIMAS MINUTE MOSS BEETLE	*Limnebius aridus*	SOC	0	0	GH	SH	NM	UNK		Very sensitive to siltation.	Little known, but probably occurs along edges of clear mountain streams, usually among sand but adults sometimes on vegetation. Since they live mainly in the shoreline substrate, most Hydraenidae require specific particle and interstitial space size.	Maintain healthy riparian habitat, water quality and water quantity.

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PARKER'S CYLLOEPUS RIFFLE BEETLE	*Cylloepus parkeri*	0	0	0	G1	S1	AZ	FS	requires water with high oxygen content, high sensitivity to pollution. Livestock grazing mining, stream bed alteration	narrow endemic	Adults and larvae live in riffles of streams and spring brooks. Found on FS lands. Pupation occurs in damp protected areas adjacent to water (not in water). Found only in Bloody Basin area.	Maintain healthy riparian habitat, water quality and water quantity.
STEPHAN'S HETERELMIS RIFFLE BEETLE	*Heterelmis stephani*	C	0	0	G2	S2	AZ	FS	requires water with high oxygen content, high sensitivity to pollution. Spring alteration from boxing, capping, piping, recreational impacts, livestock grazing, mining, or stream bed alterations.	narrow endemic	Submerged woody debris in small seeps and springs. Pupation occurs in damp protected areas adjacent to water (not in water). Bog, Kent, Sylvester Springs, Madera Canyon in Santa Rita Mtns.	Maintain water quality and quantity. Protect water from pollution and nutrient inputs.
MARRON'S SAN CARLOS RIFFLE BEETLE	*Huleechius marroni carolus*	0	0	0	GUT2	S2	AZ	UNK	Habitat modification, grazing, sedimentation or siltation	narrow endemic	Riffles within the San Carlos river. All specimens collected were < 100 m downstream from several warm springs. Pupation occurs in damp protected areas adjacent to water (not in water).	Maintain riparian habitats, water quality, and water quantity.
FERRIS' COPPER	*Lycaena ferrisi*	0	0	0	G1	UNK	AZ	FS	Small population, overgrazing, fire suppression One main threat is that of grasses. Fire suppression results in the invasion of meadow habitats and other openings by dense conifer forests. Eventual warm season intense fires could be overly intense and eliminate some populations or permanently alter previously suitable habitats.	limited distribution	Moist montane meadows, cienegas, larval host is *Rumex hymenosepalus.* White Mountains AZ.	Consider prescribed fire or thinning to maintain open montane meadows. Avoid overgrazing of montane meadows.
CAPULIN MOUNTAIN ARTIC	*Oeneis alberta capulinensis*	SOC	0	0	G5	UNK	NM, CO	State	global warming, fire suppression	limited distribution	Larval host plant is Fescuca spp. High grasslands in Capulin Volcano, City of Raton, NM State lands.	Protect high elevation grasslands from improper livestock grazing. Restore natural fire cycle.
HUACHUCA GIANT SKIPPER	*Agathymus evansi*	0	0	0	G2	UNK	AZ	FS, DOD	Habitat alteration, small population	limited distribution	Mixed pine oak juniper woodland with stands of its host. Most colonies of this species are found in open areas of heavy woodland above 1800m. In AZ, only known from the Huachuca Mtns and vicinity. Associated with Agave plants, typically found between 5,600 - 5,800 feet.	Preserve stands of its food plant, Agave parryi var. huachucensis.
CESTUS SKIPPER	*Atrytonopsis cestus*	0	0	0	G1	UNK	AZ	FS	Fire suppression. All populations and their habitat should be protected.	very rare	The habitat is upper Sonoran grassy thorn forest and open woodlands. Gullies and canyons in thorn scrub grasslands.	Protect habitat. Conduct surveys before engaging in project that would alter thorn scrub grasslands.
MACNEILL SOOTY WING SKIPPER	*Hesperopsis gracielae*	0	0	0	G2G3	UNK	AZ, NV, UT	NPS?, FWS	removal of quailbush for agriculture, non-native plant invasions (salt cedar, Russian olive)	decline in larval food plant	Larvae restricted to quailbush, Atriplex lentiformis. Adults use salt cedar, Chinese parsley and alfalfa primarily, as a source of nectar. From lower Colorado river. Also along the Virgin, Salt, and Gila Rivers.	Maintain populations of larval food plant Atriplex lentiformis.
FOUR-SPOTTED SKIPPERLING	*Piruna polingii*	SOC	0	0	G3	UNK	AZ, NM	FS	Exotic plants.	UNK	Moist woodland openings with lush vegetation, meadows, ravines, and streamsides in the mountains. Caterpillars likely feed on a native grass. Huachuca Mtns, central NM and AZ, south to MX.	Long term: the population needs to be located, monitored and their habitat, food plant and conservation needs assessed. Short term: it would be advisable to conduct surveys in riparians areas or moist woodlands that are going to be disturbed.
URSINE GIANT SKIPPER	*Megathymus ursus ursus*	SOC	0	0	G4G5T3T4	UNK	AZ, NM, MX	UNK	adults are rarely seen. Impacts to host plants, decline in host plants	Adults are rarely seen.	Primary host is Yucca baccata var brevifolia is also used. Most common at the lower edge of oak woodland belt in Animas, Santa Catalina, Santa Rita, Whetstone, Huachuca, Dragoon, Pozo Verde, Atascosa, Patagonia, and Chiricahua Mountain ranges.	Maintain health and range of host plants. Conduct surveys, if possible, before project work is done in habitat.

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VIOLA YUCCA BORER	*Megathymus ursus violae*	SOC	0	0	G3T2	UNK	NM	FS	Impacts to host plants (Yucca schottii, torreyi, baccata, arizonica), grassland habitat degradation.	UNK	Host plants are Yucca schottii, torreyi, baccata, arizonica. Found in Yucca grasslands.	Maintain health and range of host plants.
POLING'S HAIRSTREAK	*Fixsenia polingi*	SOC	0	0	G2	UNK, S1	NM, TX	FS, DOD?	Overgrazing, possibly: exotic weeds, fire. Maintenance of oaks important	UNK	Scrub oak savannah, larvae feed on oaks (Quercus grisea, emoryi). Organ, Guadalupe, and Capitan Mtns.	Maintain oak woodlands.
ARIZONA VICEROY	*Limenitis archippus obsoleta*	SOC	0	0	G5T3T4	UNK	AZ, NM	FS, BLM, State	Impacts to riparian areas, livestock grazing	UNK	Host plant for larvae are Salix goodingi and possibly other Salix species. Found in association with stands of willow along major water courses.	Maintain riparian areas, especially healthy stands of willow. Protect against overgrazing. Restore areas that have been degraded.
NOKOMIS FRITILLARY	*Speyeria nokomis nokomis*	SOC	0	0	G3T1	S?S1	AZ, NM	FS	herbicide, heavy grazing, hydrology changes, potentially: overcollecting. Some disagreement on taxonomy of subspecies	narrow endemic	Montane wet meadows, streamside meadows with an abundance of violets. Host plant is Viola nephropphylla	Protect marshes, wet meadows, and areas where host plant is present.
NITOCRIS FRITILLARY	*Speyeria nokomis nitocris*	SOC	0	0	G3T3	UNK	AZ, NM, CO	FS	herbicide, heavy grazing, hydrology changes, potentially: overcollecting. Some disagreement on taxonomy of subspecies	Degradation of alpine meadows; overgrazing OHV use.	Montane wet meadows, host plant for larvae is Viola nephropphylla	Protect marshes, wet meadows, and areas where host plant is present.
SACRAMENTO MOUNTAINS CHECKERSPOT BUTTERFLY	*Euphydryas anicia cloudcrofti*	SOC	0	0	G5T1	SNR	NM	FS	Conifer encroachment of meadows, fire suppression, overgrazing, OHV use, development that degrades or removes meadow habitat, feral horses, camping in meadows.	Narrow endemic. Previously proposed for federal listing as endangered by FWS.	Open meadows within mixed conifer forest at elevations between 2,450 and 2,750m (8,000 - 9,000 ft) in Sacramento Mtns. Larvae feed on Penstemon neomexicanus and Valeriana edulis. Adults feed on the sneezeweed, Helenium hoopesii, as well as other nectar sources.	Protect meadows and host plants for larvae and adults. Restore meadows that have been lost to conifer encroachment. Restore natural fire cycle.
MOTH	*Euhyparpax rosea*	SOC	0	0	G1G2	UNK	NM	FS	narrow endemic	The small range is susceptible to stochastic events such as fire, invasive alien plants, or inadvertent management actions that might be to the species detriment.		
MOTH	*Papaipema dribi*	SOC	0	0	GH	SH	NM	UNK	Heavy grazing and complete burns in fall, winter, or spring would likely eradicate any remnant populations at least under dry conditions.	Known only from Otero county. Was lost at only known site by a general drying out of the region, especially seepage areas, in subsequent decades.	Near seeps	Conduct surveys to see if population still exists.
ARIZONA METALMARK	*Calephelis rawsoni arizonensis*	SOC	0	0	G4T3T4	S2S?	AZ, NM	FS, State, Private	Degradation of riparian habitats, water withdrawal or development, drought, impacts to host plant.	Very limited range. Probably less than 20 meta populations.	Larval host plant is Bidens sp. A riparian plant. Found in canyons with permanent or semi permanent water, riparian areas. Speyeria Nokomis might be a useful indicator of potential habitat.	Protect riparian habitats, especially areas where host plant is found.
NETWING MIDGE	*Agathon arizonicus*	0	0	0	G1	S?	AZ	FS	events that effect water flow or water quality	disjunct population	Larvae require swift or torrential water velocities.	Protect water quantity and quality.
MAMMALS												
ARIZONA SHREW	*Sorex arizonae*	SOC	E	WSCA	G3N2N3	S2S3, S1	AZ, NM	FS, DOD, Private	Requires considerable log & dense vegetation cover; generally found near springs/water sources.	NM Game and Fish Endangered. AZ Game And Fish Department Wildlife of Species Concern. Population acutely restricted and declining; experiencing riparian habitat degradation; grazing & recreation altering necessary dense cover.	Generally found near springs/water sources. Requires logs and dense vegetation.	
CINEREUS (MASKED) SHREW	*Sorex cinereus cinereus*	SOC	0	0	GN5	S2	NM	FS	Highly restricted distribution in Southwest	Highly associated with wet meadow/marsh habitats experiencing negative impacts; high forest zone species subject to habitat loss via global warming & other human-mediated causes; potential for competitive replacement by other shrew species, data deficient		
MERRIAM'S SHREW	*Sorex merriami leucogenys*	SOC	0	0	G5	S3, S2	AZ, NM	FS, NPS, State	Resident of montane coniferous forests; primarily an arid-adapted shrew	Restricted distribution; subject to habitat loss via global warming & other human-mediated causes		

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DWARF SHREW	*Sorex nanus*	SOC	0	0	G4	S1S2, S2	AZ, NM	FS, State	Highly restricted, relict distribution in Southwest	Extremely restricted, relict distribution; alpine/subalpine zone species subject to habitat loss via global warming & other human-mediated causes; reproductively isolated		
NEW MEXICO SHREW	*Sorex neomexicanus*	SOC	0	0	G2N2N3	S2	NM	FS	Endemic, highly restricted, relict distribution	Associated with mesic forest & meadow habitats; high forest zone species subject to habitat loss via global warming; data deficient		
WATER SHREW	*Sorex palustris*	SOC	0	WSCA	G5	S1,S3	AZ, NM	FS	Southwest populations isolated on sky islands; limited to riparian/marshy areas	AZ Game and Fish Wildlife of Special Concern; extremely restricted, relict distribution; riparian habitats degraded; high forest zone species subject to habitat loss via global warming & other human-mediated causes; mesic forest & meadow habitats.	Limited to riparian/marshy areas.	
PREBLE'S SHREW	*Sorex preblei*	SOC	0	0	G4	S1	NM	FS	Limited to open, pre-settlement Ponderosa pine forest, with Gambel oak, grass & forbs. Associated with drier habitats.	Extremely restricted distribution; data deficient	Habitat is open, pre settlement Ponderosa pine forests, with Gambel oak, grass and forbs. Associated with drier habitats.	
LEAST SHREW	*Cryptotis parva*	SOC	T	0	GN5	S1	NM	FS, FWS	Limited to 3 small, highly isolated relict populations; require healthy grass component	Highly restricted, disjunct, distribution in large wetland areas; habitat easily degraded & subject to negative impacts; indicator of healthy mesic, grassy areas		
COCKRUM'S DESERT SHREW	*Notiosorex cockrumi*	0	0	0	UNK	UNK	AZ	FS	Limited distribution	Rare endemic of southeastern AZ madrean		
MEXICAN LONG-TONGUED BAT	*Choeronycteris mexicana*	SOC	0	WSCA	G4N2	S2, S1	AZ, NM	FS, BLM, State	Habitat & roost loss/degradation; food resource loss; highly vulnerable to human disturbance	AZ Game and Fish Wildlife of Special Concern; reduced abundance; loss of roosting habitat via abandoned mine closures & cave recreation; loss of agave & columnar cacti food resources through collecting & harvest	Areas with agave and columnar cacti food resources and available roost sites (mines/caves)	
CALIFORNIA LEAF-NOSED BAT	*Macrotus californicus*	SOC	0	WSCA	G4N3N4	S3S4	AZ	FS, FWS, BLM, state	Roosting habitat very limited & subject to loss; foraging habitat loss & degradation; human disturbance of roosts	AZ Game and Fish Department Wildlife of Special Concern; predicted population reduction of at least 20% in next 10 years due to human disturbance and limited roost habitat; habitat destruction via mine closures & renewed mining; documented loss of foraging habitat due to urbanization, mining renewal, and agriculture.		
SOUTHWESTERN MYOTIS	*Myotis auriculus apache*	SOC	0	0	G5	S3, S4	AZ, NM	FS, FWS, BLM, State	High risk of negative impacts, disturbance, and vandalism to roost sites; loss of snag roosts via fire and fuels treatments.	Loss of roosting habitat via abandoned mine closures, cave recreation and snag destruction		
WESTERN SMALL FOOTED MYOTIS	*Myotis ciliolabrum melanorhinus*	SOC	0	0	GN5	S3, S5	AZ, NM	FS, FWS, BLM, DOD, NPS, State	High risk of negative impacts, disturbance, and vandalism to roost sites.	Loss of roosting habitat via abandoned mine closures & cave recreation		
LONG-EARED MYOTIS	*Myotis evotis evotis*	SOC	0	0	GN5	S3S4, S4	AZ, NM	FS, FWS, BLM, DOD, NPS, State	High risk of negative impacts, disturbance, and vandalism to roost sites; loss of snag roosts via fire and fuels treatments.	Loss of roosting habitat via abandoned mine closures, cave recreation and snag destruction		
OCCULT MYOTIS	*Myotis (lucifugus) occultus*	SOC	0	0	G5T3T4	S3, S3	AZ, NM	FS, FWS, State	High risk of negative impacts, disturbance, and vandalism to roost sites; loss of snag roosts via fire and fuels treatments	Loss of roosting habitat via abandoned mine closures, cave recreation and/or forestry management practices which impact snag or tree roosts		
FRINGE-TAILED BAT	*Myotis thysanodes thysanodes*	SOC	0	0	G4G5N4	S3S4, S5	AZ, NM	FS, FWS, BLM, DOD, NPS, State	High risk of negative impacts, disturbance, and vandalism to roost sites; loss of snag roosts via fire and fuels treatments	Loss of roosting habitat via abandoned mine closures, cave recreation and/or forestry management practices which impact snag or tree roosts		

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CAVE MYOTIS	*Myotis velifer*	SOC	0	0	G5N4	S4, S4	AZ, NM	FS, FWS, BLM, DOD, NPS, State	High risk of negative impacts, disturbance, and vandalism to large, colonial roost sites	Loss of roosting habitat via abandoned mine closures and/or cave recreation; large (thousands) maternity colonies especially vulnerable to disturbance and vandalism; loss of foraging habitat in riparian areas and via development		
LONG-LEGGED MYOTIS	*Myotis volans interior*	SOC	0	0	GN5	S3S4, S5	AZ, NM	FS, FWS, BLM, DOD, NPS, State	High risk of negative impacts, disturbance, and vandalism to roost sites; loss of snag roosts via fire and fuels treatments.	Loss of roosting habitat via abandoned mine closures, cave recreation and/or forestry management practices which impact snag or tree roosts		
YUMA MYOTIS	*Myotis yumanensis yumanensis*	SOC	0	0	GN5	S3S4, S5	AZ, NM	FS, FWS, BLM, DOD, NPS, State	High risk of negative impacts, disturbance, and vandalism to roost sites; riparian loss and degradation	Loss of roosting habitat, loss and degradation of riparian habitats across Southwest		
WESTERN YELLOW BAT	*Lasiurus xanthinus*	SOC	T	WSCA	G5N2	S1, S1	AZ, NM	FS, BLM, State	Palm tree roosts vulnerable to disturbance and destruction; limited distribution	Human disturbance & destruction of palm tree roosts; loss & degradation of riparian & deciduous woodlands across Southwest; data deficient		
WESTERN RED BAT	*Lasiurus blossevillii*	SOC	0	WSCA	G5N4	S2, S2	AZ, NM	FS, FWS, BLM, DOD, NPS, State	Deciduous riparian habitat loss/degradation; roosting & foraging habitat reduced due to agricultural conversion; pesticides; winter roosts impacted by prescribed fire	Loss & degradation of riparian & other broad-leaf deciduous forests & woodlands across Southwest; indicator of healthy southwestern riparian woodlands	Southwestern riparian woodlands	
EASTERN RED BAT	*Lasiurus borealis*	SOC	0	0	G5	UNK	NM	FS, FWS, BLM, DOD, NPS, State	Species reaches western edge of distribution in NM; No heritage status given for NM, however S4 in TX, and S2 in CO.	Data deficient; separation of L. borealis & L. blossevillii difficult therefore status and trend is unknown.		
SPOTTED BAT	*Euderma maculatum*	SOC	T	WSCA	G4N3N4	S2, S3S4	AZ, NM	FS, FWS, BLM, DOD, NPS, State	Populations considered vulnerable; threats include recreational climbing, pesticides, grazing & pest control operations	Urban & suburban expansion; activities that disturb cliff roosting habitat; encroachment of high elevation meadows		
ALLEN'S LAPPET-BROWED BAT	*Idionycteris phyllotis*	SOC	0	0	G3G4N3	S2,S2	AZ, NM	FS, FWS	Vulnerable to habitat loss via vandalism, closure of abandoned mines, and forest management practices impacting tree and snag roosts; data deficient	Habitat destruction and/or modification by partial blocking or improper gating; mine closures for hazard abatement and renewal of mining activity at previously abandoned mine sites. Human disturbance of existing roosts can cause abandonment of roost and/or negatively affect reproductive success. Use of tree roosts is common, therefore susceptible to thinning, fire, and fuels management practices.		
PALE TOWNSEND'S BIG-EARED BAT	*Corynorhinus townsendii pallescens*	SOC	0	0	GTN4	S3	NM	FS, FWS, BLM, DOD, NPS, State	High risk of disturbance/destruction of roost sites via recreational caving, vandalism, mine reclamation, renewed mining, etc.. Inadequate surveys of abandoned mines prior to closure.	Documented losses and/or reductions in maternity colonies. Human disturbance has caused roost abandonment and/or negatively affected reproductive success. Habitat destruction and/or modification by partial blocking or improper gating of cave/mine roosts.		
POCKETED FREE-TAILED BAT	*Nyctinomops femorosaccus*	SOC	0	0	G4	S2S3, S1	AZ, NM	FS, NPS	Distribution is limited; require large surfaces of open water for drinking	Considered rare; data deficient		
BIG FREE-TAILED BAT	*Nyctinomops macrotis*	SOC	0	0	G5N3N4	S2S3, S2	AZ, NM	FS, FWS, BLM, DOD, NPS, State	Impacts to foraging areas from grazing, riparian management, and pesticides; require large surfaces of open water for drinking	Loss and/or degradation of riparian forests and woodlands across the Southwest; restricted to habitats with large, unobstructed bodies of water.		

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MEXICAN FREE-TAILED BAT	*Tadarida brasiliensis mexicana*	SOC	0	0	G5	S3S4, S2	AZ, NM	FS, FWS, BLM, DOD, NPS, State	Sensitive to pesticides, and vulnerable to destruction of large (millions +) roosts	Habitat destruction and/or modification by improper gating; mine closures for hazard abatement and renewal of mining activity at previously abandoned mine sites; roost disturbance can cause abandonment of roost and/or negatively affect reproductive success; roost disturbance via cave recreation; large, colonial roosts (thousands - millions of bats) vulnerable to destruction		
GREATER WESTERN MASTIFF BAT	*Eumops perotis californicus*	SOC	0	0	G4T4N3	S1S2	AZ, NM	FS, FWS, BLM, State	Highly disjunct populations (U.S., South America, Cuba); limited by suitable roost and water site availability. High risk due to disturbance, vandalism & impacts on roosts; threats include recreational climbing, pesticides, grazing, and pest control operations.	Decreasing numbers and distribution; certain historical roost sites no longer occupied due to habitat loss and/or degradation. Severely limited by availability of drinking water, therefore, not longer found in historic sites and populations are in declined. Threatened by urban/suburban expansion and by activities that destroy or disturb cliff habitat. Populations eradicated due to pest control operations.		
UNDERWOOD'S BONNETED BAT	*Eumops underwoodi*	0	0	0	G4	S1	AZ	FWS, BLM, , State	Distribution is limited, range restricted; limited by available drinking water sites	Distribution appears to be shrinking although data deficient; loss of natural springs and water sites		
PIKA	*Ochotona princeps*	SOC	0	0	GN5	S2	NM	FS	Narrowly restricted habitat, confined to talus slopes and boulder fields in alpine and sub-alpine habitats.	Restricted, relict distribution; high forest zone indicator species subject to habitat loss due to global warming		
GOAT PEAK PIKA	*Ochotona princeps nigrescens*	SOC	0	0	G5TN1	S1?	NM	FS	Narrowly restricted habitat, disjunct populations, confined to talus slopes and boulder fields in alpine and sub-alpine habitats.	Endemic subspecies; restricted, relict distribution, high forest zone species subject to habitat loss due to global warming		
SNOWSHOE HARE	*Lepus americanus*	SOC	0	0	G5	S3	NM	FS	Highly restricted habitat requirements; very sensitive to certain forest management practices.	Forest management activities (fire, logging, road construction) that reduce dense, closed canopy spruce fire forest may negatively impact hares as may global warming. Potential for competitive replacement by mountain cottontail.	Requires high elevation, closed canopy, spruce fir forests with high horizontal foliage cover.	
WHITE-SIDED JACK RABBIT	*Lepus callotis gaillardi*	SOC	T	0	G3	S1	NM	State, FS	Highly restricted distribution, habitat loss and degradation, documented population declines in U.S. and Mexico.	Declining in many areas due to loss and degradation of open grassland habitat resulting from overgrazing, agricultural expansion, shrub invasion. Generally rare, even within range; prospects for population persistence are poor. Data deficient.		
WHITE-TAILED JACK RABBIT	*Lepus townsendii campanius*	SOC	0	0	GN5	SP, S2	AZ, NM	FS, State	Limited distribution, restricted range; habitat degradation and elimination; competition with black-tailed jack rabbit.	Highly restricted distribution; apparent declines in distribution and abundance; potential for habitat changes that result in negative competitive interactions with black-tailed jackrabbit		
NUTTALL'S (MOUNTAIN) COTTONTAIL	*Sylvilagus nuttallii pinetis*	SOC	0	0	G5TN5	S?, S4	AZ, NM	FS, NPS, State	Restricted to sub-alpine coniferous forests; limiting factor is food availability related to drought and cover	Highly restricted distribution; high forest zone species subject to habitat loss due to global warming; potential for habitat changes that promote competitive replacement by other lower elevation cottontails		
GRAY-FOOTED CHIPMUNK	*Neotamias canipes canipes*	SOC	0	0	GN3	S3	NM	FS, DOD, NPS, State	Limited distribution, restricted range; data deficient.	Endemic; highly restricted distribution; documented loss of populations; high forest zone species subject to habitat loss due to global warming.	High forest zone species.	

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GRAY-FOOTED CHIPMUNK	*Neotamias canipes sacramentoensis*	SOC	0	0	UNK	UNK	NM	FS	Limited distribution, restricted range; data deficient	Highly restricted distribution; high forest zone species subject to habitat loss due to global warming	High forest zone species.	
WHITE MOUNTAINS LEAST CHIPMUNK	*Neotamias minimus arizonensis*	0	0	0	G5T2NR	SNR	AZ	FS	Highly restricted distribution; (Sullivan & Peterson (1988) revised sup specific taxonomy)	Highly restricted distribution; high forest zone species subject to habitat loss due to global warming; potential for habitat changes that promote competitive replacement by other lower elevation chipmunks	High forest zone species.	
PEÑASCO LEAST CHIPMUNK	*Neotamias minimus atristriatus*	SOC	E	0	G5T1NX	S1	NM	FS	Endemic to NM; extremely limited distributed, restricted range; habitat loss/degradation or fragmentation	Highly restricted distribution; high forest zone species subject to habitat loss due to global warming; potential for habitat changes that promote competitive replacement by other lower elevation chipmunks; Populations declined markedly		
CHUSKEAN LEAST CHIPMUNK	*Neotamias minimus chuskaensis*	SOC	0	0	G5T1NX	S4, S4	AZ, NM	FS	Highly restricted distribution	Highly restricted distribution; high forest zone species subject to habitat loss due to global warming; potential for habitat changes that promote competitive replacement by other lower elevation chipmunks		
KAIBAB LEAST CHIPMUNK	*Neotamias minimus consobrinus*	0	0	0	G5T?	NR	AZ	FS	Highly restricted distribution	Highly restricted distribution; high forest zone species subject to habitat loss due to global warming; potential for habitat changes that promote competitive replacement by other lower elevation chipmunks		
ORGAN MOUNTAINS CHIPMUNK	*Neotamias quadrivittatus australis*	SOC	T	0	G5TN1	S1	NM	FS	Endemic to NM; extremely limited distributed, restricted range; habitat loss/degraded or fragmented	Highly restricted distribution; high forest zone species vulnerable to habitat loss due to global warming; potential for habitat changes that promote competitive replacement by other lower elevation chipmunks		
OSCURA MOUNTAINS CHIPMUNK	*Neotamias quadrivittatus oscuraensis*	SOC	0	0	G5T1N?	S1	NM	DOD	Endemic to NM; extremely limited distributed, restricted range; habitat loss/degraded or fragmented	Highly restricted distribution; high forest zone species vulnerable to habitat loss due to global warming; potential for habitat changes that promote competitive replacement by other lower elevation chipmunks		
YELLOW-BELLIED MARMOT	*Marmota flaviventris*	SOC	0	0	GN5	S3	NM	FS, State	Limited distribution, restricted range; at high risk ad easily impacted by disturbance and vandalism; subject to unlimited pest control and overgrazing.	Limited distribution, restricted range; high risk, easily impacted, disturbed, vandalized; high forest zone species subject to habitat loss due to global warming; data deficient		
HARRIS' ANTELOPE SQUIRREL	*Ammospermophilus harrisii*	SOC	0	0	G5	S5, S2	AZ, NM	FS, State	Lower Sonoran desert species, barely entering NM	Indicator of Sonoran regional desert and associated thornscrub		
PROSPECT VALLEY WHITE-TAIL ANTELOPE SQUIRREL	*Ammospermophilus leucurus tersus*	0	0	0	G5TN1Q	S1	AZ	NPS	Limited distribution and restricted range; habitat loss to grazing and urbanization	Restricted distribution; apparent declines in distribution and abundance; potential for habitat changes that result in negative competitive interactions with other ground squirrels		
MEXICAN GROUND SQUIRREL	*Spermophilus mexicanus parvidens*	SOC	0	0	G5	S2	NM	NPS, State	Limited distribution and restricted range; habitat loss to grazing and urbanization	Indicator of arid grasslands		
WHITE MOUNTAINS GROUND SQUIRREL	*Spermophilus tridecemlineatus monticola*	SOC	0	0	G5TN3	S3, UNK	AZ, NM	FS, FWS	Greatly reduced habitat, loss & degradation	Restricted, relict isolated distribution; pattern requires grassland which has declined due to agriculture, development, and shrub invasion; Sacramento Mountain population may be extinct		
TULAROSA ROCK SQUIRREL	*Spermophilus variegatus tularosae*	SOC	0	0	G5TN1TN3	S5	NM	State	Endemic, limited distribution and restricted range	Associated with malpais habitats		

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BLACK-TAILED PRAIRIE DOG	*Cynomys ludovicianus ludovicianus*	SOC	0	WSCA	G3	SX, S2?	AZ, NM	FS, FWS, NPS, BLM, DOD,	Vulnerable to poisoning, shooting, agriculture, urbanization, habitat fragmentation, disease; Populations disjunct	Keystone species; extreme reduction in distribution and abundance; subject to agricultural control and plague		
ARIZONA BLACK-TAILED PRAIRIE DOG	*Cynomys ludovicianus arizonensis*	SOC	0	WSCA	G3	S?	NM	FS, DOD, NPS	Vulnerable to poisoning, shooting, agriculture, urbanization, habitat fragmentation, disease; populations disjunct.	Keystone species; extreme reduction in distribution and abundance; subject to agricultural control and plague; extirpated throughout historic range.		
GUNNISON'S PRAIRIE DOG	*Cynomys gunnisoni*	SOC	0	0	GN5	S5, S2	AZ, NM	FS, , FWS, State	Oil and gas development; vulnerable to poisoning, shooting, agricultural practices, urbanization, habitat fragmentation and destruction, and disease; competitors for food with domestic livestock.	Keystone species, extreme reduction in distribution and abundance; subject to agricultural control and plague; poisoned to point of extirpation		
ARIZONA GRAY SQUIRREL	*Sciurus arizonensis arizonensis*	SOC	0	0	GN4	S4, S2	AZ, NM	FS	Restricted distribution, riparian habitat loss/degradation	Endemic to Southwest, recognized and charismatic, data deficient		
ABERT'S CHUSKA SQUIRREL	*Sciurus aberti chuscensis*	SOC	0	0	G5T3	SNA, S3	AZ, NM	FS, DOD, State, NPS		Recognized and charismatic, data deficient		
KAIBAB SQUIRREL	*Sciurus aberti kaibabensis*	0	0	0	G3	S3	AZ	FS, NPS, BLM, State		Recognized and charismatic, data deficient		
CHIRICAHUA FOX SQUIRREL	*Sciurus nayaritensis chiracahuae*	0	0	0	G5TN1TN2	S1S2	AZ	FS	Subject to unlimited pest control, overgrazing	Uncommon with restricted distribution; high forest zone species subject to habitat loss due to global warming		
RUIDOSO RED SQUIRREL	*Tamiasciurus hudsonicus lychnuchus*	SOC	0	0	G5	S5	NM	FS	Endemic with limited distribution and restricted range; data deficient	Endemic, limited to high elevation spruce fir forests; high forest zone species subject to habitat loss due to global warming.		
BOTTA'S POCKET GOPHER	*Thomomys bottae actuosus*	SOC	0	0	G5	S5	NM	FS	Endemic, highly limited distribution, restricted range in transition zone	Uncommon with restricted distribution; high forest zone species subject to habitat loss due to global warming		
BOTTA'S POCKET GOPHER	*Thomomys bottae aureus*	SOC	0	0	G5	S5	NM	FS, BLM, State	Endemic; limited distribution and restricted range.	Other T. bottae subspecies' ranges are embedded within the range of this subspecies, therefore taxonomy is difficult to distinguish; data deficient.		
BOTTA'S POCKET GOPHER	*Thomomys bottae collis*	SOC	0	0	G5	S5	NM	BLM, State	Restricted distribution	Limited range		
BOTTA'S POCKET GOPHER	*Thomomys bottae connectens*	SOC	0	0	G5	S5	NM	FS, BLM, State	Limited distribution; loss of habitat due to urbanization	Documented loss of populations throughout range due to human development		
BOTTA'S POCKET GOPHER	*Thomomys bottae cultellus*	SOC	0	0	G5	S5	NM	FS	Limited distribution, restricted range	Limited to montane coniferous forests; data deficient		
GRAHAM MOUNTAINS POCKET GOPHER	*Thomomys bottae grahamensis*	SOC	0	0	G5T3Q	S3	AZ	FS	Restricted distribution, riparian habitat loss/degradation	Extremely limited distribution & restricted range		
GUADALUPE POCKET GOPHER	*Thomomys bottae guadalupensis*	SOC	0	0	G5TN2	S1	NM	FS, NPS, State	Limited distribution, restricted range	Restricted to montane forests, subject to habitat loss due to drought and global warming		
MEARN'S SOUTHERN POCKET GOPHER	*Thomomys bottae mearnsi*	SOC	0	0	G1TN5	SP, S2	AZ, NM	State	Restricted distribution, reduced distribution & abundance	Extremely restricted distribution		
BOTTA'S POCKET GOPHER	*Thomomys bottae morulus*	SOC	0	0	G5	S5	NM	FS,	Extremely limited range; embedded within range of another Thomomys sp., little habitable soil within range	Endemic, extremely restricted distribution, only found in one small area of Cibola Co.		
BOTTA'S POCKET GOPHER	*Thomomys bottae opulentus*	SOC	0	0	G5	S5	NM	BLM, State	Endemic, limited distribution and restricted range	Endemic, extremely restricted distribution, only found in narrow strip near Rio Grande; displaced by human development (urbanization and agriculture)		

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CEBOLLETA SOUTHERN POCKET GOPHER	*Thomomys bottae paguatae*	SOC	0	0	G5TN2	S2	NM	FS, BLM, State	Extremely limited range; embedded within range of another Thomomys sp., little habitable soil within range	Endemic, extremely restricted distribution, only found in one small area of Cibola Co.		
BOTTA'S POCKET GOPHER	*Thomomys bottae pectoralis*	SOC	0	0	G5	S5	NM	NPS	Restricted distribution & limited habitat	Extremely restricted distribution, endemic		
BOTTA'S POCKET GOPHER	*Thomomys bottae planorum*	SOC	0	0	G5	S5	NM	FS	Extremely limited range; embedded within range of another Thomomys sp., little habitable soil within range	Restricted to montane coniferous and subalpine coniferous forests, subject to habitat loss due to drought and global warming		
BOTTA'S POCKET GOPHER	*Thomomys bottae ruidosae*	SOC	0	0	G5	S5	NM	FS	Endemic, limited distribution and restricted range.	Endemic to small area in south-central NM		
HARQUAHALA POCKET GOPHER	*Thomomys bottae subsimilis*	0	0	0	G5TH	SH	AZ	BLM, State	Endemic, limited distribution and restricted range.	Endemic to Harquahala Mtns., possibly extirpated		
BOTTA'S POCKET GOPHER	*Thomomys bottae tularosae*	SOC	0	0	G5	UNK	NM	BLM, State	Endemic, highly restricted distribution and relict population	Endemic to small area in south-central NM		
KAIBAB NORTHERN POCKET GOPHER	*Thomomys talpoides kaibabensis*	0	0	0	UNK	UNK	AZ	FS	Highly restricted distribution, high forest zone subspecies subject to habitat loss and competitive displacement by other gopher species.	Extremely limited and relict populations, high forest zone species subject to habitat loss due to drought and global warming.		
MT. TAYLOR NORTHERN POCKET GOPHER	*Thomomys talpoides taylori*	SOC	0	0	UNK	UNK	NM	FS	Highly restricted distribution, high forest zone subspecies subject to habitat loss and competitive displacement by other gopher species.	Extremely limited relict populations, high forest zone species subject to habitat loss due to drought and global warming.		
SOUTHERN POCKET GOPHER	*Thomomys umbrinus emotus*	SOC	T	0	G5T?N1	S1	AZ, NM	FS	Endemic, highly restricted distribution and relict population	Extremely restricted distribution, subject to habitat destruction and alteration, and rodent control		
HUACHUCA MOUNTAINS POCKET GOPHER	*Thomomys umbrinus intermedius*	0	0	0	G5TN3	S3	AZ	FS, DOD	Endemic, highly restricted distribution and relict population	Extremely restricted distribution, found only in Huachuca Mtns., on rocky slopes >9,000 ft, subject to habitat loss due to drought and global warming.		
SOUTHERN POCKET GOPHER	*Thomomys umbrinus quercinus*	0	T	0	G5TN3	S2	AZ	FS	Endemic, highly restricted distribution and relict population	Extremely restricted distribution, found only in Atascosa-Pajarito Mtns., subject to habitat loss due to drought and global warming		
DESERT POCKET GOPHER	*Geomys arenarius arenarius*	SOC	0	0	GN3	S3	NM	FWS	Restricted distribution, reduced distribution & abundance	Extremely restricted distribution, subject to habitat destruction and alteration, and rodent control		
WHITE SANDS POCKET GOPHER	*Geomys arenarius brevirostris*	SOC	0	0	GTN3	UNK	NM	DOD, FWS, NPS	Endemic, limited distribution and restricted range	Extremely restricted distribution, subject to habitat destruction and alteration, and rodent control		
YELLOW-FACED POCKET GOPHER	*Cratogeomys castanops*	SOC	0	0	GN5	S2	NM	FS, DOD, FWS, NPS	Needs well-developed grasslands; habitat lost to urbanization and agriculture; displaced by competitors due to increased disturbance of native habitats	Highly restricted distribution, probable extirpation of at least one population on western edge; associated with well-developed grassland but can be competitively displaced by other gopher species with habitat change (from grass to forbs)		
YAVAPAI ARIZONA POCKET MOUSE	*Perognathus amplus amplus*	0	0	0	G3T3	S3	AZ	BLM, State	Geographically isolated, restricted distribution; habitat loss	Loss and degradation of habitat		
WUPATKI ARIZONA POCKET MOUSE	*Perognathus amplus cineris*	0	0	0	G5T2Q	S2	AZ	BLM, State	Limited distribution, restricted range; sensitive to degradation of desert scrub habitat.	Restricted distribution, loss of habitat, sensitive to habitat loss, fragmentation, degradation.		
SPRINGERVILLE SILKY POCKET MOUSE	*Perognathus flavus goodpasteri*	0	0	0	G5TN3	S3	AZ	FS, BLM, State	Extremely rare; restricted distribution	Restricted distribution, loss of habitat, sensitive to grazing		
PLAINS POCKET MOUSE	*Perognathus flavescens gypsi*	SOC	0	0	GN5	UNK	NM	DOD, NPS	Endemic, limited distribution and restricted range; associated with gypsum sands of White Sands	Distribution very limited to small area in Otero Co.		

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APACHE POCKET MOUSE	*Perognathus flavescens (=apache) melanotis*	0	0	0	G5T1NH	SH	AZ	BLM, State	Endemic, restricted, relict distribution, agricultural activities	Possibly extirpated from Region; highly restricted distribution; experienced habitat loss and alterations		
ROCK POCKET MOUSE	*Chaetodipus intermedius ater*	SOC	0	0	GN5	UNK	NM	BLM, State	Endemic, highly limited distribution, restricted range	Found only in malpais habitats of NM		
ROCK POCKET MOUSE	*Chaetodipus intermedius rupestris*	SOC	0	0	GN5	UNK	NM	BLM, State	Endemic, highly limited distribution, restricted range; isolated to some lava flows	Restricted to certain malpais habitats of NM		
NELSON'S POCKET MOUSE	*Chaetodipus nelsoni canescens*	SOC	0	0	GN5	SR	NM	NPS	Highly limited distribution and restricted range (only known from vicinity of Carlsbad Caverns)	Habitat loss and modification; status and threats poorly known		
BANNER-TAILED KANGAROO RAT	*Dipodomys spectabilis clarenci (baileyi)*	SOC	0	WSCA	GTN4	S1?, S4	AZ, NM	FS, DOD, FWS, NPS, State	Possibly extirpated in AZ; distribution & abundance highly reduced in NM	Experienced significant habitat loss, degradation and fragmentation; prefers well-developed grasslands which are disappearing; associated with prairie dog towns, also disappearing		
CHISEL-TOOTHED KANGAROO RAT	*Dipodomys microps*	0	0	0	G5T2Q	S2	AZ	BLM, State	Requires good shrub cover	Needs well-developed shrub cover; habitat lost to urbanization and agriculture		
HOUSEROCK VALLEY CHISEL-TOOTHED K. RAT	*Dipodomys microps leucotis*	SOC	0	WSCA	G5T2Q	S2	AZ	BLM, FS, State	Extremely limited distribution; low general abundance; habitat lost to agriculture and ranching; requires well developed shrub cover or can be replaced by competitors.	Relative abundance is low and patchy species is absent from parts of former range, most likely due to intense past and present grazing practices.		
FULVOUS HARVEST MOUSE	*Reithrodontomys fulvescens*	SOC	0	0	GN5	S4, S1	AZ, NM	FS, State	Highly sensitive to degradation of riparian grassland habitat; Limited distribution	Restricted, relict, isolated distribution; declining abundance, habitat degradation & loss		
PLAINS HARVEST MOUSE	*Reithrodontomys montanus*	SOC	0	0	GN5	S2, S4	AZ, NM	FS, DOD, FWS, BLM, State	Highly sensitive to degradation of riparian grassland habitat; limited distribution.	Restricted, relict, isolated distribution ; habitat degradation and loss.		
MESQUITE MOUSE	*Peromyscus merriami*	0	0	0	G5N2	S2	AZ	FS, BLM, State	Requires heavy mesquite bosque thickets with dense herbaceous growth	Habitat limited and subjected to degradation, especially via fuel cutting, grazing, and recreation. Restricted distribution.		
WHITE-ANKLED MOUSE	*Peromyscus pectoralis laceianus*	SOC	0	0	GN5	S1	NM	FS, NPS	Endemic, highly restricted distribution	Distribution very limited (small area in Eddy Co. only)		
NORTHERN PYGMY MOUSE	*Baiomys taylori ater*	SOC	0	0	G4G5N4	S2S3, S2	AZ, NM	FS, BLM, State	Highly restricted distribution, require well-developed grassland, especially in riparian lowlands	Requires well-developed warm grassland habitat; sensitive to degradation (e.g. grazing, shrub encroachment) of grassland habitat. Restricted, localized distribution.		
CAMP VERDE ARIZONA COTTON RAT	*Sigmodon arizonae arizonae*	SOC	0	WSCA	G5TNH	S1SH	AZ	BLM, State	Endemic; highly restricted distribution; isolated and sensitive to degradation of riparian and grassland habitat	Riparian habitat loss and degradation		
YAVAPAI COTTON RAT	*Sigmodon arizonae jacksoni*	0	0	0	G5TNH	SH	AZ	BLM, State	Endemic; highly restricted distribution; isolated and sensitive to degradation of riparian and grassland habitat	Riparian habitat loss and degradation; Possibly extirpated		
COLORADO RIVER COTTON RAT	*Sigmodon arizonae plenus*	0	0	0	G5T2T3	S2S3	AZ	UNK	limited information about species	pesticides; limited data		
YUMA HISPID COTTON RAT	*Sigmodon hispidus eremicus*	0	0	0	G5T2T3	S2S3	AZ	BLM, State	Uncommon; restricted range.	Uncommon; restricted range		
YELLOW-NOSED COTTON RAT	*Sigmodon ochrognathus*	SOC	0	0	G4G5N3N4	S3S4, S2	AZ, NM	FS	Restricted distribution; sensitive to grazing and riparian degradation	Experienced significant reductions in distribution and abundance		
SOUTHERN PLAINS WOODRAT	*Neotoma micropus canescens*	SOC	0	0	G5T1T2Q	SU	NM	FS	Associated with relatively mesic, low elevation habitats, especially grasslands	Historical declines in distribution and abundance. Experiencing declines due to loss of mesic grassland habitat with reduction in water table.		

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MEXICAN WOOD RAT	*Neotoma mexicana atrata*	SOC	0	0	G5	S5, S5	AZ, NM	FS, DOD, NPS, Private, state	Endemic, limited distribution, restricted range; isolated to malpais habitats	Restricted to certain malpais habitats of NM		
WHITE-THROATED WOOD RAT	*Neotoma albigula melas*	SOC	0	0	G5	UNK	NM	UNK	Endemic, limited distribution, restricted range; isolated to malpais habitats	Restricted to certain malpais habitats of NM		
SOUTHERN RED-BACKED VOLE	*Clethrionomys gapperi*	SOC	0	0	GN5	S3S4, S3	AZ, NM	FS	Good indicator of cool, mesic sites with high elevation old growth, spruce fir forests; require abundance of surface litter including stumps and logs.	Requires mesic areas with abundance surface litter; unable to colonize pioneer plant communities such as recent burns; high forest zone subspecies subject to habitat loss due to global warming and other human mediated causes; potential for competitive replacement by other vole species.		
WESTERN HEATHER VOLE	*Phenacomys intermedius intermedius*	SOC	0	0	GN5	S3	NM	FS	Relict distribution pattern; declines in abundance and distribution	Extremely rare; restricted distribution; may require mesic, dense, herbaceous vegetation; high forest zone subspecies subject to habitat loss due to global warming and other human mediated causes; potential for competitive replacement by other species of voles		
ARIZONA MONTANE VOLE	*Microtus montanus arizonensis*	0	E	0	G3	S3S4, S1	AZ, NM	FS	Associated with dense, tall, mesic grass. Very restricted distribution in NM, therefore vulnerable to habitat alteration such as grazing.	Endemic subspecies with highly restricted distribution; requires wet herbaceous growth (i.e., wet meadows, marshes); habitat subject to negative impacts; high forest zone subspecies subject to habitat loss due to global warming and other human mediated causes; potential for competitive replacement by other vole species		
PRAIRIE VOLE	*Microtus ochrogaster haydenii*	SOC	0	0	GN5	S1	NM	State	Destruction of grasslands for agricultural, restricted distribution; riparian habitat degradation	Restricted distribution; associated with mesic plains grasslands with ample density and cover; habitat subject to degradation through grazing and agriculture		
HUALAPAI MOGOLLON VOLE	*Microtus mogollonensis hualpaiensis*	SOC	0	WSCA	G4G5TN1Q	S1	AZ	FS	Loss or degradation of habitat.	AGFD species of special concern.		
NAVAJO MOGOLLON VOLE	*Microtus mogollonensis navaho*	SOC	0	WSCA	G4TN2Q	S1	AZ	FS	Relic distribution pattern; declines in abundance and distribution due to loss of ground cover.	Documented population declines; declines in abundance and distribution due to loss of grassland habitats; requires relatively well developed grassland/meadow habitat; dewatering of springs and grazing have negatively impacted species.		
LONG-TAILED VOLE	*ocrptis ;pmgocaidis*	0	0	0	GN5	S4, S4	AZ, NM	FS	Dependent on mesic habitat with ample vegetative cover in mixed conifer forest zone; good indicator of permanent water in montane forests. Favors areas with grassy understory. Improper livestock grazing negatively impacts species.	This species is impacted by degraded riparian areas from improper livestock grazing. Relict populations with limited area and/or relatively poorly developed habitat are subject to loss due to climate change and other human mediated causes. Also potential for replacement by other competitive species of voles Although this species is ranked globally and within the state as secure, it has been included based on recent research conclusions.		

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WHITE-BELLIED LONG-TAILED VOLE	*Microtus longicaudus leucophaeus*	0	0	0	GN5	S4,S4	AZ, NM	FS	Dependent on mesic habitat (wet meadows, marshes, willow riparian) with ample vegetative cover in mixed conifer forest zone; good indicator of permanent water in montane forests. Favors areas with grassy understory. Grazing negatively impacts species.	Documented declines in NM. Many relic populations with limited area and/or poorly developed habitat; Habitat subject to negative impacts, i.e., degraded riparian areas from overgrazing; High forest zone species subject to habitat loss due to global warming; potential for competitive replacement by other vole species.		
PECOS RIVER MUSKRAT	*Ondatra zibethicus ripensis*	SOC	0	0	G5TN3TN4	UNK	NM	FS, FWS, NPS	needs waterway with constant stable source of water	Distribution and abundance greatly reduced; requires perennial, slow-moving water with herbaceous vegetation; elimination and control of beaver negatively impacts species; subject to habitat degradation		
MEADOW JUMPING MOUSE	*Zapus hudsonius luteus*	SOC	T	WSCA	G5TN2	S2	AZ, NM	FS	highly restricted distribution, restricted range, loss of riparian habitat	Decreasing numbers and riparian habitat, populations impacted by destruction of wetlands		
RED FOX	*Vulpes vulpes*	SOC	0	0	G5	S3, S3	AZ, NM	FS	Extremely rare with restricted distribution; generally a high forest zone species subject to habitat loss due to global warming; threats and status poorly known; however, negative impacts from predator control efforts.	Available information indicates that populations have decreased due to trapping, poisoning, and other predator control efforts, elimination of wolves, potential hybridization with nonnative introduced red foxes; limited and data deficient.		
SWIFT FOX	*Vulpes velox velox*	SOC	0	0	GN3	S?, S2	AZ, NM	FS	Highly restricted distribution, loss of grassland prairie ecosyste, indiscriminant and accidental killing.	Populations have been severely reduced due to habitat destruction (short, medium & mixed grass prairies), trapping, poisoning, and other measures intended to control predators. Northern populations are rare and/or extinct.		
RINGTAIL	*Bassariscus astutus*	SOC	0	0	G5	S5, S4	AZ, NM	FS	Threats and status poorly known, Animal Damage Control activities	Limited and dated data contribute to unknown status for this species		
WHITE-NOSED COATI	*Nasua narica*	SOC	0	0	G5N4	S4, S2	AZ, NM	FS	Endemic, indiscriminant killing, predator control, habitat degradation	Restricted distribution; associated with riparian habitats, subjected to predator control campaigns		
AMERICAN MARTEN	*Martes americana origenes*	SOC	T	0	GN5	S2	NM	FS	Habitat loss & degradation, past extensive logging and trapping for pelts	Restricted distribution; high forest zone species subject to habitat loss due to global warming; trapping, poisoning, and other measures intended to control predators.		
ERMINE	*Mustela erminea muricus*	SOC	0	0	GN5	S1, S3	AZ, NM	FS	Requires high altitude, spruce fir forest with abundant grass/shrub understory. Reliant on forest edge and successional habitats.	Restricted distribution; high forest zone species subject to habitat loss via global warming, trapping, poisoning, and other measures intended to control predators; data deficient.		
MINK	*Mustela vison energumenos*	SOC	0	0	GN5	S3	NM	FS	Requires permanent wetland/riparian habitat with abundant cover such as fallen logs and debris. Presence and density affected by availability of den sites, shoreline vegetation, vertebrate prey, and winter hunting sites.	Documented declines in NM; previously thought to be extirpated from the state. Impacted by degraded riparian areas from overgrazing. Decline largely unexplained, but habitat degradation, trapping, disease, and interspecific competition have affected the species.		
SOUTHWESTERN RIVER OTTER	*Lontra canadensis sonorae*	SOC	0	WSCA	G5TN1	S1, SX	AZ, NM	FS	Habitat destruction, human encroachment, and overharvest; needs high quality water with low sediment loads, and abundant food base of fish or crustaceans.	Possibly extinct in NM; Channelization, bank-armoring, marshland draining, and other kinds of habitat destruction responsible for population declines.		

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HOODED SKUNK	*Mephitis macroura milleri*	SOC	0	0	G5N4	S4, S2	AZ, NM	FS	Restricted distribution; associated with low-elevation riparian habitats	Conversion of low-elevation riparian habitats to urban and agricultural lands, indeterminate trapping and poisoning.		
SANDHILL WHITE-TAILED DEER	*Odocoileus virginianus texana*	SOC	0	0	G5	S4	NM	FS	Experienced significant reductions in distribution and abundance	Range has greatly diminished, due to fire suppression, forage has decreased in quality and quantity.		
ROCKY MOUNTAIN BIGHORN SHEEP	*Ovis canadensis canadensis*	SOC	0	0	G4	S4, S1	AZ, NM	FS	Overhunting/poaching, disease, competition for forage, drought, urban development, heavy recreational use of habitat.	Subspecies extirpated from NM in 1906; reintroduced into portions of historical range.		
DESERT BIGHORN SHEEP	*Ovis canadensis mexicana*	SOC	0	0	G3	S4, S2	AZ, NM	FS	Poaching, disease, surface water availability, competition for forage, drought, human conflict, habitat loss, fragmentation, degradation	Low and decreasing numbers, decreasing distribution and range; small populations experiencing inbreeding and high predation.		
WESTERN SPOTTED SKUNK	*Spilogale gracilis*	SOC	0	0	GN5	S5, S4	AZ, NM	FS	Biology, threats and status poorly known	Limited and dated data contribute to unknown status for this species		
WESTERN HOG-NOSED SKUNK	*Conepatus (mesoleucus) leuconotus*	SOC	0	0	G4N3	S4, S2S3	AZ, NM	FS	Subject to unlimited pest control			
YUMA PUMA	*Puma (Felis) concolor browni*	0	0	WSCA	G5TN1TN2	S1	AZ	UNK				
SANDHILL WHITE-TAILED DEER	*Odocoileus virginianus texana*	SOC	0	0	G5	S4	NM	FS	Experienced significant reductions in distribution and abundance	Range has greatly diminished; due to fire suppression, forage has decreased in quality and quantity		
CHIHUAHUAN PRONGHORN	*Antilocapra americana mexicana*	SOC	0	0	G5	SXS2	AZ	FS	Experienced reductions in distribution and abundance due to fire suppression, over grazing, urbanization & agricultural practices	Historically occurred in grass-shrub valleys and grasslands; Habitat loss to grazing and urbanization; genetics questionable due to indiscriminate restocking without consideration of sub-species		
REPTILES												
WESTERN RIVER COOTER	*Pseudemys gorzugi*	SOC	T	0	G4	S3	NM	FWS	Habitat loss and fragmentation. Low numbers.	Limited distribution, restricted range. Decreasing numbers and easily impacted.		
BIG BEND SLIDER	*Trachemys gaigeae*	SOC	0	0	G3	S3	NM	BLM, FWS. Stte	Habitat loss and fragmentation. Low numbers.	Limited distribution, restricted range.		
SONOYTA MUD TURTLE	*Kinosternon sonoriense longifemorale*	C	0	0	G4T1	S1	AZ	NPS	Extremely limited distribution.	Considered imperiled (S1) in AZ and has limited distribution.		
SONORAN DESERT TORTOISE	*Gopherus agassizii (Sonoran Population)*	SOC	0	WSCA	G4T4	S4	AZ	FS, FWS, , BLM, BOR, DOD, AGFD, State, Private	Habitat loss. Urbanization.	Population appears to be stable or increasing in AZ.		
BLEACHED EARLESS LIZARD	*Holbrookia maculata ruthveni*	SOC	0	0	UNK	UNK	NM	UNK	declining numbers, limited distribution.	Population declines, limited distribution, restricted range.		
SAND DUNE LIZARD	*Sceloporus arenicolus*	C	E	0	G2	S1	NM	BLM, state	Declining numbers and distribution. Restricted range.	State listed species which is easily impacted/disturbed/vandalized. Restricted range.		
NORTHERN SAGEBRUSH LIZARD	*Sceloporus graciosus graciosus*	0	0	0	G5T5	S3S4	AZ	BLM, FS	Limited and spotty distribution.	No known population declines, stable.		
SLEVIN'S BUNCHGRASS LIZARD	*Sceloporus slevini*	SOC	T	0	G4	S2S3/S1	AZ, NM	FS, BLM, DOD, Private	Improper livestock grazing in AZ and NM has degraded habitat and has caused large population declines.	Declines have been noted in the northern portion of the range, limited distribution. Thriving at many localities within Arizona (although a limited) range.		
WHITE SANDS PRAIRIE LIZARD	*Sceoloporus undulatus cowlesi*	SOC	0	0	G5T1	UNK	NM	DOD, NPS, private, state	Declining numbers.	Limited distribution, restricted range.		
COLORADO DESERT FRINGE-TOED LIZARD	*Uma notata*	SOC	0	WSCA	G3Q	S2S3	AZ	UNK	Declining numbers.	Limited distribution, restricted range.		
COWLES FRINGE-TOED LIZARD	*Uma notata rufopunctata*	0	0	0	G3QT2T3	S2S3	AZ	BLM	Declining numbers. Limited distribution, restricted range.	This is now Uma rufopunctata.		

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YUMAN DESERT FRINGE TOED LIZARD	*Uma rufopunctata*	0	0	0	G3QT2T3	S2S3	AZ	FWS, BLM, BOR, DOD, State, Private	Significant potential threats include restricted habitat, limited distribution, OHV activity, and residential and agricultural development.	Population trends unknown in AZ.		
MOJAVE FRINGE-TOED LIZARD	*Uma scoparia*	SOC	0	WSCA	G3G4Q	S2S3	AZ	BLM, State	Extreme eastern edge of range, restricted habitat and limited distribution. Potential direct disturbances of the fragile loose wind-blown sand habitat, includes habitat loss or damage from urban development, off-highway vehicles, and agriculture. Potential indirect disturbances are associated with the disruption of the dune ecosystem source sand, wind transport, and sand corridors.	Population trends unknown, but apparently not very threatened.		
ARIZONA NIGHT LIZARD	*Xantusia arizonae*	0	0	0	G3	S3	AZ	FS, State, Private	Habitat destruction, predation	Population trends are unknown, limited range		
TEXAS HORNED LIZARD	*Phrynosoma cornutum*	SOC	0	0	G4G5	S3S4	AZ, NM	BLM, FS, NPS, DOD, FWS, State, Private	Is collected for the pet trade.	Population trends unknown in AZ but probably upward trend in desert invaded former grasslands.		
FLAT-TAIL HORNED LIZARD	*Phrynosoma mcallii*	SOC	0	WSCA	G3	S2S3	AZ	BLM, BOR, DOD, State, Private	Limited distribution. Urban and agricultural expansion resulting in habitat destruction. Subject to pesticide contamination and OHV activities. Basks on roadways thus road-kill is a major source of known mortality. Border Patrol maintains many miles of roads in mcallii habitat, which depending on how often they are used, may contribute to mortality. Military controls high proportion of habitat in Arizona.	Information concerning population dynamics of flat-tailed horned lizard populations is limited and inconclusive (FWS 2003). Pronounced declines have been postulated for all areas now heavily urbanized or where agricultural practices dominate. Status uncertain in southern parts of range (Mexico).		
BANDED GILA MONSTER	*Heloderma suspectum cinctum*	0	0	0	G4T4	S4	AZ	FWS, BLM, DOD, NPS, State, Private	Humans are one of their primary enemies: road kills take a large toll and active pet trade. Habitat preservation is important, especially denning sites.	Population trends in AZ unknown.		
RETICULATE GILA MONSTER	*Heloderma suspectum suspectum*	SOC	E	0	G4T4	S4	AZ, NM	FS, BLM, State, Private	Threatened by active pet trade. Habitat preservation is important, especially denning sites.	Decreasing only in heavily urbanized or agricultural areas. Locally common elsewhere.		
CHUCKWALLA	*Sauromalus ater*	0	0	0	G5	S4	AZ	BLM	According to NatureServe (2001), the greatest threats to the species are excessive collecting and habitat destruction. Physical damage to habitat has become common and widespread in AZ. This habitat degradation is believed to be associated with reptile collecting for the commercial trade resulting in the removal of individuals from the population and microhabitat destruction caused by unscrupulous collectors, who may use tools to move or break rocks and exfoliations to expose reptiles (NM Department of Game and Fish 1997).	Populations decreasing due to pet trade demand.		

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GLEN CANYON CHUCKWALLA	*Sauromalus ater (Glen Canyon Population)*	0	0	0	GST2Q	S2?	AZ	FS, NPS	There is a moderate threat to the "Glen Canyon" population in northern Arizona due to collecting. Also, historical populations of this population in the Glen Canyon area of Utah, have been reduced or eliminated by the damming of the Colorado River.	Populations decreasing due to pet trade demand.		
MOUNTAIN SKINK	*Eumeces callicephalus*	SOC	T	0	G5	S2, S1	AZ, NM	FS, DOD, Private	Habitat destruction by wildfire, habitat loss, cattleguards, trenches	Limited/decreasing distribution, population trends not available for AZ and NM.		
ARIZONA SKINK	*Eumeces gilberti arizonensis*	0	0	WSCA	G5T1Q	S1	AZ	Private	E.g. arizonensis has a limited distribution. Habitat loss in riparian localities is a concern. Threats include water diversion and habitat destruction, including loss of flood-deposited debris used as cover (AGFD in prep).	Population trends unknown but believed to be locally common and probably stable. May be severely decreasing in some localities.		
GIANT SPOTTED WHIPTAIL	*Aspidoscelis burti stictogrammus*	SOC	T	0	G4T3	S3, S2	AZ, NM	FS, BLM, NPS, State, Private	Habitat loss and fragmentation. Arizona - Limited distribution.	Low population numbers, limited distribution in NM. Population trends in AZ unknown but thought to be stable. Can be locally abundant.		
REDBACK WHIPTAIL	*Aspidoscelis burti xanthonota*	0	0	0	G4T2	S2	AZ	FWS, DOD, NPS	Limited distribution in AZ.	Population trends are apparently stable in AZ.		
GRAY-CHECKERED WHIPTAIL	*Aspidoscelis dixoni*	SOC	E	0	G3G4	S1	NM	BLM, FS	Decreasing numbers and habitat loss. High risk as they are easily disturbed/vandalized.	Limited distribution, restricted range.		
LITTLE WHITE WHIPTAIL	*Aspidoscelis gypsi*	SOC	0	0	GNR	SNR	NM	DOD, NPS	Low population numbers.	Limited distribution, restricted range.		
DESERT ROSY BOA	*Charina trivirgata gracia*	0	0	0	G4G5T3	S3	AZ	FWS, BLM, DOD, Private	Threatened by over-collection for the pet trade.	Population trend is unknown for AZ.		
SONORAN SHOVEL-NOSED SNAKE	*Chionactis palarostris*	0	0	0	G2G3	S2	AZ	NPS	Restricted range, urbanization, road morality	Restricted range. Abundance and trend are poorly known.		
ORGAN PIPE SHOVEL-NOSED SNAKE	*Chionactis palarostris organica*	0	0	0	G2T2	S2	AZ	BLM, NPS, Private	Extreme northern edge of range and limited distribution. Threats include future road widening, and increased traffic especially along highway 85, which cuts through their prime habitat on the Organ Pipe Cactus National Monument.	The total population is unknown. They are uncommon in AZ, and in a highly restricted range.		
GRAY-BANDED KINGSNAKE	*Lampropeltis alterna*	SOC	E	0	G5	S1	NM	NPS	Direct mortality, habitat loss, over collection.	Limited and decreasing distribution, limited range.		
CALIFORNIA KINGSNAKE	*Lampropeltis getula californiae*	SOC	0	0	G5T5	S5	AZ, NM	BLM	Low numbers, limited distribution. Easily impacted, disturbed, vandalized.	Restricted range, low population numbers.		
WESTERN BLACK KINGSNAKE	*Lampropeltis getula nigrita*	0	0	0	G3	S1S2/S3	AZ, NM	FS	Easily impacted, disturbed, vandalized	Population trends unknown.		
UTAH MOUNTAIN KINGSNAKE	*Lampropeltis pyromelana infralalis*	0	0	0	G5T3	S4/SE	AZ, NM	FS, NPS, Private	Decreasing numbers. Habitat loss, degradation, fragmentation. Commercial exploitation.	Limited distribution, restricted range. Population trends unknown.		
AJO MOUNTAIN WHIPSNAKE	*Masticophis bilineatus lineolatus*	0	0	0	G5T2Q	S2	AZ	NPS	Two factors that threaten this snake are its' sensitivity to climatic change and urbanization.	According to Parezek et al. (1996), the Ajo Mountain whipsnake is more widespread than previously thought and may be fairly abundant in rocky habitats in much of the AZ Upland Desert of southern AZ.		
PLAIN BELLIED WATER SNAKE	*Nerodia erythrogaster transversa*	SOC	E	0	G5T5	UNK	NM	FS	Declining numbers, habitat loss, direct mortality.	Limited distribution, restricted range. Little data available.		
BROWN VINESNAKE	*Oxybelis aeneus*	SOC	0	WSCA	G5	S2	AZ	FS	Threats include brush clearing and wood cutting.	Population trends unknown in AZ. Seems to be less common in Sycamore Canyon than a few years ago.		

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THORNSCRUP HOOKNOSED SNAKE	*Gyalopion quadrangulare*	0	0	0	G4	S1, S2	AZ, NM	FS	Limited distribution in AZ.	Rarely seen, not abundant in AZ. Distribution in U.S. is limited to extremely small part of AZ. Within this very small area it is infrequently encountered.		
MARICOPA LEAF-NOSED SNAKE	*Phyllorhynchus browni lucidus*	0	0	0	G5T2	S2	AZ	FS, , BLM, DOD, NPS, State, Private	This snake is greatly affected by heavy urban development such as what is occurring in Phoenix and Tucson. In addition, they are affected by agriculture as in the Avra Valley. They are apparently closely adapted to local conditions. There is also a concern that since these snakes are so adapted to local conditions that a loss of a large local population area may be a serious matter of biodiversity loss, and could eliminate an important source of variation contributing to the long term survival of the species.	Leaf-nosed snakes appear to be declining or possibly disappearing in areas with heavy urban development such as Tucson and Phoenix.		
GREEN RAT SNAKE	*Senticolis triaspis*	SOC	T	0	G5	S3	AZ, NM	FS, FWS, BLM, NPS, State, Private	Catastrophic wildfire, habitat destruction, active interest by collectors.	Limited range, population trends are unknown for this species		
YAQUI BLACK-HEADED SNAKE	*Tantilla yaquia*	SOC	0	0	G4	S2, S1	AZ, NM	FS, NPS, Private	Habitat loss/fragmentation, catastrophic wildfire	Low population numbers, limited distribution		
MEXICAN GARTER SNAKE	*Thamnophis eques megalops*	SOC	E	WSCA	G3T3	S2S3	AZ, NM	FS, FWS, , BLM, DOD, State, Private	Overcollecting, overgrazing, habitat alteration (dewatering, siltation, modification of stream morphology, and arroyo cutting), and the introduction of predaceous, non-native species, particularly bullfrogs and domestic geese	Moderate, spotty range in AZ, NM, and Mexico; documented declines in the number of U.S. populations and abundance, with substantial range contractions in AZ, NM and probable reductions in Mexico; threats are high and ongoing in the U.S. and the same threats probably exist in Mexico.		
ARID LAND RIBBONSNAKE	*Thamnophis proximus diabolicus*	SOC	T	0	G5	S3	NM	FS, FWS	Habitat loss, easily disturbed, exotic predators	Low population numbers, limited distribution		
NARROW-HEADED GARTER SNAKE	*Thamnophis rufipunctatus*	SOC	T	WSCA	G3G4	S3/S3	AZ, NM	FS, State, Private	Lowered water table; habitat modification; grazing along streambeds and increased recreational use in riparian areas. Also introduction of predators such as bullfrogs and some fishes, and habitat fragmentation.	The species does not appear to be abundant in the U.S., and quite likely it has declined there as habitat has been lost or altered. In NM, it is peripheral and of uncertain but probably low population density. The specie's population trend is unknown in AZ and NM. Believed to be extirpated from Flagstaff and Wall Lake, AZ areas where it was formerly abundant. It is also becoming more difficult to find in historical strongholds like Oak Creek AZ.		

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DESERT MASSASAUGA	*Sistrurus catenatus edwardsii*	SOC	0	WSCA	G3G4T3T4	S1S2	AZ	DOD, State, Private	The subspecies occurs in the extreme western edge of its range and has a limited distribution in AZ (Stebbins 1985). Its reduced range in AZ is primarily due to habitat loss from agricultural development (Lowe et al. 1986). Alteration of the grassland habitat via overgrazing could further impact AZ populations (Holycross and Douglas 1996). Highway mortality is a significant source of non-natural attrition (Holycross and Douglas 1996).	Quantified data are lacking, but the desert massasauga has almost certainly experienced long-term population declines and a general range contraction in AZ. Lowe et al (1986) infer currently stable population along Highway US 80 based on fairly constant number of road kills observed (roughly several dozen per year).		
MOTTLED ROCK RATTLESNAKE	*Crotalus lepidus lepidus*	SOC	T	0	G5T4T5	S2	NM	FS,	Cattleguards, trenches, habitat alteration	The mottled subspecies of the rock rattlesnake is probably secure and common in its rather large Mexican range; however, in NM the subspecies is peripheral and of unknown but probably low population density. This species is very rare and/or very limited in distribution in NM.		
TWIN SPOTTED RATTLESNAKE	*Crotalus pricei*	0	0	0	G5	S3	AZ	FS	Limited distribution, highly sought after for the black market pet trade.	Found only at high elevations within coniferous forests of the "Sky Islands. Uncommonly encountered.		
GRAND CANYON RATTLESNAKE	*Crotalus viridis abyssus*	0	0	0	G5T3	S3	AZ	NPS	Limited range.	Abundant within it's range. Population trends in AZ unknown.		
ARIZONA RIDGE-NOSED RATTLESNAKE	*Crotalus willardi willardi*	SOC	0	WSCA	G5T3	S3	AZ	FS, DOD, Private	Threatened by illegal collecting, mining, recreational development, and woodcutting (Lowe et al. 1986).	Population trends are unknown. A "general feeling" exists that it may be less common locally in the Huachuca Mountains than 25 years ago.		
SNAILS												
NO COMMON NAME	*Juturnia tularosae*	SOC	0	0	G1	S1	NM	DOD	groundwater pumping, direct alteration of spring source & rheocrene, water diversion	narrow endemic	Perennial spring. Tularosa Basin, WSMR, central reach of Salt creek.	Protect habitat from disturbances.
NIOBRARA AMBERSNAIL	*Oxyloma haydeni haydeni*	0	0	0	G2G3	S1	AZ	NPS, FS	Dewatering of habitat, inundation of habitat by floods and experimental flows, trampling by hikers.	Narrow endemic	One population is restricted to permanently wet areas fed by a small spring and is associated with the Typha and other wetland vegetation. The other population is restricted to areas with damp or saturated cattail litter, common reed litter, watercress, and among sedges growing in saturated soil.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
BYLAS SPRINGSNAIL	*Pyrgulopsis arizonae*	0	0	0	G1	S1	AZ	Private?	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination	narrow endemic	Springs. Upper Gila drainage, SE AZ near Bylas.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
GRAND WASH SPRINGSNAIL	*Pyrgulopsis bacchus*	0	0	0	G1	S1	AZ	NPS	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination	narrow endemic	Springs from 1,570 to 1,720 feet. Grapevine Spring and Whiskey Springs and Tassi Springs, Grand Wash, NW, AZ, Colorado river drainage. Seven Spring and Big Springs on private land.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
SAN BERNARDINO SPRINGSNAIL	*Pyrgulopsis bernardina*	0	0	0	G1	S1	AZ	Private?	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination	narrow endemic	Springs. NW Cochise Co, and spring at San Bernardino Ranch.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
KINGMAN SPRINGSNAIL	*Pyrgulopsis conica*	0	0	0	G1	S1	AZ	UNK	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination	narrow endemic	Springs. Dripping Springs, Mohave Co. Sacramento Valley W. of Kingman.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.

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CHUPADERA SPRINGSNAIL	*Pyrgulops chupaderae*	CAN	0	0	G1	S1	NM	Private	Spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, drought.	Narrow endemic.	Springs. Endemic to Willow Spring, Chupadera Mtns.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
DESERT SPRINGSNAIL	*Pyrgulopsis deserta*	0	0	0	G2	S1	AZ, UT	UNK	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination	limited distribution	Springs in Virgin River drainage, below the Virgin river Narrows near Littlefield, AZ	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
VERDE RIM SPRINGSNAIL	*Pyrgulopsis glandulosa*	0	0	0	G1	S1	AZ	FS	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination	limited distribution	Springs in the Verde River drainage.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
GILA SPRINGSNAIL	*Pygulopsis gilae*	SOC	T	0	G2	S2	NM	FS, Private	Natural and/or human induced destruction, modification, or curtailment of habitat	Limited distribution. Former FWS candidate species, NM G&F threatened species.	Known from 10 geographically isolated springs in Gila drainage.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
MONTEZUMA WELL SPRINGSNAIL	*Pyrgulopsis montezumensis*	0	0	0	G1	S1	AZ	Private?	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	narrow endemic	Montezuma Well, Yavapai, Co, AZ	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
PAGE SPRINGSNAIL	*Pyrgulopsis morrisoni*	0	0	0	G1	S1	AZ	FS	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	narrow endemic	Page Springs, Yavapai Co., AZ	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
FOSSIL SPRINGSNAIL	*Pyrgulopsis simplex*	0	0	0	G1	S1	AZ	FS	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	limited distribution	Springs along Fossil Creek, lower Verde drainage, spring near Strawbery.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
NEW MEXICO HOT SPRINGSNAIL	*Pyrgulopsis thermalis*	SOC	T	0	G1	S1	NM	FS	Poor watershed management practices, contamination, and wetland habitat degradation. Recreational use and improper livestock grazing are also threats to this species.	Limited distribution. Former FWS candidate species. NM Game and Fish threatened species.	Thermal springs along the East Fork and Alum spring on the mainstem Gila river.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
BROWN SPRINGSNAIL	*Pyrgulopsis sola*	0	0	0	G1	S1	AZ	FS	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	narrow endemic	Brown Spring, Yavapai Co, AZ	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
HUACHUCA SPRINGSNAIL	*Pyrgulopsis thompsoni*	0	0	0	G2	S2	AZ	UNK	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	limited distribution	Upper Santa Cruz drainage (tributary to Gila river), AZ and north-central Sonora, MX	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
THREE FORKS SPRINGSNAIL	*Pyrgulopsis trivalis*	0	0	0	G1	S1	AZ	FS	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	limited distribution	Springs in the Upper Black River drainage	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
METCALF SPRINGSNAIL	*Pyrgulopsis metcalfi*	0	0	0	G1	SX	TX	Private?	trampling by livestock, boxing diversion, damming	Not in NM or AZ; trampling by livestock, boxing diversion, damming	Naegele Springs.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.

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PECOS SPRINGSNAIL	*Pyrgulopsis pecosensis*	SOC	T	0	G1	S1	NM	UNK	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	Limited to springs in Pecos River drainage.	Springs in Pecos River drainage. Blue Spring.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
MIMBRES SPRINGSNAIL	*Pyrgulopsis n. sp. 2*	SOC	0	0	G1	S1	NM	Private	spring development, cattle grazing, lowered groundwater table, spring diversion, water contamination, non-native species	narrow endemic	Thermal water of springbrook. On private property.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
GILA TYRONIA SNAIL	*Tryonia gilae*	0	0	0	G1	S1	AZ	UNK	groundwater depletion, reduction of spring flow, spring development, water diversion, non-native species	narrow endemic	Warm spring (26-32 C) near Bylas.	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
QUITOBAQUITO TYRONIA	*Tryonia quitobaquitoae*	0	0	0	G1	S1	AZ	NPS	groundwater depletion, reduction of spring flow, spring development, water diversion, non-native species	narrow endemic	Quitobaquito springs, Organ pipe cactus National Monument	Protect habitat from anthropogenic disturbances: dewatering, diversion, wildlife improvement projects, inundation, trampling, contamination, water quality, degradation, exotic species.
SONORELLA sp.	*Sonorella n. sp*	SOC	0	0	UNK	UNK	NM	Private	fire, climate change, destabilization of talus slopes	narrow endemic	Madrean Encinal, Madrean juniper savanna, Lang Canyon, San Luis Mountains	Protect talus slopes. Route recreational trails away from talus slopes.
SQUAW PEAK TALUSSNAIL	*Sonorella allynsmithi*	0	0	0	G1	S1	AZ	City	Human encroachment. Restricted distribution makes pop. More susceptible to stochastic events. Hiking/climbing on talus slopes.	endemic	Deep, open, talus piles or rockslides, preferably north facing in some locations. Squaw Peak Park and Mummy Mountain. 1,100 - 3,900 ft.	Protect talus slopes. Route recreational trails away from talus slopes.
CLARK PEAK TALUSSNAIL	*Sonorella christenseni*	0	0	0	G1G2	S1S2	AZ	FS, City	fire, drought, global warming. Events that affect humidity levels	narrow endemic	Rock slides on north slopes, Pinaleno Mtns.	Protect talus slopes. Route recreational trails away from talus slopes.
MIMIC TALUSSNAIL	*Sonorella imitator*	0	0	0	G2	S2	AZ	FS	perhaps fire	narrow endemic	Rock slides, Pinaleno Mountains 6,680 - 10,280 feet	Protect talus slopes. Route recreational trails away from talus slopes.
PINALENO TALUSSNAIL	*Sonorella grahamensis*	0	0	0	G1	S1	AZ	FS	potentially intense fire, global warming	narrow endemic	Rockslides within the Pinaleno Mountains, 6,000 - 10,000 feet	Protect talus slopes. Route recreational trails away from talus slopes.
WET CANYON TALUSSNAIL	*Sonorella macrophallus*	0	0	0	G1	S1	AZ	FS	Any disturbance that alters or removes talus, increased sedimentation, or depletion of streamflow.	narrow endemic	Found in canyon bottom along perennially flowing portion of Wet Canyon	Protect riparian area and water flow.
PAPAGO TALUSSNAIL	*Sonorella papagorum*	0	0	0	G1	S1	AZ	UNK	Quarrying and possible urban development , climate warming	narrow endemic	Found in crevices one to several feet below the surface, sealed to stones. Snail is found deep within the rock slides of black basalt. 3,200 feet, Pinaleno Mtns.	Be aware of snail's presence. Avoid major land disturbances in area.
ANIMAS TALUSSNAIL	*Sonorella animasensis*	SOC	0	0	G1	S1	NM	Private	fire, climate change, destabilization of talus slopes	narrow endemic	In deciduous forest on steep sides of canyons under rocks, Animas Mtns.	Protect talus slopes. Route recreational trails away from talus slopes.
FLORIDA MOUNTAIN TALUSSNAIL	*Sonorella hachitana flora*	SOC	0	0	G1	S1	NM	BLM, State	fire, climate change, destabilization of talus sprawls, Species description in progress (Lang, Gilbertson, and Metcalf In Preparation)	narrow endemic	Occurs sporadically throughout higher elevations of Florida Mtns.	Protect talus slopes. Route recreational trails away from talus slopes.
NEW MEXICO TALUSSNAIL	*Sonorella hachitana hachitana*	SOC	0	0	G1	S1	NM	BLM	fire, climate change, destabilization of talus slopes	narrow endemic	7,400 TO 7,500 ft under large stones on steep slopes in Big Hatchet Mtns., Chaney canyon.	Protect talus slopes. Route recreational trails away from talus slopes.
NO COMMON NAME GIVEN; see Metcalf and Smartt (1997)	*Sonorella hachitana pleoncillensis*	SOC	0	0	G1	S1	NM	FS	fire, climate change, destabilization of talus sprawls	narrow endemic	Madrean juniper savanna, Skull Canyon, Peloncillo Mtns.	Protect talus slopes. Route recreational trails away from talus slopes.
FRANKLIN MOUNTAIN TALUSSNAIL	*Sonorella metcalfi*	SOC	0	0	G1	S1	NM, TX	UNK	fire, climate change, destabilization of talus slopes	endemic, limited distribution	Organ Mountains. 6,000 feet in rhyolitic talus. Head of Finley Canyon.	Protect talus slopes. Route recreational trails away from talus slopes.
ORGAN MOUNTAIN TALUSSNAIL	*Sonorella orientis*	SOC	0	0	G3	S3	NM, TX	UNK	fire, climate change, destabilization of talus sprawls. Further taxonomic study may show isolated pops. as distinct.	endemic with sporadic distribution	Rhyolithis can monzonitic talus, Organ Mtns (4,900 - 7,900ft), Dripping Springs; San Anres Mtns (1,675 - 2,105 ft) Salinas Peak	Protect talus slopes. Route recreational trails away from talus slopes.

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DONA ANA TALUSSNAIL	*Sonorella todseni*	SOC	T	0	G1	S1	NM	BLM	fire, climate change, destabilization of talus slopes	narrow endemic	Igneous rock talus under a sparse growth of live oak ad shrubs, north and east slope of Dona Ana Peak.	Protect talus slopes. Route recreational trails away from talus slopes.
NORTHERN THREEBAND	*Humboltiana ultima*	SOC	0	0	G1	S1	NM, TX	FS	fire, climate change, destabilization of talus sprawls	narrow endemic	Limestone talus and under limestone rocks	Protect talus slopes. Route recreational trails away from talus slopes.
BEARDED MOUNTAINSNAIL	*Oreohelix barbata*	SOC	0	0	G1	S1	AZ, NM	FS	riparian disturbance: cattle grazing, road building	narrow endemic	Along creeks at bottom of canyons, riparian forest. Chiricahua Mtns., AZ, Mogollon Mtns., NM	Protect riparian habitats along creeks. Prevent overgrazing, rout trails and roads away from canyon bottoms.
PINOS ALTOS MOUNTAINSNAIL	*Oreohelix confragosa*		0	0	UNK	UNK	N	UNK	fire, climate change, mining, destabilization of talus	narrow endemic	Under flat limestone rocks below cliff, 6,700 feet, Willow Springs Canyon	Protect talus slopes. Route recreational trails away from talus slopes. Conduct surveys if mining is proposed in or near occupied habitat.
PINALENO MOUNTAINSNAIL	*Oreohelix grahamensis*	0	0	0	G2	S2	AZ	FS	chance events, intense fire	narrow endemic	Found within leaf litter within and around talus and rockslides. 6,500 - 10,080 ft. Mt. Graham	Protect talus slopes. Route recreational trails away from talus slopes.
DIABLO MOUNTAINSNAIL	*Oreohelix houghi*	SOC	0	0	G2	S2	AZ, NM	UNK	climate change	endemic, disjunct distribution	Sandstone outcrops along drainages. Little Colorado river drainage near Lyman and Nelson reservoirs; NM Carrizo Wash.	Conduct surveys if project is proposed in occupied habitat. Avoid or minimize impact to populations.
SAN AUGUSTIN MOUNTAINSNAIL	*Oreohelix litoralis*	SOC	0	0	G1	S1	NM	UNK	climate change, deforestation, fire	narrow endemic	Rhyolitic rock outcrops, in crevices and rock rubble. 6,900 feet southern edge of Lake San Augustin.	Conduct surveys if project is proposed in occupied habitat. Avoid or minimize impact to populations.
MAGDALENA MOUNTAINSNAIL	*Oreohelix magdalanae*	SOC	0	0	G1	S1	NM	FS	climate change, deforestation, fire	narrow endemic	Forested habitat, leaf litter, igeneous bedrock, crevices, rubble at 7,000 in Magdalena Mtns. North Fork canyon, Water canyon, N. Baldy Peak.	Conduct surveys if project is proposed in occupied habitat. Avoid or minimize impact to populations.
NO COMMON NAME	*Oreohelix metcalfei acutidiscus*	SOC	0	0	G1	S1	NM	FS	fire, climate change, mining, destabilization of talus sprawls	narrow endemic	Limestone ledge, talus, Sawyer Peak, Black Range.	Protect talus slopes. Route recreational trails away from talus slopes. Conduct surveys if mining is proposed in or near occupied habitat.
NO COMMON NAME (Black Range mountainsnail)	*Oreohelix metcalfei concentrica*	SOC	0	0	G1	S1	NM	FS	fire, climate change, mining, destabilization of talus sprawls, deforestation	narrow endemic	Limestone bedrock and scree, forested habitat. Black Range, Silver Creek Canyon.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining is proposed in or near occupied habitat. Leave forested buffer around occupied habitat if timber harvest is planned.
NO COMMON NAME	*Oreohelix metcalfei cuchillensis*	SOC	0	0	G1	S1	NM	UNK	fire, climate change, mining, deforestation	narrow endemic	Limestone outcrops, scree, and rocks North end of Cuchillo Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining is proposed in or near occupied habitat. Leave forested buffer around occupied habitat if timber harvest is planned.
NO COMMON NAME	*Oreohelix metcalfei hermosensis*	SOC	0	0	G1	S1	NM	UNK	climate change, mining	narrow endemic	Limestone bedrock. Black Range, Palomas Creek	Conduct surveys if project is proposed in occupied habitat. Avoid or minimize impact to populations.
NO COMMON NAME	*Oreohelix metcalfei metcalfei*	SOC	0	0	G1	S1	NM	FS	climate change, mining, destabilization of talus sprawls	narrow endemic	Limestone outcrops and scree. Canyons of upper Percha Creek system.	Protect talus slopes. Route recreational trails, road away from talus slopes. Conduct surveys if mining is proposed in or near occupied habitat.
NO COMMON NAME	*Oreohelix metcalfei radiata*	SOC	0	0	G1	S1	NM	FS	fire, climate change, mining, destabilization of talus sprawls	narrow endemic	Limestone ledge, talus. Black Range, Iron and Spring Creek drainages.	Protect talus slopes. Route recreational trails, road away from talus slopes. Conduct surveys if mining is proposed in or near occupied habitat.
OSCURA MOUNTAINSNAIL	*Oreohelix neomexicana*	SOC	0	0	G2G3	S1	NM	UNK	climate change?	narrow endemic	In Oscura Mtns. North, northeast facing slopes near 7,800 feet in pinon juniper woodland, limestone talus, with leaf litter in between the rocks.	Conduct surveys if project is proposed in occupied habitat. Avoid or minimize impact to populations.
NO COMMON NAME	*Oreohelix nogalensis*	SOC	0	0	G1	S1	NM	FS	fire, climate change, deforestation	narrow endemic	Canyon habitats > 7,000 feet in leaf litter (aspen, maple, pine-oak woodland). Known only from Sierra Blanca-Nogal Peak complex, Sierra Blanca Mtns.	If possible, protect occupied canyons from catastrophic fire.
MINERAL CREEK MOUNTAINSNAIL	*Oreohelix pilsbryi*	SOC	T	0	G1	S1	NM	FS	Mining, canopy removal, fire, climate change	narrow endemic	In limestone strata along northeast facing outcrop. Moist soils on well shaded north and east facing slopes. Black Range, Mineral Creek Canyon.	Conduct surveys if mining is proposed in occupied habitat. Avoid or minimize impacts to populations.

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MORGAN CREEK MOUNTAINSNAIL	*Oreohelix swopei*	SOC	0	0	G1	S1	NM	FS	climate change, deforestation, fire. Species requires further study & evaluation regarding taxonomy & distribution as it relates to the O. strigosa depressa & O. subrudis groups	narrow endemic	Canyons within the Black Range.	Conduct surveys if timber harvest of prescribed burns are proposed in occupied habitat. Avoid or minimize impacts to populations.
SUPALPINE MOUNTAINSNAIL	*Oreohelix subrudis*	SOC	0	0	G4	S3	NM	FS	fire, climate change, mining, destabilization of talus sprawls	Widespread in Rocky Mtns. from so. Canada south to Colorada. NM: higher elevations of Black Range and Mogollon & San Mateo Mtns. Further tax. studies may show the NM pops. distinct from higher latitude pops.	Forested habitat under igneous and limestone talus. NM: higher elevations of Black Range and Mogollon & San Mateo Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining is proposed in or near occupied habitat. Leave forested buffer around occupied habitat if timber harvest is planned.
CUMMING'S MOUNTAINSNAIL	*Oreohelix yavapai cummingsi*	0	0	0	G4?T1	S1	AZ, UT	UNK	Livestock grazing	narrow endemic	Limestone outcrops. Found in very xeri, open rocky dry areas. South side of Navajo Mtns in AZ, N side of Navajo Mtns and Abajo Mtns in UT, 6,000 - 7,900 ft.	Conduct surveys if project is proposed in occupied habitat. Avoid or minimize impact to populations.
FRINGED MOUNTAINSNAIL	*Radiocentrum ferrissi*	SOC	0	0	G1	S1	NM	BLM	Fire, climate change, mining	narrow endemic	Ledges and faces of limestone cliffs; Madrean Pine Oak Forest and Woodland. Higher elevations near Big Hatchet Peak, lower elevations of S part of Big Hatchet Mtns, and E. side of Teocalli butte	Conduct surveys if mining or prescribed fire is proposed in occupied habitat. Avoid or minimize impacts to populations.
HACHETA MOUNTAINSNAIL	*Radiocentrum hachetanum*	SOC	0	0	G1	S1	NM	BLM	fire, climate change, mining	narrow endemic	Madrean Oak Forest and woodland. Summit of Hacheta Grande, Big Hatchet Mtns., Chaney canyon.	Conduct surveys if mining or prescribed fire is proposed in occupied habitat. Avoid or minimize impacts to populations.
NO COMMON NAME	*Ashmunella amblya cornudasensis*	SOC	0	0	G1	S1	NM	UNK	fire, climate change, disturbance to talus	narrow endemic	Igneous talus and bedrock. Cornudas Mtns. Group	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest, or prescribed burns are proposed in or near occupied habitat.
ANIMAS PEAK WOODLANDSNAIL	*Ashmunella animasensis*	SOC	0	0	G1	S1	NM	Private	fire, climate change, deforestation	narrow endemic	Madrean pine oak forest and woodland. Igneous talus slopes and pine oak and juniper. Animas Mtns. From Indian Creek south to Victoria Peak.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest, or prescribed burns are proposed in or near occupied habitat.
BOULDER CANYON WOODLANDSNAIL	*Ashmunella auriculata*	SOC	0	0	G2	S2	NM	UNK	fire, climate change, deforestation	narrow endemic	Thyolitic talus. Southern Organ Mtns. From lower Filmore Canyon, northward to Baylor Peak	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
SILVER CREEK WOODLANDSNAIL	*Ashmunella binneyi*	SOC	0	0	G1	S1	NM	UNK	fire, climate change, deforestation	limited distribution	West side of Black Range 8,000 - 8,500 ft at upper ends of Silver, Bull Top, and Spring Creek Canyons.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
GUADALUPE WOODLANDSNAIL	*Ashmunella carlsbadensis*	SOC	0	0	G2	S2	NM	NPS, FS?	fire, climate change, disturbance to talus	narrow endemic	Lower slopes along canyon walls in deep limestone talus with leaf litter. Guadalupe Mtns. From McKittrick canon (TX) north to Carlsbad Caverns National Park.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
NO COMMON NAME	*Ashmunella cockerelli argenticola*	SOC	0	0	G1	S1	NM	FS	fire, climate change, deforestation	narrow endemic	Mesic forested habitat among limestone rubble and leaf litter. SW Black Range, Silver Creek	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
BLACK RANGE WOODLANDSNAIL	*Ashmunella cockerelli cockerelli*	SOC	0	0	G1	S1	NM	FS	fire, climate change, deforestation	narrow endemic	Open woodland, in limestone talus, in sheltered undisturbed areas. SW Black Range near Royal John Mine.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
NO COMMON NAME	*Ashmunella cockerelli perobtusa*	SOC	0	0	G1	S1	NM	FS	fire, climate change, deforestation. Type locality merits verification.	narrow endemic	Limestone talus. SE Black Range from Sawyer Peak to Grand Central mine.	Protect talus slopes. Route recreational traisl, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
WHITEWATER CREEK WOODLANDSNAIL	*Ashmunella danielsi*	SOC	0	0	G1	S1	NM	FS	fire, climate change, disturbance to talus, deforestation. Current literature recognizes 2 species. The entire complex of smaller-shelled Ashmunellae of the tetradon-danielsi groups merit taxonomic study.	limited distribution	Wooded, north facing slopes in igneous rock talus, containing damp leaf litter in between the rocks. Western Mogollon Mtns 7,000 - 7,500 ft. Little Whitewater canyon, Cave spring canyon.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
GOAT MOUNTAIN WOODLANDSNAIL	*Ashmunella harrisi*	SOC	0	0	G1	S1	NM	UNK	fire, climate change, disturbance to talus, deforestation	narrow endemic	Accumulations of limestone talus. Occurs in 21 unnamed canyons on the E side of Goat Mtn., southern San Andres Mtns.	Protect talus slopes. Route recreational traisl, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
BIG HATCHET WOODLANDSNAIL	*Ashmunella hebardi*	SOC	T	0	G1	S1	NM	BLM	climate warming, fire, mining	narrow endemic	Found under loose rock below cliffs in an area of unusually tall or dense pinyon pine.Known only from the NW slope of Chaney Canyon, Hacheta Grande, Big Hatchet Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
SAN ANDRES WOODLANDSNAIL	*Ashmunella kochii kochii*	SOC	0	0	G2	S2	NM	UNK	climate warming, fire, mining, disturbance to talus	narrow endemic	Limestone talus. San Andres Mtns, Black Brushy and Goat Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
NO COMMON NAME	*Ashmunella kochii caballoensis*	SOC	0	0	G1	S1	NM	UNK	climate warming, fire, mining, disturbance to talus	narrow endemic	Limestone talus. San Andres Mtns, W. slope of San Andres Peak.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
NO COMMON NAME	*Ashmunella kochii sanandresensis*	SOC	0	0	G1	S1	NM	UNK	climate warming, fire, mining, disturbance to talus	narrow endemic	Limestone talus. Caballo Mtns, Brush Mtn.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
COOKE'S PEAK WOODLANDSNAIL	*Ashmunella macromphala*	SOC	T	0	G1	S1	NM	BLM	fire, climate change, disturbance to talus, deforestation, mining	narrow endemic	Steep northern slope of Cooke's Peak 6,900 - 7,000 feet. Snails under rocks and in debris between rocks. Oak bordered the rock slides. Cooke's Range and S. end of Black Range.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
BIG HATCHET WOODLANDSNAIL	*Ashmunella mearnsii*	SOC	0	0	G1	S1	NM	BLM	climate warming, fire, mining	narrow endemic	Snail occurs in litter soil mold that collects in limestone talus, in thick leaf litter, and under stones, especially below north facing cliffs that support stands of Gambel oak, pinyon pine, and juniper that provide shade. Madrean Pine Oak forest and woodland. Widespread in Big Hatchet Mtns. 6,600 - 8,170 ft.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
IRON CREEK WOODLANDSNAIL	*Ashmunella mendax*	SOC	0	0	G1	S1	NM	FS	fire, climate change, disturbance to talus, deforestation, mining	limited distribution	Elevation range from about 5,500 to 9,000 feet in Black Range. In canyons in lower elevations in forested zone at higher elevations.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
ORGAN MOUNTAINS WOODLANDSNAIL	*Ashmunella organensis*	SOC	0	0	G2	S2	NM	UNK	fire, climate change, disturbance to talus, deforestation, mining	limited distribution	Igneous rock talus, usually rhyolyte 5,470 to 8,200 feet W. slope of Organ Mtns. From Fillmore canyon south to Finley and Boulder canyons.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
FRANKLIN MOUNTAIN TALUSSNAIL	*Ashmunella pasonis pasonis*	SOC	0	0	G1	S1	NM	UNK	fire, mining, climate warming, disturbance to talus	limited distribution	Found in accumulations of limestone talus. San Andres Mtns from Hembrillo, Lots Man and Dead Man canyons S. to Mayberry Canyon. Upper Little San Nicholas Canyon north slope Black Mtn.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
CAPITAN WOODLANDSNAIL	*Ashmunella pseudodonta*	SOC	0	0	G2	S2	NM	FS	fire, mining, climate warming, disturbance to talus	narrow endemic	Igneous talus sprawls. Lone Peak Carrizo Peak, Patos Mtn, Capitan Mtn. complex.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
MOUNT RILEY WOODLANDSNAIL	*Ashmunella rileyensis*	SOC	0	0	G1	S1	NM	UNK	fire, mining, climate warming, disturbance to talus	limited distribution	Snail is found in long, linear mounds of rhylotic talus that radiate downslope from the higher peaks of the mountain complex. Mount Riley complex, surrounded by the La Mesa Plain, west of the Rio Grande Valley, southernmost NM	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
SALINAS PEAK WOODLANDSNAIL	*Ashmunella salinasensis*	SOC	0	0	G1	S?	NM	UNK	fire, mining, climate warming, disturbance to talus	limited distribution	Found in talus accumulations, where trees grow within the talus. E. Salinas Peak, Salinas Peak, San Andreas Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
DRY CREEK WOODLANDSNAIL	*Ashmunella tetradon tetradon*	SOC	0	0	G1	S1	NM	FS	deforestation, fire. A. t. tetrodon complex of SW Mogollon Mtns. Merits taxonomic study. Listing here reflects published literature	narrow endemic	Riparian corridor of deep canyons in deciduous leaf litter. SW Mogollon Mtns. Along Dry Creek Canyon, 6,000 - 7,000	Protect riparian areas within canyons. Route recreational trails, road away from canyon bottoms. Conduct surveys if timber harvest or prescribed burns are proposed in or near occupied habitat.
NO COMMON NAME	*Ashmunella tetradon mutator*	SOC	0	0	G1	S1	NM	FS	deforestation, fire. A. t. tetrodon complex of SW Mogollon Mtns. Merits taxonomic study. Listing here reflects published literature	narrow endemic	Riparian corridor of deep canyons in deciduous leaf litter. SW Mogollon Mtns, along Dry Creek Canyon.	Protect riparian areas within canyons. Route recreational trails, road away from canyon bottoms. Conduct surveys if timber harvest or prescribed burns are proposed in or near occupied habitat.
NO COMMON NAME	*Ashmunella tetradon inermis*	SOC	0	0	G1	S1	NM	FS	deforestation, fire	narrow endemic	Riparian corridor of deep canyons in deciduous leaf litter. SW Mogollon Mtns, along Dry Creek Canyon.	Protect riparian areas within canyons. Route recreational trails, road away from canyon bottoms. Conduct surveys if timber harvest or prescribed burns are proposed in or near occupied habitat.
NO COMMON NAME	*Ashmunella tetradon animorum*	SOC	0	0	G2	S2	NM	FS	fire, deforestation, disturbance to talus	narrow endemic	Higher forests, igneous talus. Black Range, Holden's spring	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
NO COMMON NAME	*Ashmunella tetradon fragilis*	SOC	0	0	G1	S1	NM	UNK	fire, deforestation, disturbance to talus	narrow endemic	Igneous (?) talus sprawl. Black Range, eastern foothills	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
MAPLE CANYON WOODLANDSNAIL	*Ashmunella todseni*	SOC	0	0	G1	S1	NM	UNK	fire, mining, climate warming, disturbance to talus. A. t. tetrodon complex of SW Mogollon Mtns. Merits taxonomic study. Listing here reflects published literature.	narrow endemic	In rhyolitic talus. Maple Canyon and Texas Canyon, NE Organ Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
FLORIDA MOUNTAINS WOODLANDSNAIL	*Ashmunella walkeri*	SOC	0	0	G1	S1	NM	BLM	fire, mining, climate warming, disturbance to talus	limited distribution	Limestone talus or igneous rock talus on N slopes. West side of Florida Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining, timber harvest or prescribed burns are proposed in or near occupied habitat.
APACHE SNAGGLETOOTH	*Gastrocopta cochisensis*	SOC	0	0	G4	S1	NM	UNK	center of distribution in MX; more common in AZ; sp of limited distribution in NM. Threats: fire, deforestation, climate change	only NM records from the Animas Mtns.	Mesic forested canyons. N & E slopes of Animas Peak	Protect forested canyons. Conduct surveys if timber harvest or prescribed burns are proposed in or near occupied habitat.

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations
SHORTNECK SNAGGLETOOTH	*Gastrocopta dalliana dalliana*	SOC	E	0	G4T3	S1	NM	BLM, Private	secure in AZ (widespread); known from only 4 sites in NM, 2 of which are on Diamond A (TNC/Gray Ranch preserve) Ranch. Threats: fire, deforestation, climate change.	limited distribution	Habitat associations: Madrean pine oak forest and woodland, Madrean juniper Savanna, Maderea Encinal; xeric-mesic habitats.NM: Indian Creek Canyon on northern slope of Animas Peak, Thompson Canyon n Big Hatchet Mtns. Lang Canyon in San Luis Mtns, and riparian corridor along Guadalupe Creek, Guadalupe Canyon in Sonoran Desert.	Protect forested canyons. Conduct surveys if timber harvest or prescribed burns are proposed in or near occupied habitat.
OVATE VERTIGO	*Vertigo ovata*	SOC	T	0	G5	S1	NM	Private	spring "development", overgrazing by cattle, draining of marshes, groundwater pumping, alteration of spring flow	limited distribution in NM	Occurs in proximity to water in and on living and dead vegetation, organic debris, and damp or muddy soil. Blue spring, Eddy Co., riparian corridor of Alamosa creek upstream of Monticello Box.	Protect springs, streams, wetlands, and riparian areas.
BLUNT AMBERSNAIL	*Oxyloma retusum*	SOC	0	0	G5	S1	NM	FWS,FS	climate change, groundwater pumping, riparian habitat degradation. Taxonomic study may reveal pops. distinct from such diverse habitats. Further statewide surveys of marsh habitats may clarify status	Common in eastern US; species known only from fossil record in NM & AZ	Marsh associated species, also sympatric with prosobranch snails, Pyrgulopsis gilae and P. thermalis, in hotsprings. Tularosa River drainage near Mescalero; hotsprings along E fork and mainstem Gila River.	Protect springs, streams, wetlands, and riparian areas.
BISHOP'S CAP SNAIL	*Coelostemma pyrgonasta*	SOC	0	0	G1	S1	NM	UNK	fire, climate change, mining	narrow endemic	Found under limestone blocks below cliffs. Endemic to Bishop's Cap Mtn, occupies 3-4 square miles of area.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining or prescribed burns are proposed in or near occupied habitat.
ANIMAS HOLOSPIRA	*Holospira animasensis*	SOC	0	0	G1	S1	NM	UNK	fire, climate change, mining	narrow endemic	Base of limestone cliff. North end of Animas Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining or prescribed burns are proposed in or near occupied habitat.
COCKERELL TUBESHELL	*Holospira cockerelli*	SOC	0	0	G2	S2	NM	UNK	fire, climate change, mining	endemic, sporadic distribution	Limestone bedrock, ledges, rubble, talus eastern foothills of Black Range, from near Kingston north to Cuchillo Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining or prescribed burns are proposed in or near occupied habitat.
CROSS HOLOSPIRA	*Holospira crossei*	SOC	0	0	G1	S1	NM	BLM	fire, climate change, mining, deforestation	narrow endemic	Limestone bedrock, ledges, rubble, talus. Big Hatchet Mtns complex, Big Hatchet Mtns, northern limit of Alamo Hueco Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining or prescribed burns are proposed in or near occupied habitat.
METCALF'S HOLOSPIRA	*Holospira metcalfi*	SOC	0	0	G1	S1	NM	UNK	climate change, fire, deforestation	narrow endemic	Found under large stones at base of U-Bar cliffs, obligate to limestone rocks. Howells Ridge, Little Hatchet Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining or prescribed burns are proposed in or near occupied habitat.
VAGABOND HOLOSPIRA	*Holospira montivaga*	SOC	0	0	G1	S1	NM, TX	FS	fire, climate change, mining	narrow endemic	Higher elevations of range in mesic, wooded canyons (limestone ledges and walls). West slope Guadalupe Mtns, Devil's Den Canyon, 6,950 ft.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining or prescribed burns are proposed in or
A VALLONIA	*Vallonia sonorana*	SOC	0	0	GUQ	S1	NM	BLM	climate warming, fire, mining	limited distribution, taxonomy of this species still unclear	In Gambel oak leaf litter at base of cliffs. Madrean pine oak forest and woodland. Big Hatchet Peak, Big Hatchet Mtns, Howell's Ridge Little Hatchet Mtns.	Protect talus slopes. Route recreational trails, roads away from talus slopes. Conduct surveys if mining or prescribed burns are proposed in or near occupied habitat.

SPECIES AT RISK LIST LEGEND

0	No information to display
?	Information questionable
AGFD	Arizona Game and Fish Department
A-S	Apache Sitgreaves National Forest
AZ	Arizona

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations

AGFD	Arizona Game and Fish Department
AZWSCA	Arizona Watch Category
BLM	Bureau of Land Management
BMPs	Best Management Practices
BOR	Bureau of Reclamation
C	federal candidate species
CAR	Carson National Forest
CBM	Coal bed methane
CHR	Contaminant Hazard Review
COC	Coconino National Forest
CO	Colorado
COR	Coronado National Forest
CWA	Clean Water Act
DOD	Department of Defense
E	federally Endangered
Fed	Federal
FS	U.S. Forest Service
ft	feet
FWS	U.S. Fish and Wildlife Service
G (1-5)	Global Heritage Rank
	1= critically imperiled
	2=imperiled
	3=vulnerable
	4=apparently secure
	5=demonstrably widespread, abundant, and secure
IUCN	The International Union for the Conservation of Nature and Natural Resources.
m	meters
MX	Mexico
NF	National Forest
NM	New Mexico
NMG&F	New Mexico Game and Fish Department
NNWCA	NM Wildlife Conservation Act - State listed species
NPS	National Park Service
OHV	Off Highway Vehicle
OK	Oklahoma
P	Federally proposed species
PRE	Prescott National Forest
Private	Occurs on private lands

Common Name	Scientific Name	Fed Status	NM WCA (listed)	AZ WSCA	Heritage Global Rank	Heritage State Rank AZ/NM	State	Land Jurisdiction where species is known to occur	Limiting Factors	Justification	Habitat	Management Recommendations

Q	Heritage rank qualifier. Questinalbe tazonomy that may reduce conservation priority
S (1-5)	State Heritage Rank 1= critically imperiled 2=imperiled 3=vulnerable to extirpation 4=apparently secure 5=demonstrably widespread, abundant, and secure
SF	Santa Fe National Forest
SH	Possibly extirpated
State	ocurs on state lands
SOC	Species of Concern
T	Threatened
TON	Tonto National Forest
TX	Texas
UNK	Information unavailable or undertermined
U.S.	United States
WSCA	Wildlife Species of Concern in Arizona
WSMR	White Sands Missle Range

APPENDIX F

BAIRD'S SPARROW

Class	Order	Family	Genus	Species
Aves	Passeriformes	Emberizidae	Ammodramus	bairdii

SPECIES DESCRIPTION AND TAXONOMY

Named in 1843 by John James Audubon in honor of his assistant, Spencer Baird. About 5 ¼ inches in size and intricately patterned, as is common for this genus. Mustard-yellow head with ochre stripe down center of crown. Neck buffy to ocher with fine stripes. White breast with dark neck spots and dark, lateral throat stripes leading to a necklace of dark streaks. Call a very high, weak *teep*. Flight call a high, thin, *tsee*; higher than that of grasshopper sparrow. Also called Gorrion Baird (Hispanic).

LIFE HISTORY

Nests in the northern Great Plains and feeds mainly on insects and seeds. Female lays 1 clutch per year. Baird's sparrows are secretive and usually only perch when singing in the early spring and summer. They are very difficult to spot any time of year, including migration and winter when they do not sing. They forage on the ground moving slowly among grass clumps eating insects and seeds. When disturbed, Baird's sparrows prefer darting among the grasses to flight. They usually flush before being seen, then fly low and drop back into the grasses again. Baird's sparrows are typically only identified by experienced birders.

HABITAT REQUIREMENTS

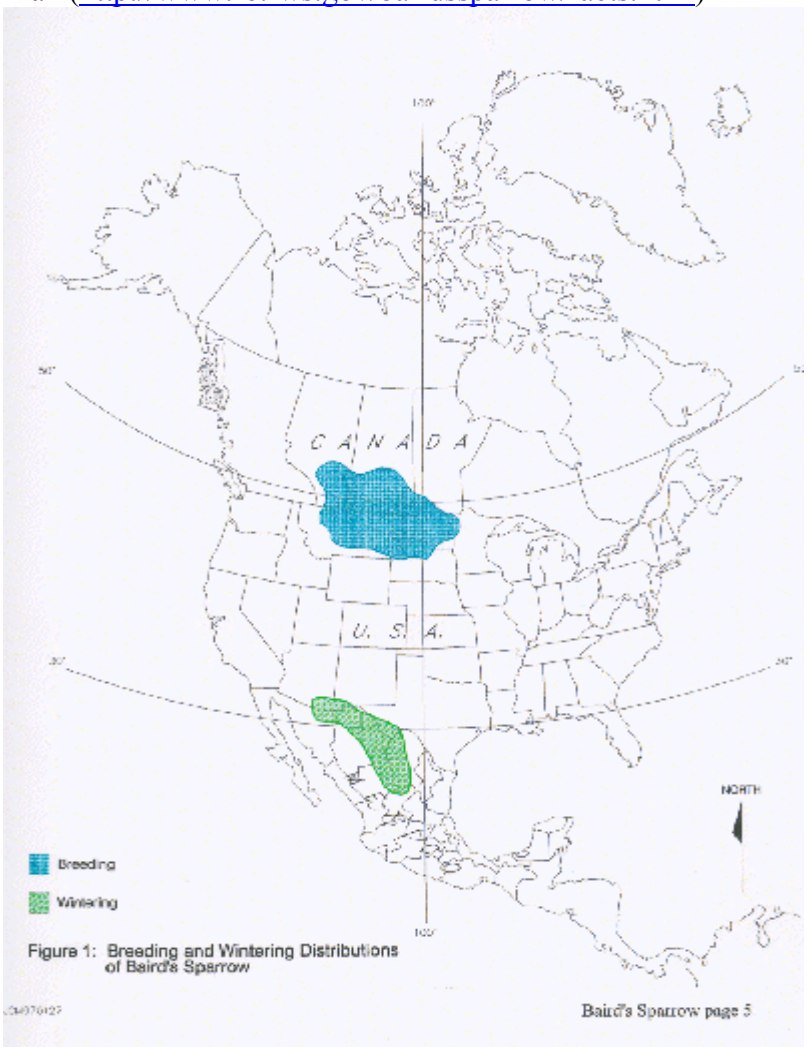
In the southwest, Baird's sparrows are found in open grasslands, overgrown fields, dense stands of grass, and usually in extensive expanses of grasslands. They seem to prefer areas of taller, denser grass. They can also be found in south-facing slopes of mixed-oak grassland where they occupy grassland habitat and the north slopes support the oak. They prefer open, mixed short-grass prairie consisting of native species and forbs with small, widely scattered shrubs. They avoid areas with excessive litter and or heavy shrub development. Habitat regions/land cover associations used by Baird's sparrows in the southwest include: Chihuahuan Desert Grassland (black grama and tabosa/sacaton), Great Plains-Short Grass Prairie (grama-buffalo grass), Rocky Mountain Forest (ponderosa pine-Douglas-fir forest), Colorado Plateau (grama-galleta steppe/pinyon- juniper woodland mosaic) and Upper Sonoran (pinyon-juniper). In New Mexico, they range from prairies in the northeast and mountain meadows in the San Juan and Sangre de Cristo mountains, including elevation over 11,800 feet, to desert grasslands.

DISTRIBUTION AND ABUNDANCE

Baird's sparrows summer in the northern Great Plains, including parts of Minnesota, North and South Dakota, Montana, Saskatchewan, Alberta and Manitoba. They migrate to southeast Arizona (Cochise, Pima, Santa Cruz counties), east to southwest Texas and

northern Mexico in winter (including Hidalgo, Otero counties in New Mexico). Rare occurrences are reported across Arizona and New Mexico. Baird's sparrows arrive in the southwest between the first week of August into October and November. Early migrants may arrive in juvenile plumage. The species is seldom seen in the southwest during spring and apparently does not sing until returning to the Great Plains. They have shown a statistically significant decline of 3% per year between 1966 and 2001 according to Breeding Bird Surveys. Although the species is locally common where healthy habitat remains, overall they are uncommon.

Figure 1. Distribution map from Baird's sparrow Status Assessment and Conservation Plan (http://www.r6.fws.gov/bairdssparrow/facts.htm)



STATUS OF THE SPECIES AND STATE RANKS

AZ: Species of Special Concern (S2N – imperiled, nonbreeding)
NM: Threatened; full protection (S1N – critically imperiled, nonbreeding)
TX: Imperiled (S2)
FS/BLM: Sensitive

FWS: Species of Concern (a 90-day finding of not warranted for listing was published in the Federal Register May 21, 1999)

THREATS

Although estimated occurrence and population numbers still appear substantial for Baird's sparrows, the restricted range, spotty distribution, recent rapid and long-term population and range declines, few protected occurrences, and apparent habitat selectivity are cause for concern. Due to extensive habitat loss, the species will probably never recover to historic levels. Their habitat has been compromised by decline in native plants, negatively impacting both nesting and foraging. Problems with non-native plants like Kentucky bluegrass, leafy spurge and smooth brome have increased the loss of diversity and vigor in native plants. Improper livestock grazing, fire suppression, and plowing of native prairie for agriculture development have all led to decreases in habitat quality and quantity. Habitat loss and fragmentation have decreased both distribution and numbers of Baird's sparrows. In the Great Plains, cow bird parasitism and predation by a range of rodents, birds, and garter snakes have significantly reduced reproduction rates, particularly as patches of suitable habitat are further fragmented and reduced in size.

HABITAT/SPECIES MANAGEMENT RECOMMENDATIONS

Baird's sparrows do not like prairies with thick accumulations of litter, but do respond to management. Two or 3 years after fire, e.g., prescribed burning, Baird's sparrows are usually more abundant. Occasional burning is suggested to maintain dense graminoid vegetation and reduce the number of shrubs, but not so often that the litter never accumulates. Moderate mowing is beneficial in wetter areas, but in arid habitat, mowing may be detrimental. Baird's sparrows have responded negatively to improper grazing practices in grasslands of the southwest and Mexico while over wintering. A program called Partners for Wildlife in North Dakota has developed initiatives to keep cattle producers on the land to prevent the conversion of native prairie to croplands. However, moderate or lightly grazed pastures have fewer birds than undisturbed habitats and grazing could be detrimental in the more arid areas. Although the Federal Register notice does not include Arizona as part of Baird's sparrow wintering habitat, the US Fish and Wildlife Service Region 6 Baird's sparrow fact sheet does, similar to other sources. The health of Baird's Sparrow populations depends upon the protection of native short-grass prairies in breeding and wintering areas. Conserving and restoring larger patches of southwest grasslands should improve fitness and survival of migrant Baird's sparrows. Quantitative data on habitat requirements, including preferred habitats in both breeding and wintering seasons are needed. Also unknown is the relationship between patch size and numbers of Baird's sparrows.

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APPENDIX G

CALIFORNIA FLOATER

Class	Order	Family	Genus	Species
Bivalvia	Unionoida	Unionidae	Anodonta	californiensis

SPECIES DESCRIPTION AND TAXONOMY

The California floater is a freshwater clam with an extremely thin, large shell, about 80 mm (3.20 in.), hinge has no teeth. This species was reported in Utah by Call (1884) as *Anodonta nuttalliana*, the name under which he synonymized *A. nuttalliana*, *A. wahlametensis*, and *A. californiensis*. As currently recognized, this species is monotypic, but may be a composite species with *A. nuttalliana*, *A. wahlametensis*, and *A. oregonensis*. Combining these species into one has not been generally accepted. The 1998 American Fisheries Society publication separates all but *A. wahlametensis*. Mock et al. (2005) found a lack of resolution in phylogenetic reconstructions of *Anodonta* populations in the Bonneville Basin, Utah, but there was a tendency for the Bonneville Basin Anodonta (tentatively *A. californiensis*) to cluster with *A. oregonensis* from the adjacent Lahontan Basin in Nevada. Freshwater clam with an extremely thin, large shell, about 80 mm (3.20 in.), no teeth.

LIFE HISTORY

As bivalves, California floaters are filter-feeders that trap and consume plankton. Adult freshwater mussels are largely sedentary spending their entire lives very near to the place where they first successfully settled. Movement occurs after stimulus (i.e., water disturbance, physical removal from the water such as during collection, exposure conditions during low water, seasonal temperature change or associated diurnal cycles) and during spawning. Movement is confined to either burrowing deeper into sediments though rarely completely beneath the surface (vertical movement), or in a distinct path often away from the area of stimulus (horizontal movement). Vertical movement is generally seasonal with rapid descent into the sediment in autumn and gradual reappearance at the surface in spring. Horizontal movement is generally less than a few meters. Such locomotion plays little, if any, part in the distribution of freshwater mussels as these limited movements are not dispersal mechanisms. Several factors may be responsible for species distribution within a stream including stream size and surface geology (Strayer 1983, Strayer and Ralley 1993), utilization of flow refuges during flood stages (Strayer 1999), and patterns of host fish distribution during spawning periods (Watters 1992).

Nearly all mussels require a host or hosts (usually fish) during the parasitic larval portion of their life cycle. No information is available on the host species for California floaters, but Haag and Warren (1998) found patterns of mussel community variation were correlated with patterns of fish community variation but not with habitat. Densities of host-specialist mussels without elaborate host-attracting mechanisms were correlated positively with host-fish densities. They hypothesized that mussel species dependent on

host-fish density are restricted to sites with stable numbers of hosts and mussels not dependent on host-fish density are able to persist in areas with more unstable fish assemblages. If California floaters are non-displaying host specialists, then their populations are correlated with native fish species.

Fertilization occurs internally with eggs fertilized by sperm brought though the brood pouch (formed by the gills of the female) with respiratory currents of water. Eggs are continually bathed by currents while incubating and hatch into larvae (glochidia). Upon release by the female, glochidia fall to the substrate. *Anodonta* glochidia have hooks on the edge of their shells which aid their attempt to attach to tail edges or fins of host fish. Glochidia may use chemical cues to detect and attach to host fish; however, glochidia do not appear to be host specific but attach to any fish they contact (Thorp and Covich 1991). Unsuitable host fish reject glochidia, sloughing them off after encystment. Glochidia encyst in host tissues within 2-36 hours at attachment (Thorp and Covich 1991). The time to juvenile metamorphosis and encystment is approximately 27 days. Once the mussel detaches from its host, the juvenile stage begins and lasts about two years. During this time organs transform from immature to adult state. Although life span of A. *californienisis* is unknown, closely related species live about 10 to 15 years (Hulen 1988).

HABITAT REQUIREMENTS

A. californiensis is a low elevation freshwater mussel species that is found in both lakes and lake-like stream environments (Frest and Johannes, 1995), preferring shallow areas of unpolluted perennial waters. Shallow areas, less than 2 m. deep in unpolluted lakes, reservoirs, and perennial streams 4,000 - 8,670 ft. (1,220 - 2,644 m) elevation are the preferred habitat of freshwater mussels. Adult mussels typically live in mud or sand and juveniles in loose sand.

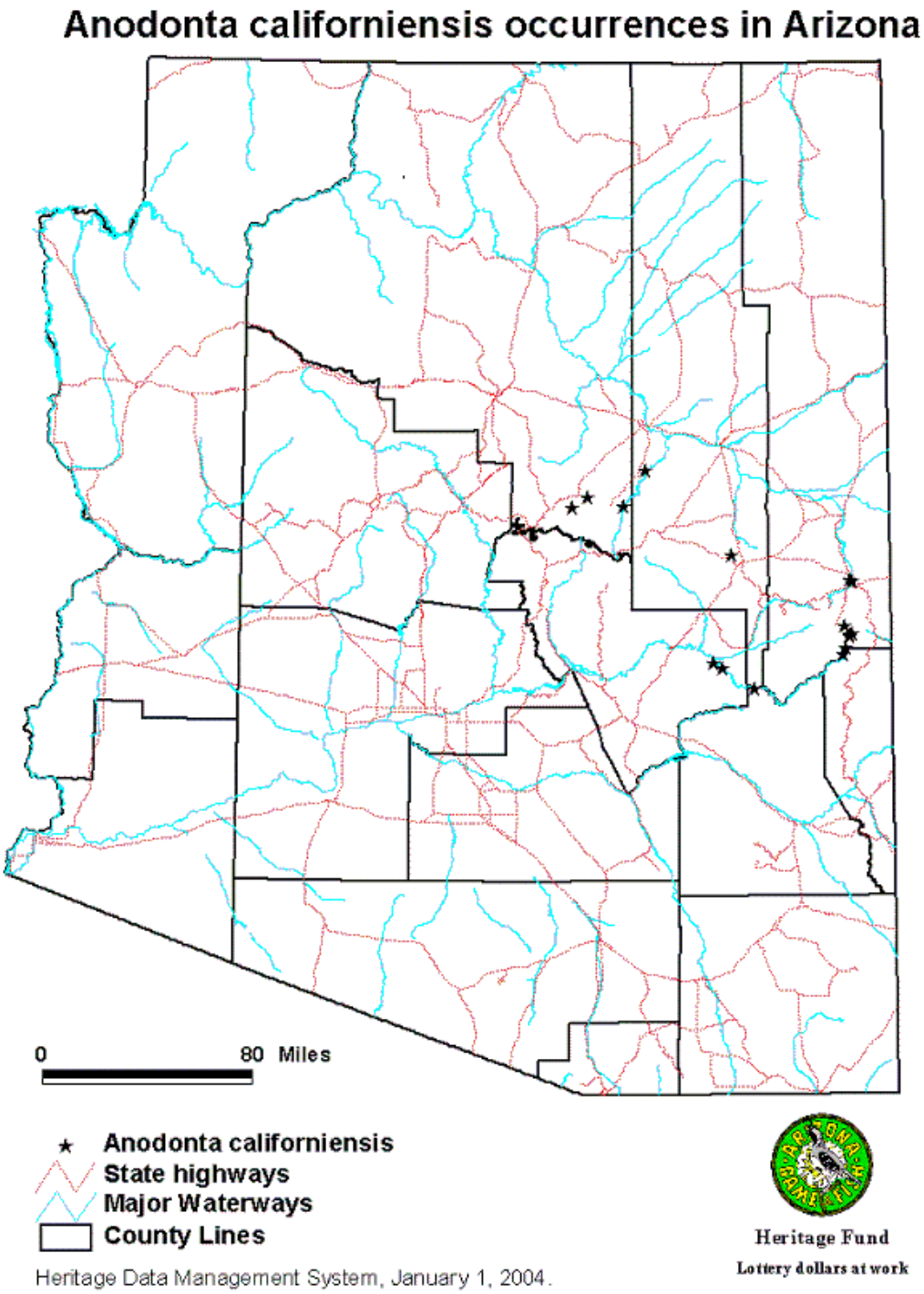
DISTRIBUTION AND ABUNDANCE

Widely distributed though scarce and patchy Frest and Johannes (1995) report it is declining in terms of area occupied and number of sites and individuals. Range is unclear due to taxonomic uncertainty with the Pacific Drainage members of this genus. In the broadest view, it once ranged from Southern British Columbia to northernmost Baja California, eastward to western Wyoming, eastern Arizona and Chihuahua, but this distribution probably includes records for other species (Taylor, 1981). Clark and Hovingh (1993) state that "As presently understood this species occurs in California, Nevada, Utah, and Arizona." and that the closely related *A. nuttalliana* occurs in Oregon, Washington, and British Columbia. Presently, Frest and Johannes (1995) report the range has been reduced and extant populations are currently found in the following areas: the Middle Snake River in Idaho; the Fall and Pit rivers in Shasta County, California (likely extirpated from the Death Valley Basin, Los Angeles Basin, and Central Valley in Caifornia (Hovingh, 2004); the Okanogan river in Chelan County, Washington; and Roosevelt and Curlew lakes in Ferry County, Washington. Extant occurrences in the Columbia and Snake river systems are threatened by river impoundment. No living specimens were found in the Willamette and lower Columbia rivers in searches by Frest and Johannes conducted from 1988-1990. Taylor (1981) reports that most of the natural

populations in California have been eradicated and it is probably extinct in most of the Central Valley of southern California. In Utah the only recent records are in two widely-spaced locations, Big Creek and Reddin Spring pond, but it may still be extant in the Raft River and portions of the Bear River drainage (Clark and Hovingh, 1993). It is extirpated from Utah Lake. Hovingh (2004) found it widely distributed in the Humboldt River drainage (Lahontan Basin) in northern Nevada, in the Bonneville Basin in Utah, Nevada, and Wyoming, and in the Malheur and Warner Basins in Oregon. Arizona counties include: Apache, Coconino, Gila, Graham, and Navajo. Likely extirpated from the Colorado River Basin in Arizona. Reported to occur in the following Arizona watersheds (with HUC codes): Little Colorado headwaters (15020001), Silver (15020005), Middle Little Colorado (15020008), Chevelon Canyon (15020010), Black (15060101).

Current range in Arizona is within Apache County and today it is found only in the upper Black River in the Alpine Ranger District of the Apache-Sitgreaves National Forest, Arizona, to at least the White Mountain Apache Reservation. A population may still be extant on Chevelon Creek according to Landye (1981). Current land managers in California floater habitat within Arizona include USFS - Apache-Sitgreaves and Coconino National Forests; AGFD Becker Lake; Private.

Figure 1.



STATUS OF THE SPECIES AND STATE RANKS
AZ: S1S2* (State Species of Special Concern)
Utah: S1

Nevada: S1
California S2? (inexact numeric rank)
National Status: N3
British Columbia: S3
Global Status: G3Q**
Rounded Global Status: G3 – Vulnerable
USFS Sensitive: Region 3 (New Mexico and Arizona)
* A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species due to lack of information.
** Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority.

THREATS

Several factors have been identified as causing declines in this species. They include alteration and destruction of riverine habitat, declining water quality, competition with and predation by nonnative fish. Pesticides in agricultural run-off, habitat degradation by cattle, and water diversion are the most immediate threats. The proliferation of the introduced Asian clam (*Corbicula manilensis*) may also be adversely affecting the California floater through interspecific competition. In Arizona it has been noted that possible declines may also be linked with reduced populations of native fish that serve as larval hosts.

The species can tolerate some water pollution, but not heavy nutrient enhancement (Frest and Johannes, 1995). Destruction of mussel habitat has ranged from the obvious -- dams, dredging, and channelization -- to the more subtle siltation and contaminants. Dams change the physical, chemical, and biological environment of streams, both upstream and downstream of the structure, to the point that approximately 30% to 60% of the mussel fauna is destroyed. The most detrimental effect of dams is likely the disruption of the reproductive cycle by eliminating host species (Williams, J.D. et al., 1992).

HABITAT/SPECIES MANAGEMENT RECOMMENDATIONS

The California floater is not specifically protected. Some populations could be indirectly protected if they are located on Federal, state or local lands. However, no public agency is known to specifically manage sites for the California floater. Inventory is needed, particularly in drainages in Arizona, as is continued monitoring of known populations. The identification of potential for restoration of original habitat and reintroduction sites and research on effects of suspected competitors and predators is important information needed for this species.

As *A. californiensis* is closely associated with species of fish, once the host or hosts are known, a total fish-molluscan management plan should be developed to avoid developing a habitat to improve one native species at the expense of another native species. No information is available on the California floater in the majority of its range.

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APPENDIX H

MEXICAN GARTERSNAKE

Class	Order	Family	Genus	Species	Sub Species
Reptilia	Squamata	Colubridae	Thamnophis	Eques	Megalops

SPECIES DESCRIPTION AND TAXONOMY

Gartersnakes are characterized by having unmodified nasal scales (rostrals), keeled dorsal scales, and two prefrontals. There is little variation within the pattern of scales among the different varieties of garter snakes, but coloration varies widely across varieties and geographic regions. Mexican gartersnakes ranges in color from olive to olive-brown to olive-gray versus whitish in similar species. Mexican gartersnakes resemble many other species of garter snakes in possessing striping along the length of its body. In Mexican gartersnakes, 3 stripes run the length of the body with an orange to yellow dorsal stripe that darkens toward the tail and buff to yellow lateral stripes. A portion of the lateral stripe occurs on the 3rd and 4th scale rows. In sympatric gartersnake species, the lateral stripe begins on the 2nd or 3rd scale rows. Paired black spots extend along the dorsolateral fields between the dorsal and lateral longitudinal stripes. A light-colored (whitish to greenish) crescent extends behind the corners of the mouth. Mexican gartersnakes typically reach lengths of 40 to 44 inches, although the greatest reported length for a T.e.megalops specimen is 448 inches (Boundy 1995).

LIFE HISTORY

Sexual maturity in male Mexican gartersnakes occurs at 2 years, and in 2-3 years in females. This species mates in April and May in their northern distribution and the neonates emerge in July and August. Mexican gartersnakes are ovoviviparous (embryo gains no nutritional substances directly from the female while fertilized eggs are developing within her), giving live birth to between seven and 26 young (average = 13.6) young. Only half of the sexually mature females within a population reproduce in any given season. Mexican gartersnakes use underground burrows and dens and are surface-active at ambient temperatures ranging from 71° F to 91° F.

Mexican gartersnakes forage along the banks of water bodies. An important component of suitable Mexican gartersnake habitat is a stable prey base. They feed primarily upon native fish (e.g., Gila topminnow, desert pupfish, etc.) and native ranid frogs (e.g., adult and larval lowland leopard frog, Chiricahua leopard frog, etc.). They may also supplement their diet with vertebrates such as lizards, small rodents, salamanders, and hylid frogs (treefrogs) and earthworms, leeches, and slugs. Although adult Mexican gartersnakes prey upon juvenile nonnative tadpoles and bullfrogs, predation from nonnative adult bullfrogs is a major mortality factor.

HABITAT REQUIREMENTS

Mexican gartersnakes most frequently occur between 3,000 and 5,000 feet elevation, but have been found up to 8,500 feet. In the northern part of the range, they are usually found in or near water in highland canyons with pine-oak forest and pinyon-juniper woodland. Mexican gartersnakes have also been found in mesquite grasslands and low to middle elevational watercourses with cottonwoods, willows, and other riparian vegetation. Despite the variety of terrestrial habitats, Mexican gartersnakes are typically an aquatic species. They are associated with marshes (rush/bulrush/sedge/cattail), lowland riparian (cottonwood/sycamore), and springs. The aquatic components of their habitats are characterized by shallow, slow-moving, and at least partially vegetated waters. Mexican gartersnake habitat in Arizona has been described as: 1) source area ponds, including stock tanks and cienegas; 2) lowland river riparian forests and woodlands; and 3) upland stream gallery forests. The species uses densely vegetated cienegas, cienega-streams, and stock tanks in Mexico and within its historical distribution in New Mexico.

DISTRIBUTION AND ABUNDANCE

The historical distribution of Mexican gartersnakes in the U.S. included the Santa Cruz, San Pedro, Colorado, Gila, Salt, Agua Fria, and Verde river watersheds in Arizona and the upper Gila River watershed in New Mexico. It also occurred from the United States border south through central Mexico, including the Sierra Madre Occidental and the Mexican Plateau.

Mexican gartersnakes now occur primarily in central, south-central, and southeastern Arizona, primarily near permanent marshes and springs. In southeastern Arizona, their current distribution includes the San Bernardino National Wildlife Refuge, Appleton-Whittell Research Ranch), Huachuca Mountains, San Raphael Valley, Canelo Hills, Sonoita Grasslands, Babocomari, Ciénega Creek, Arivaca Cienega, and the San Pedro River. However, most of these populations are small or declining.

In New Mexico, this species is known from two sites in the Upper Gila watershed in Grant County (along Duck and Mule creeks) and one in Hidalgo County (near Virden). It may now be eliminated from Duck Creek and a record from a single locality along Mule Creek is the only recent record. Apparently there is disagreement as to whether Mexican gartersnakes have been extirpated in New Mexico or whether they still occur in the Upper Gila watershed.

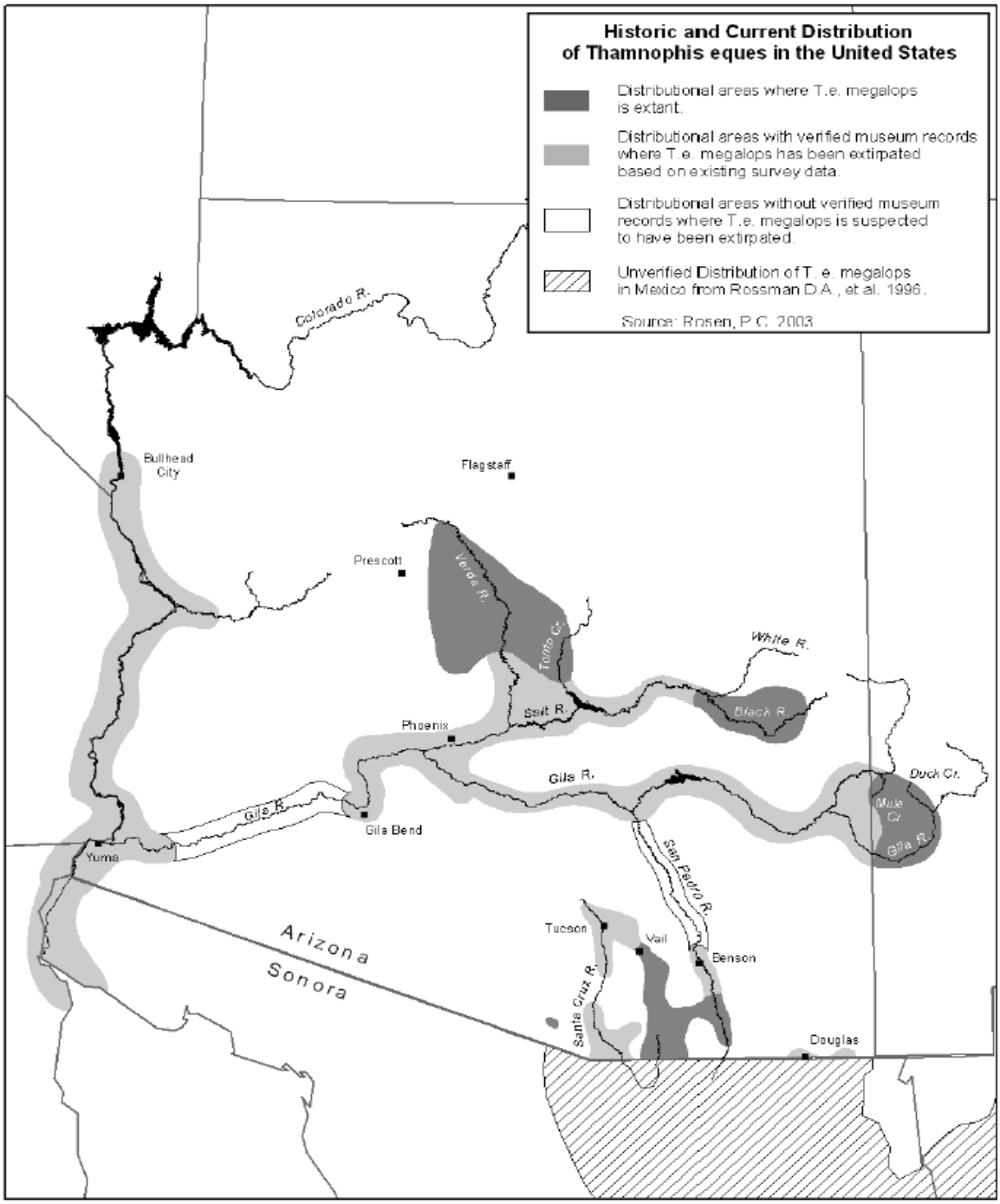

Figure 3: Distribution of the Mexican garter snakes in the U.S.
from http://www.biologicaldiversity.org/swcbd/species/garter/hist-curr-map.gif

STATUS OF THE SPECIES AND STATE RANKS

AZ: Species of Special Concern (S2S3 – ranges from imperiled to vulnerable to extirpation or extinction)

NM: Endangered; full protection (S1 – critically imperiled)

NV: SH – part of historic range but may be extirpated
FS/BLM (NM): Sensitive
FWS: No Federal status (a 90-day finding found substantial scientific and commercial information indicating that listing may be warranted; a status review is underway)
Global Status: S5 – secure
National Status: N2N3 – ranges from imperiled to vulnerable to extirpation or extinction

THREATS

The U.S. Fish and Wildlife Service was petitioned December 15, 2003 to list the Mexican gartersnake as an endangered or threatened species with critical habitat under the Endangered Species Act. The petition sought protection of the snake's habitat from livestock grazing and other threats, establishment of minimum instream flows in Southwest rivers, prohibitions on further introductions of non-native fish and amphibians, and more funding for research and removal of non-natives. The Fish and Wildlife Service concluded the petition presented substantial scientific and commercial data that may warrant listing. A status review is currently underway.

Threats to the Mexican gartersnake include: 1) destruction and modification of its habitat; 2) predation on the subadults from nonnative species, primarily bullfrogs; 3) significant reductions in its native prey base; 4) genetic effects from fragmentation of populations; and 5) overcollecting.

Reductions in the range and distribution of Mexican gartersnakes in Mexico have been associated with loss or alteration of aquatic habitats. Across the southwest, riparian habitat has been dramatically reduced. Remaining habitat is increasingly compromised by introductions and expansions of non-native species. Over the last century, habitat within the range of the Mexican gartersnake has been impacted by: irrigation and dewatering; channelization and other modifications to stream morphology; and siltation and arroyo-cutting. These activities have largely resulted from agriculture development, and effects of urbanization.

Improper livestock management has contributed to the unraveling of aquatic habitats. In addition to impacts to stream geomorphology, grazing also removes both aquatic and terrestrial vegetation. Especially vulnerable to loss of hiding cover are small, isolated populations of Mexican gartersnakes in areas of limited habitat. Removal of cover for even a single season could eliminate a population.

Competition and predation by non-native species represents perhaps the most immediate threat to Mexican gartersnakes. The decline of native frogs and native fishes, which serve as critical food resources for the snake, has contributed to the decline in Mexican gartersnakes. Bullfrogs, domestic geese, bass, catfish, sunfish, pike, and non-native crayfish also prey upon Mexican gartersnakes. Bullfrogs consume young Mexican gartersnakes (1-3 years old) and can effectively remove these age/size classes from local populations. Mexican gartersnakes reproduce when sympatric with bullfrogs, but until young snakes outgrow vulnerability to bullfrog predation, survival is low. In one study, even larger, older Mexican gartersnakes had damaged tails from repeated bullfrog bites.

Bullfrogs are cannibalistic, allowing reproductively mature members of the population to survive times of prey scarcity. Populations in the San Bernardino National Wildlife Refuge are declining due specifically to the introduction of bullfrogs.

Figure 1. In this unstaged photograph, taken at Parker Canyon Lake, Cochise County Arizona 1964, an introduced bullfrog is swallowing a Mexican garter snake, which is normally a frog-eating species. http://biology.usgs.gov/s+t/noframe/x188.htm#31389

HABITAT/SPECIES MANAGEMENT RECOMMENDATIONS

Riparian habitat restoration, enhancement, and maintenance are essential. Recovery of native prey species (i.e., fish and frogs) and eliminating non-native predators, particularly bullfrogs, is necessary to create functional ecosystems for Mexican gartersnakes. Prohibitions against taking and excessive collecting need to be enforced to protect remnant populations. The petition seeking ESA protection made the following recommendations: protect Mexican gartersnake habitat from livestock grazing and other threats; establish minimum instream flows in southwest rivers; prohibit further introductions of non-native fish and amphibians; increase funding for research and non-native removals.

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APPENDIX I

POLING'S HAIRSTREAK

Class	Order	Family	Genus	Species	Sub Species
Insecta	Lepidoptera	Lycaenidae	Fixsenia	polingi	[organensis]

SPECIES DESCRIPTION AND TAXONOMY

Poling's hairstreak is a butterfly and is part of the forest and woodland hairstreak group (Subfamily Theclinae). Butterflies in the hairstreak subfamily usually have two or three hair like tails on the hind wings. Opler and Warren (2002) state, "Species previously place[d] in *Fixsenia* Tutt, 1907 and *Harkenclenus* dos Passos, 1970. Note that NatureServe classifies *F. p. organensis* as a distinct subspecies in addition to the species description.

Poling's hairstreak is brown underneath, with a single traverse line (dark, outer edge white) on forewings and hind wings. Two tails occur on each hind wing with a blue tail-spot capped narrowly with orange; a black-edged white "W" is near the inner margin of the underling. Upper sides lack any tawny patches. Wing span measures 1-1⅜ inches (2.5 – 3.0 cm). Although many hairstreaks appear similar, Poling's is relatively easy to identify because no closely related species occur sympatrically. Poling's hairstreak is very similar in appearance to the southern hairstreak (*F. favonius*). Although the southern hairstreak does occur in northeast New Mexico and west Texas, the 2 species do not occur together. The gray hairstreak (*Strymon melinus)* occurs across Arizona and New Mexico and is similar in size and pattern, but distinctly is gray, not brown beneath.

LIFE HISTORY

Adults fly in mid-May to June, and again in mid-August to early-September. Second flight may be partial and is highly unusual (probably unique) for the *Fixsenia/Satyriu*m group. Second flight larvae presumably feed on new growth resulting from summer rains and hatch the following spring. Eggs are laid singly on host plant twigs, specifically gray oak (*Quercus grisea*) and very likely Emory oak (*Q. emoryi*) as well. Eggs over winter and larvae presumably hatch in spring around bud burst. Larvae feed on new growth (leaves, buds), and probably male catkins of gray and (probably) Emory oak. Assuming a pupal period of about three weeks, as is typical for this group, larvae would finish feeding around late-April. Second brood larvae apparently reach full size about late-July.

Adults use nectar from a variety of flowers, including milkweed and catsclaw acacia. Poling's hairstreaks are non-migratory and sedentary, although they probably do occasionally move between habitat patches within oak woodlands. They are rarely seen more than a few hundred meters outside habitat patches, generally only leaving in search of nectar when nectar flowers are scarce.

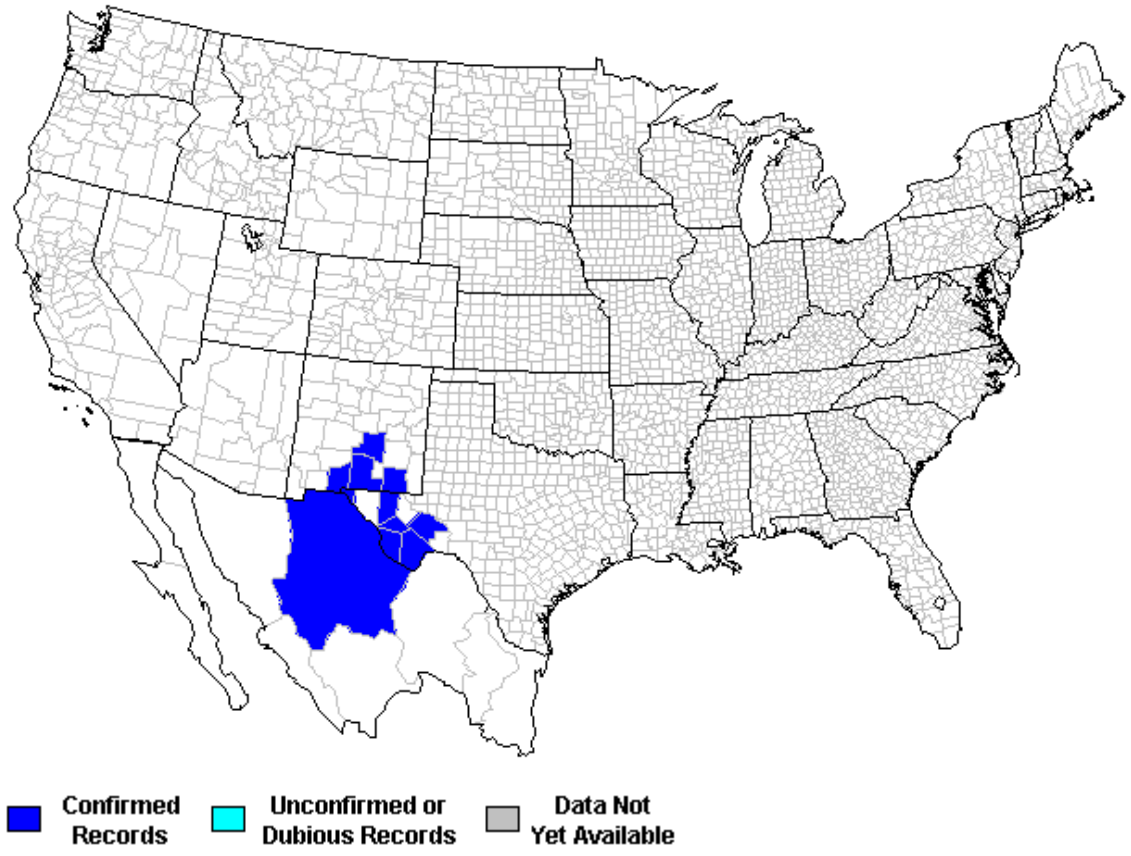
HABITAT REQUIREMENTS

Habitat for the forest and woodland hairstreak group may cover several thousand hectares and measure 5-10 kilometers or more in at least one dimension. Because Poling's hairstreaks feed on the dominant or co-dominant vegetation of the canopy or shrub layer, the larvae and adults tend to be widely distributed across the habitat. Territorial males may seasonally be much more localized than females. However, both sexes can be concentrated when nectar flowers are scarce. While there are no hard data, a distance of 2 kilometers is probably more than enough to effectively separate populations.

DISTRIBUTION AND ABUNDANCE

Their range extends from southern New Mexico into west Texas and south into Coahuila state, northeastern Mexico. Poling's hairstreak occurs in Dona Ana, Eddy, Lincoln, and Otero counties, New Mexico, within the Organ Mountains range. They are restricted to the Davis and Chisos Mountains in Texas. There are no reports of serious population declines, but little information exists regarding their status. *F. p. organensis* is known only from Organ, Guadalupe, and Capitan Mountains in New Mexico (Cary and Holland 1992).

Figure 1. Poling's Hairstreak *(Fixsenia polingi).* Occurrences are recorded as merely presence/absence by state (Mexico) or county; map does not include *F. p. organensis*.



STATUS OF THE SPECIES AND STATE RANKS

AZ is outside the range of *F. polingi*

NM: Not Ranked/Under review (SNR/SU) – includes *F. p. organensis*
TX: Critically Imperiled (S1) – *F. p. organensis* occurs in the Guadalupe National Park, Guadalupe Mountains, Texas.
Global: Imperiled because of rarity (less than 20 occurrences). At high risk of extinction due to very restricted range (G2)
Rounded Global Status for *F. p. organensis* is Critically Imperiled (T1)
Global Range: less than about 40-100 square miles (less than 100-250 square km).
National Status: Critically imperiled due to extreme rarity (N1) – includes *F. p. organensis*
FWS (NM Ecological Services Field Office): Species of Concern at the species level

THREATS

Very restricted range, no documented large scale threats, but little information is available. Unknown whether any populations are protected or managed. Habitats are subject to improper grazing by livestock and ungulates which may reduce survival of host seedlings. Invasion of alien weeds may be possible but is unreported.

HABITAT/SPECIES MANAGEMENT RECOMMENDATIONS

Surveys would address the current absence of data regarding Poling's hairstreak distribution within seemingly suitable habitat. Status of host oak populations and nectar availability should be inventoried and monitored. Livestock, game, and noxious weed management should be reviewed relative to direct and indirect impacts to gray and Emory oak. Pesticide and herbicide use within potential habitat should be timed to avoid impacts to Poling's hairstreak larvae and adults.

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APPENDIX J

RIO GRANDE SUCKER

Class	Order	Family	Genus	Species
Osteichthyes	Cypriniformes	Catostomidae	Catostomus	plebeius

SPECIES DESCRIPTION AND TAXONOMY

The Family Catostomidae is characterized by soft fin rays and fleshy, subterminal protractile mouths. The Rio Grande sucker was described by Baird and Girard in 1854 from specimens obtained from the Mimbres River, New Mexico. It was eventually placed in the genus *Pantosteus*, and later moved to the genus *Catostomus* when *Pantosteus* was reduced to a subgenus. Rio Grande suckers, like other members of the subgenus *Pantosteus*, have jaws with well-developed, cartilaginous scraping edges.

Rio Grande suckers are small-sized for Catostomids. Raush (1963) conducted extensive age and growth research on over 700 individual Rio Grande suckers in Jemez Creek, New Mexico. After one year of growth, the average standard length (SL) of juveniles was 1.3 inches (33 mm). The oldest males captured were age six and averaged 5.3 inches SL (134 mm); the oldest females were age seven and 6.7 inches SL (169 mm). Males mature at SLs of 2.3 to 3.1 inches and females mature at SLs of 2.8 to 3.5 inches.

Rees and Miller (2005) described the following characteristics from Sublette et al. (1990) for distinguishing Rio Grande suckers from other Catostomids (counts presented equal the most common or average number followed by the range of values found in the literature inside the brackets):

"Coloration: Back and sides brownish-green to dusky brown overlain with darker blotches; abdomen paler with mottling often present on the sides; peritoneum silvery/dusky with scattered melanophores. Caudal rays pigmented, interradial membranes lacking pigment.

Head: Mouth ventral; snout broad. Lips uniformly papillose, including external surface of upper lip; lower lip thick, fleshy; a deep median cleft with two or three rows of papillae between the base and lower jaw; well developed notches at the junction of upper and lower jaws. Cartilaginous ridge of mandible slightly convex; width of mandibular ridge = 20.8 mm (19.2-23.8 mm); Isthmus width = 6-9 mm. Gill rakers papillose; rakers on outer row usually less than 25 (20-27), inner row usually less than 35 (26-37) in specimens longer than 70 mm SL (Smith 1966; Smith et al. 1983). Pharyngeal teeth in a single row, 22-23, weakly bifurcate; diminishing in size towards the dorsal apex, becoming strap-like and ultimately spinose. Fontanelle nearly closed in young specimens; nearly always closed in adults.

Body: Shape round and tapering, moderately depressed dorsoventrally. Maximum SL 260 mm. Caudal peduncle deeper than in other members of the subgenus Pantosteus; Caudal peduncle depth = 10.5 mm (9.5-11.9 mm). Predorsal scales

usually less than 50 (40-55). Scales in lateral line usually 79-92 (74-99). Scales above the lateral line 14-15. Vertebrae 38-46 (Snyder 1979).

Fins: Dorsal triangular, short, Pectorals bluntly pointed; auxiliary process absent. Pelvics oval; inguinal process absent. Anal elongate, extending posteriorly to base of caudal fin. Caudal deeply forked, lobes bluntly pointed. Rays: dorsal 9 (8-10); pectorals 14-15; pelvics 9 (8-10); anal 7.

Sexual differences: Breeding males black on dorsum with a crimson red lateral stripe, sometimes with a yellow golden band above; tuberculate on the anal and caudal fins and caudal peduncle; the dorsal side of the pectoral and pelvic fins occasionally with smaller tubercles. During spawning season, females with large tubercles on the ventral part of the caudal peduncle and rarely on the anal fin (Smith 1966)."

LIFE HISTORY

Information on Rio Grande suckers regarding survival rates, fecundity, and sex ratio are sparse. These characteristics often depend on location (e.g., stream size, habitat) and their high degree of variability likely results from data being restricted to single site locations.

Timing of their life cycle is affected by latitude. In Mexico, most Rio Grande suckers were sexually mature by age 2; in New Mexico fish did not become sexually mature until they were 3-years-old. Spawning can begin as early as February in Mexico, but typically occurs in May – July in New Mexico (Raush 1963, Smith 1966, Rinne 1995). Rio Grande suckers in Hot Creek, Colorado have also been observed in spawning condition and coloration in autumn, which may be a result of the influence of thermal springs in the drainage (Zuckerman and Langlois 1990, Swift 1996). Spawning habitat consists of flowing water with fine gravel where they form gravel nests. Female Rio Grande suckers >3.9 inches (100 mm) total length reportedly produce an average of 2,035 mature ova. Typical of many fish species, the Rio Grande sucker likely has a high mortality rate from egg through age 1, and a high mortality rate following the first year of spawning. Other life-stages are assumed to have lower mortality rates. Spawning and recruitment likely take place each year but with a high rate of variability. Overall success depends on location and fluctuating environmental conditions.

Rio Grande suckers feed in swift waters over rocks and gravel bottoms. They may be the most omnivorous of the *Pantosteus* subgenus and have been reported to eat aquatic insects, fingernail clams and other mollusks, microcrustaceans, annelids, and mosses. They have specially adapted mouths for scraping periphyton from benthic rocks and from the interstitial gravels between cobble and boulders found in riffles [periphyton refers to a complex matrix of algae and heterotrophic microbes attached to submerged substrata]. Gut contents of young-of-the-year from Jemez Creek consisted of 59 percent animal matter and 41 percent algae. Animal matter was primarily Cladocera and algae consisted mostly of diatoms. The mouth shifts to a completely ventral position as they grow into a juvenile life-stage and feeding behavior appears to be similar to that of adults. Growth rate and age of maturity likely depend on the thermal regime and food resources of a given stream.

HABITAT REQUIREMENTS

In general, Rio Grande suckers typically occur in middle elevations (6,600-8,600 feet) of small to large streams (i.e., creeks to medium rivers). They favor low to moderate gradient riffles and pools below riffles in low velocity stream reaches. They are usually found over gravel and/or cobble, but can also be in backwaters. Rio Grande suckers prefer clear-water streams where periphyton is common and are rarely found in waters with heavy loads of silt and organic detritus. During a survey of streams in Mexico, Hendrickson et al. (1980) noted that Rio Grande suckers occupied pool habitat during the day and moved into riffle habitat for feeding at night and during the early morning. Movement or dispersal patterns (e.g., larval drift) have been described in more detail for other catostomid species, but it is unknown whether Rio Grande suckers display similar behavioral strategies. White (1972) found young-of-the-year Rio Grande suckers (0.4-0.9 inches/11-22 mm long) using relatively low velocity stream margins. They were schooled in groups of 20 or 30, often in shaded areas. These fish were making frequent darting movements that were presumed to be feeding behavior.

In the Carson and Santa Fe National Forests of New Mexico, Rio Grande suckers were found in low gradient (<3.2%) stream reaches at elevations from 5,600-9,600 feet. Juveniles and adults both preferred glides and pools with mean water column velocities <20cm/s. They have also been found at elevations above 9,000 feet in the Rio de las Vacas, a third-order montane stream on the Santa Fe National Forest.

DISTRIBUTION AND ABUNDANCE

The native range of the Rio Grande sucker includes the Rio Grande and its tributaries in northern New Mexico and southern Colorado and in the Mimbres drainage in southwestern New Mexico. They also occur in three states of Mexico, including the Rio Yaqui basin and tributaries of Laguna de Guzman, Chihuahua, headwaters of Rio Piaxtla, Rio Mezquital, and Rio Nazas, Durango, and headwaters of Rio Trujillo, Zacatecas.

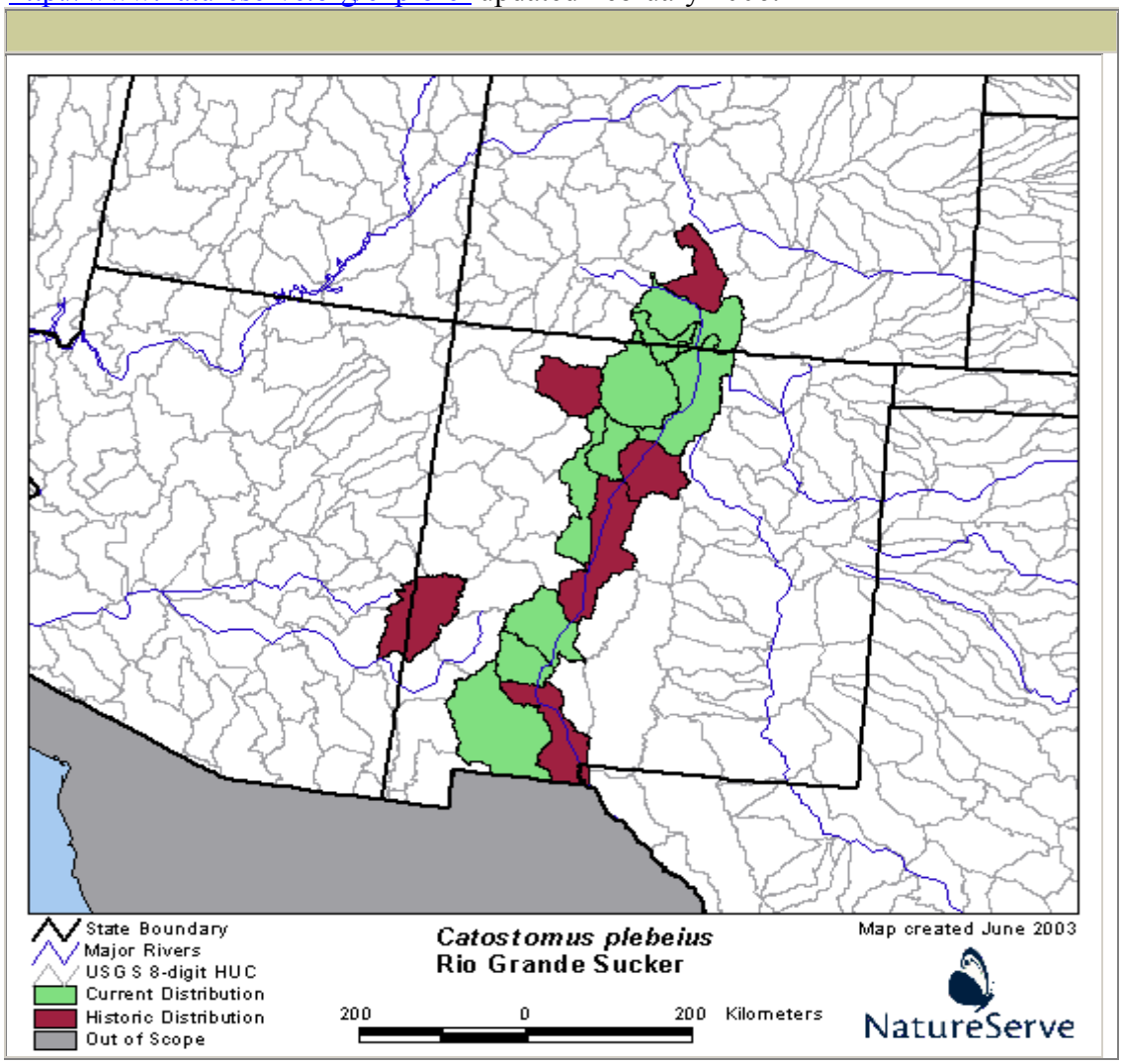
Rio Grande suckers steadily declined in range and abundance in the upper Rio Grande drainage and were almost eliminated from the northern portion of its range. Only 2 populations remain in Colorado: a small population in Hot Creek and a recently discovered population in Crestone Creek located in the Baca National Wildlife Refuge (the refuge was established in 2003). Although the genetic purity of this latter population is still being tested, it occurs in an isolated stream sympatric with other native fish species. There was only 1 identified population of Rio Grande sucker recognized in Colorado previous to the Crestone Creek discovery. Rio Grande suckers have been re-introduced into several Colorado streams since 1995.

Rio Grande suckers have been introduced into the Gila River basin in Arizona and New Mexico; the San Francisco drainage in Arizona and New Mexico; and the Rio Hondo of the Pecos drainage, New Mexico. They also occur in the Gila River and Sapello Creek (tributary of the Gila River); however, it is uncertain whether or not this population originated naturally via a stream capture from the Mimbres River or was introduced. A number of sizable and stable populations of Rio Grande suckers also occur in New Mexico: the Rio Grande (primarily north of the 36th parallel); tributary streams of the

Rio Grande (mostly north of the 35th parallel); and the Mimbres River (normally only in Grant county except during and immediately following periods of flooding when the species may occur further downstream). They are still moderately common in Guzman Basin where streams are free of sediments. Rio Grande suckers are apparently extant in Santa Fe County, but have never been found in Los Alamos or Bernalillo Counties. They are presumed to be extirpated from Valencia County.

Eleven populations of Rio Grande suckers were confirmed on the Santa Fe National Forest, including the Rio de las Vacas. Three populations were confirmed and 2 former populations were no longer detected on the Carson National Forest. Rio Grande suckers are uncommon in Gila National Forest. The Rio Grande suckers occur in the Bosque Del Apache National Wildlife Refuge.

Figure 1. U.S. Distribution of Rio Grande sucker by watershed http://www.natureserve.org/explorer updated February 2006.



STATUS OF THE SPECIES AND STATE RANKS

AZ: SNA – not applicable
NM: S2 – imperiled
CO: S1 – critically imperiled
Sonora: Threatened
Global: G3G4 – status uncertain, overall threat is ranks between vulnerable to extirpation and apparently secure
Rounded Global Status: G3 – Vulnerable*
USFS Sensitive: Region 3 (NM & AZ)

* Rounded Global Status is based on an algorithm to evaluate Conservation Status Ranks and systematically produce values easier to interpret without qualifiers or ranges (e.g. G2G4 becomes G3; G4T1? becomes T1).

THREATS

Although it has been reported that white suckers simply replaced native Rio Grande suckers in New Mexico, hybridization with introduced white suckers has generally been identified as the primary reason for the decline of the Rio Grande sucker. Hybrids between white suckers and Rio Grande suckers are thought to be infertile. Rio Grande suckers are considered extremely threatened in Colorado due to hybridization with white suckers. Hybridization between Rio Grande suckers and the white suckers has been reported in Hot Creek and hybridization with white suckers was reported in the McIntyre Springs population several years prior to the extirpation of Rio Grande suckers at that location (Zuckerman and Langlois 1990).

Habitat modifications that elevate sediments and dewater streams, leading to deceased oxygen and increased temperature and turbidity, have contributed to populations declines. Growth rate and age of maturity for Rio Grande suckers likely depend on thermal regimes and food resources in a given stream. Runoff patterns and thermal regime can also influence timing and success of spawning. Habitat modifications and sediment loads can be affected by improper grazing, which has led to unstable stream banks and increased fine sediment content that contributes to siltation of the stream substrate. Streams inhabited by Rio Grande suckers have also been negatively affected by transbasin water diversions, pollution, logging, recreation, and road building.

Most tributaries with Rio Grande suckers (reintroduced or natural populations) have become intermittent streams due to habitat management. This effectively eliminates gene flow between populations. The potential loss of genetic heterogeneity in isolated populations presumably leaves them more vulnerable to stochastic/catastrophic events.

In some waters, populations may have been extirpated by the introduction of predaceous northern pike; during the mid-1970s use of rotenone in an effort to improve sport fishing in the San Luis Valley, Colorado, coincided with population declines of Rio Grande suckers.

HABITAT/SPECIES MANAGEMENT RECOMMENDATIONS

Information regarding the biology and ecology of Rio Grande suckers prior to the recent decline in distribution and abundance is generally nonexistent and additional research into basic life history information is still needed. Specific research recommendations include: identifying the mechanisms by which white suckers and other non-native species limit the distribution and abundance of Rio Grande suckers; conducting additional studies of their life history and ecology; and using periphyton monitoring as a means to track potential and existing Rio Grande sucker habitat conditions. Periphyton (also known as "aufwuchs") is an important primary producer and can be an indicator of water quality. Biological indicators can show problems that can otherwise be missed or underestimated. Periphyton response to pollutants can be measured at a variety of times scales representing species to community-level changes. The Environmental Protection Agency supports periphyton as good biological indicators due to their:

- naturally high numbers of species;
- rapid response time to both exposure and recovery;
- identification to species level by experienced biologists;
- ease of sampling, requiring few people;
- tolerance or sensitivity to specific changes in environmental condition is known for many species (e.g., diatoms are useful indicators of biological condition because they are ubiquitous and found in all lotic systems).

Because these biological indicators integrate the effects of a variety of stressors, they reflect current conditions and cumulative effects over time. Assessing the condition of biological communities provides a basis to determine ecological potential and a measure of success in achieving that potential [http://www.epa.gov/bioiweb1/html/periphyton.html].

This species is particularly vulnerable to reduced stream flows and increased sediment loads. In streams where Rio Grande sucker management is a priority, the following activities can contribute to conserving the species: elimination or containment of introduced game species; following best management practices for livestock management, timber harvest, road building and maintenance to minimize sediment delivery to streams; managing recreation to limit disturbance within riparian areas; and maintaining historic levels of woody debris within streams and adjacent riparian areas. Maintenance of genetically pure captive stocks has also been recommended.

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APPENDIX K
WESTERN RED BAT

Class	Order	Family	Genus	Species	Subspecies
Mammamila	Chiroptera	Vespertilionidae	Lasiurus	blossevillii	teliotis

SPECIES DESCRIPTION AND TAXONOMY

The western red bat (*Lasiurus blossevillii*) is a medium-sized insectivorous bat that is red-brown in color and has a slightly smaller body size than the eastern red bat (*L. borealis*) (Jones 1961). Named for their distinctive coloration, only eastern red bats share the red to orange pelage that identifies western red bats. The bright color becomes cryptic once a bat is roosting in dead leaves of broad-leafed trees.

Eastern and western red bats were formerly considered subspecies: *Lasiurus borealis borealis* (eastern red bat) and *L.b. teliotis* (western red bat). Jones et al. (1992) accepted distinct species classification based on electrophoretic work by Baker et al. 1988. Western red bats were also reclassified at the genus-level from *Nycteris* to *Lasiuris*.

LIFE HISTORY

Much of the natural history of red bats comes from research on eastern red bats. Western red bats roost primarily in the foliage of trees or shrubs but also occasionally use caves. They are often associated with riparian habitat, especially mature cottonwood/sycamore forests (Hoffmeister 1986, Findley et al. 1975, Mumford et al. 1964, Jones 1961). Pierson et al. (2000) saw significantly more activity by western red bats in mature riparian forest at least 50 meters in width. Research indicates that they prefer roost trees approximately 15-20 feet in height with dense leaves near a natural or artificial water source (Constantine 1959, Pierson et al. 2000).

Western red bats tend to forage in close association with one another, and generally begin foraging 1-2 hours after sunset (Western Bat Working Group 2005). Foraging periods typically overlap evening emergence of nocturnal insects, followed by a decrease in activity until hours before sunrise when a secondary peak in insect activity occurs. Western red bats feed near lights, capitalizing on concentrations of insects. Large lepidopterans are considered main prey items, but homopterans, coleopterans, hymenopterans, and dipterans have also been reported in their diets (Western Bat Working Group 2005). Western red bats are considered fast fliers and capture prey in a pouch formed by curling their tail membranes, then grabbing prey with their mouths. Captures may require 3 or 4 attacks, each of which can take as long as 5 seconds. They typically feed along forest edges or in small openings. Long echolocation calls are used in open habitats at longer distances (5-10 m) and short calls are used when close to prey or when hunting in smaller openings.

Limited information exists on the reproduction of western red bats however it is believed that its reproductive life history is similar to that of eastern red bats. Western red bats mate in late summer or early fall, prior to migrating south. Fertilization is delayed until

spring when the northward migration begins. Gestation lasts approximately 80-90 days (Schmidly 1991). In New Mexico, pregnant females have been found from mid-May to mid-late June; and lactating females from mid-June to mid-July (Findley et al 1975). Twins are common for this species; however litters of up to 4 pups have been produced (Bat Conservation International 2006). Pups are born altricial, weighing 0.5 grams, and are capable of flight in 3-6 weeks. Females with young tend to roost higher than males. Females carry their young when changing roost locations, but leave the young at roost sites when hunting.

Winter behavior is poorly understood. Although generally solitary, western red bats migrate in groups, and timing of migration appears to differ between males and females (Schmidly 1991). Western red bats have only been recorded in the Southwest from May-August; therefore they are thought to migrate in late summer (Hoffmeister 1986). Predators include scrub jays, falcons, accipters, owls, roadrunners, opossums, and domestic cats.

HABITAT REQUIREMENTS

Day roosts are typically in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. They are associated with intact riparian habitat (particularly cottonwoods, sycamores, oaks, and walnuts) below 6,500 feet elevation. Roost sites are generally obscured from view except from below, allowing the bat to drop downward for flight, and are generally located on the south or southwest side of a tree. Hibernation sites are largely unknown, but it is thought they burrow into leaf litter or dense grass, similar to eastern red bats (Bat Conservation International 2006). Summer habitat associations include: coniferous forest; closed pinyon-juniper woodlands; open encinal oak; Great Basin shrublands; Mohave and Sonoran desert scrub; Chihuahuan desert grassland; short grass steppe; deciduous riparian forest including cottonwood, sycamore, walnut, and oak; dry and irrigated agricultural lands; mines and quarries; and urban habitats (Hoffmeister 1986).

DISTRIBUTION AND ABUNDANCE

Western red bats are distributed from southern British Columbia, through the western United States to Central and South America (Baker et al. 1988). They have an extensive but patchy distribution, and have been documented in New Mexico, Arizona, Texas, Utah, Nevada and California (Pierson et al. 2000). Western and eastern red bats are known to overlap in west Texas, and possibly also in eastern/southern New Mexico, creating the potential for hybridization (Baker et al. 1988). Although largely undocumented, western red bat populations appear to have declined sharply across the west due to the loss of deciduous riparian communities (Bat Conservation International 2005).

Figure 1. Approximate North American range, from Bat Conservation International (www.batcon.org).

STATUS OF THE SPECIES AND STATE RANKS

AZ: Species of Concern (S2 - imperiled)
NM: Sensitive taxa (S2 - imperiled)
CA: Mammal of Special Concern (SNR – species not ranked)
UT: Special Concern/Conservation Taxa (S1 – critically imperiled)
NV: S1; OR: SNR; TX: S2; WA: S3; BC: S1
Western Bat Working Group rated this species as a high conservation priority species throughout most of the southwestern United States.

THREATS

One of the primary identified threats to western red bats is the loss of riparian habitat. Many of the mature sycamore/cottonwood riparian forests have been lost or altered over the past 200 years. River channelization, agricultural conversion, cattle grazing, timber harvesting, development and exotic plant invasion have contributed to the loss, degradation, and fragmentation of riparian and other broad-leaf deciduous habitat (Krueper 1996). Creation of water storage reservoirs has reduced foraging habitat. Pesticide use in fruit orchards may threaten roosting bats and significantly reduce insect prey availability (Western Bat Working Group 2005). Winter roosts may be impacted by fire: controlled burns may be a significant mortality factor for western red bats roosting in leaf litter during cool temperatures.

HABITAT/SPECIES MANAGEMENT RECOMMENDATIONS

More effort is required to accurately determine the status of and develop conservation measures for western red bats. Increased survey efforts could aid in documenting presence and better identify roosting and foraging habitat, winter ecology, altitudinal distribution, define habitat requirements, and migration patterns (Western Bat Working Group). Western red bats are indicators of healthy southwestern riparian woodlands and should benefit from conservation and restoration of this habitat. Surveys and/or mitigation should be included in plans to conduct controlled burns within riparian and other broad-leaf deciduous forests. Pesticide use should be timed to minimize impacting western red bats whenever possible. Coordinate/conduct outreach with adjacent land managers applying pesticides in orchards and other agricultural lands near riparian habitat and other deciduous forests.

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