Gila Monster (*Heloderma suspectum*)

Recovery Plan

5 April 2017

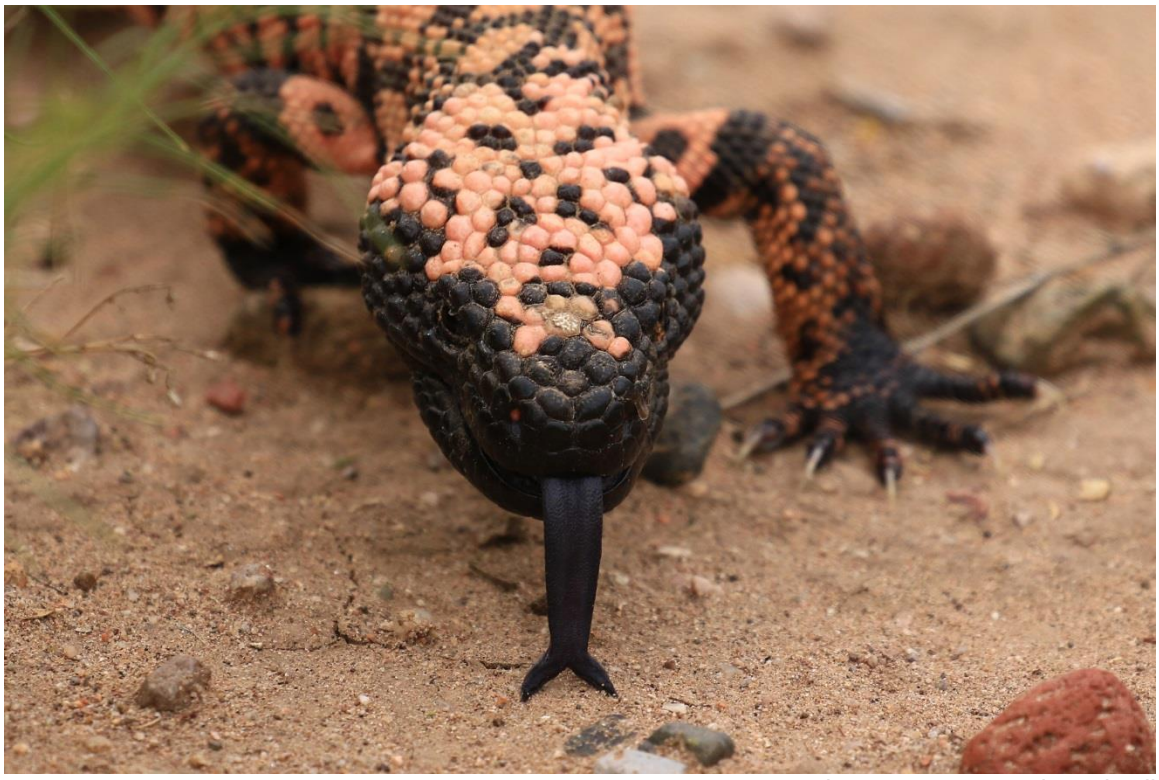

Photo courtesy Paul Bardwell

Prepared by:

John Bulger

Wildlife Management Division

New Mexico Department of Game and Fish

P.O Box 25112

Santa Fe, NM 87504

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1.0 Introduction

This recovery plan for Gila Monster (*Heloderma suspectum*) was developed under the authority of the New Mexico Wildlife Conservation Act (WCA). The New Mexico Department of Game and Fish (NMDGF) is directed under the WCA to develop recovery plans for species listed as threatened or endangered by the State [17-2-40.1 NMSA 1978]. To the extent practicable, each recovery plan should be developed to achieve the following objectives:

- restoration and maintenance of viable populations of the listed species and its habitat to the extent that the species may eventually be downlisted
- avoidance or mitigation of adverse social or economic impacts resulting from recovery actions (if indicated)
- identification of social or economic benefits and opportunities of recovery actions (if indicated)
- use of existing resources and funding to implement the overall plan

As directed by the WCA, public information meetings were held on 21 June 2016 in Las Cruces, New Mexico, and 22 June 2016 in Silver City, New Mexico. An Advisory Committee was the formed that includes research scientists, representatives of the U.S. Forest Service and Bureau of Land Management, NMDGF biologists and conservation officers, and interested members of the public. See Appendix 6.1 for a list of committee members.

The organization of this recovery plan is based on Graves (2002). Section 1 provides introductory materials. Section 2 includes background information on natural history, as well as habitat and population assessments. Section 3 contains the goal for the recovery of the Gila Monster, accompanying objectives, a listing of issues affecting the recovery of the species, and strategies for addressing those issues.

1.1 EXECUTIVE SUMMARY

This is a recovery plan for Gila Monster (*Heloderma suspectum*), developed under the authority of the New Mexico Wildlife Conservation Act (WCA). Recovery plans, which are mandated under the WCA, are long-term conservation and management strategies that are intended to restore and maintain viable populations of the species and its habitat. *Heloderma suspectum* is the largest native, and only venomous, lizard in the United States. It occurs primarily in Sonoran Desert habitats of Arizona and Mexico,

with the limits of its range overlapping potions of the Mojave Desert in Utah, Nevada, and California, and the Chihuahuan Desert in southwestern New Mexico. Threats to the species in New Mexico include road mortality, illegal collection for the pet trade, wanton killing, habitat loss, and climate change. Distribution and abundance of Gila Monsters in the state are poorly known, although it has been suggested that populations may be locally stable. The goal of this recovery plan is to ensure continued survival of viable populations of Gila Monsters within the verified historical range of the species in the state.

1.2 RECOMMENDED CITATION

New Mexico Department of Game and Fish. 2016. Gila Monster (*Heloderma suspectum*) Recovery Plan. New Mexico Department of Game and Fish, Wildlife Management Division, Santa Fe, New Mexico. 23 p.

1.3 ADDITIONAL COPIES

Additional copies of the Gila Monster Recovery Plan may be obtained from:

New Mexico Department of Game and Fish
P. O. Box 25112
Santa Fe, NM 87504
(505) 476-8038

2.0 Background

Section 2.0 consists of background information on distribution, status, habitat requirements, biology, and ecology of the Gila Monster. This information provides the basis of assessing current status, threats to population persistence, and the most effective strategies for conservation and recovery of the species.

2.1 NATURAL HISTORY

The sections below summarize relevant aspects of Gila Monster natural history. For a comprehensive treatment, the interested reader should consult Beck (2005).

2.1.1 Taxonomy

Gila Monster taxonomy and systematics are described in detail in Beck (2005); additional phylogenetic treatment is reported in Douglas et al. (2010). *Heloderma suspectum* and *H. horridum* (Beaded Lizard) are the only known venomous species of lizards in the world and are the sole members of the family Helodermatidae, order Squamata. Two subspecies of *H. suspectum* – the Banded Gila Monster (*H. s. cinctum*) and the Reticulate Gila Monster (*H. s. suspectum*) – were described by Bogert and Martin del Campo (1956) based on apparent geographic color pattern distinctions. However, Beck (2005) has questioned the basis for geographic color pattern differentiation, and a recent analysis using mitochondrial and nuclear DNA was unable to support subspecific designation (Douglas et al. 2010).

Taxonomists have typically placed Helodermatid lizards in the clade Monstersauria, an ancient group that dates back to the Middle Cretaceous (100 million years ago); fossil evidence indicates that *Heloderma* has inhabited the American Southwest for at least 23 million years (Beck 2005). The closest living relatives are the Old World monitor lizards (*Varanus*). Helodermatids are evolutionarily closer to snakes than most other extant lizard taxa (Douglas et al. 2010).

2.1.2 Description

Helodermatid lizards are easily recognized by the colorful beadlike scales (osteoderms) that cover their entire body. The Gila Monster is the largest native lizard in the United States; adults reach a total body length of 350-550 mm (snout-vent length: 300-360 mm), with an average body mass of approximately 500 g (Beck 2005). The tail is one-third as long as the snout-vent length. Newly hatched young average approximately 140 mm total body length. Gila Monsters are robust and large-headed, with small eyes and short legs. The tongue is forked, and used in a snake-like fashion for chemosensory reception. The jaws are powerful and the teeth have sharp cutting edges, which are grooved for venom delivery. Gila Monsters have orangish or pinkish background coloration (occasionally yellowish) with irregular black blotches. The tail is short and

stout and typically banded, with occasional light or dark spots within bands. Juvenile coloration is similar to adults, though the body as well as tail is usually banded. Males and females are morphologically similar, although males have wider heads than females (Gienger and Beck 2007). Distinct differences in dorsal color patterns are used to identify the banded and reticulate forms (Beck 2005).

2.1.3 Distribution

North America

The Gila Monster inhabits portions of the Mohave and Chihuahuan deserts, and most of the Sonoran Desert (Figure 1). Within the Mojave Desert, it occurs in southwestern Utah, extreme southeastern Nevada, southeastern California, and northwestern Arizona. In the Chihuahuan Desert, its range encompasses southeastern Arizona and southwestern New Mexico. In the Sonoran Desert, Gila Monsters are distributed from central Arizona south through Sonora and into northern Sinaloa, Mexico.

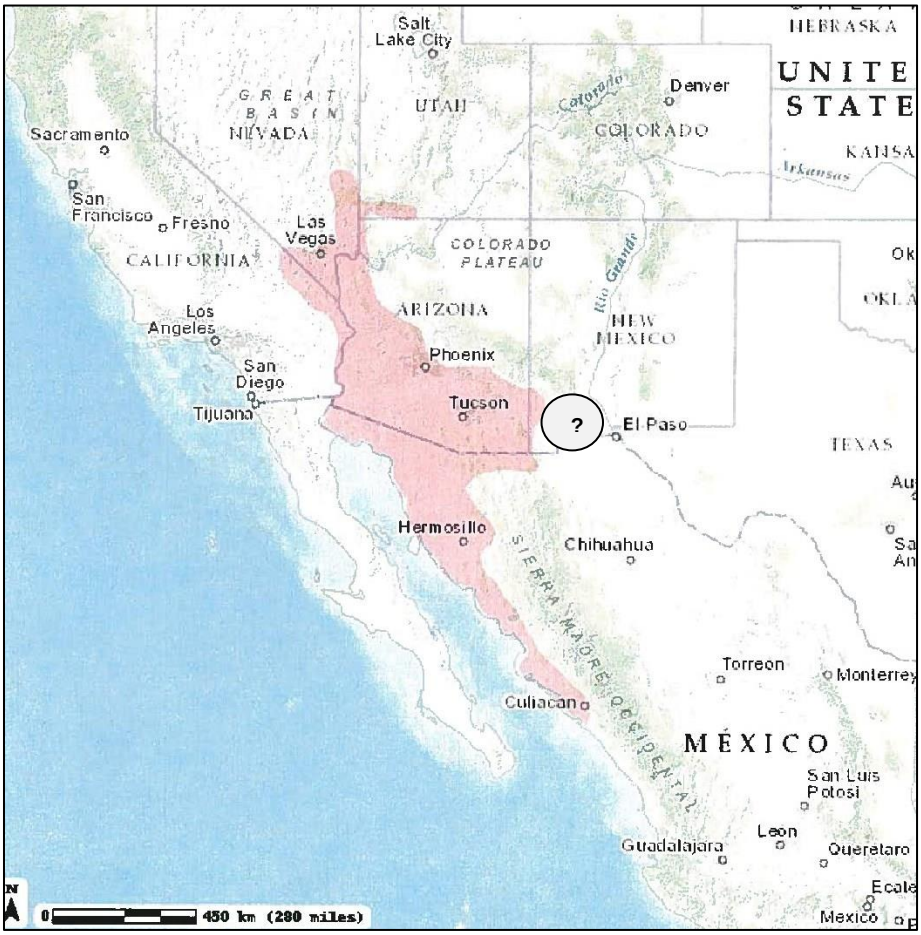

Figure 1. Distribution of *Heloderma suspectum* in North America (Beck 2005, Lemos-Espinal et al. 2015). Eastern extent of range in New Mexico is uncertain.

New Mexico

The Gila Monster reaches the eastern extent of its range in southwestern New Mexico, but the limits of the range are poorly understood. Its occurrence in Hidalgo and Grant Counties is well established (Figure 2), whereas origins of the small number of specimens and sight records from Luna and Doña Ana Counties have been questioned (Campbell 1976, Degenhardt et al. 1996). The records from Kilbourne Hole in Doña Ana County and near Deming and Las Cruces are suspected to be released or escaped pets (Degenhardt et al. 1996). Gila Monsters are most regularly encountered in the central Peloncillo Mountains, Hidalgo County, and at Red Rock Wildlife Area, Grant County. See Section 2.2 for a more detailed account.

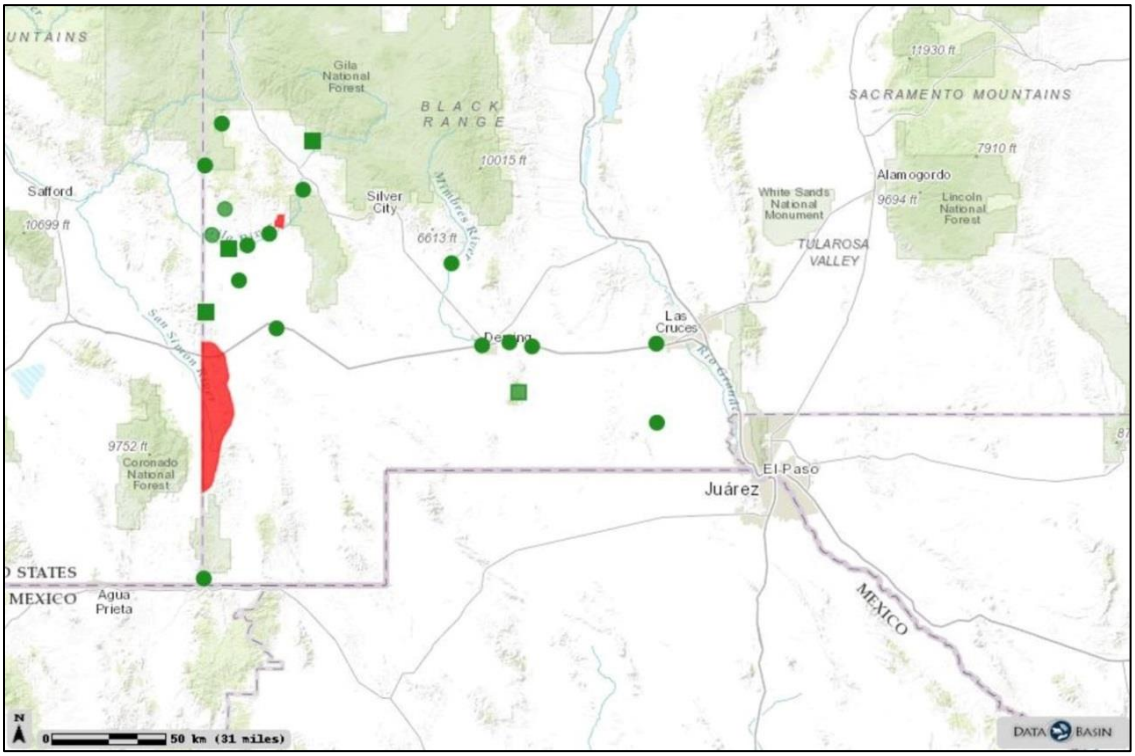

Figure 2. Distribution of *Heloderma suspectum* in New Mexico. Red polygons are sites where the species is regularly in encountered. Green circles are other occurrences based on museum records or reliable sighting reports spanning 1918 to the present. Green squares are unverified but recent reports of occurrence. (Data from Campbell 1976, USGS BISON, NMDGF files).

2.1.4 General Habitats Requirements

Beck (2005) reported that Gila Monsters in New Mexico are typically found below 5700 feet elevation where Chihuahuan desert scrub merges with desert grassland. Dominant

vegetation in occupied sites includes creosotebush (*Larrea tridentata*), catclaw (*Acacia greggii*), snakeweed (*Gutierrezia sarothrae*), ocotillo (*Fouquieria splendens*), mesquite (*Prosopis* spp.), juniper (*Juniperus* spp.), cacti, sotol (*Dasylirion wheeleri*), and numerous grasses. Small trees, shrubs, and herbaceous vegetation provide important cover and food for the Gila Monster's prey.

In the central Peloncillo Mountains, the species often occurs on lower slopes and alluvial outwash plains (bajadas), particularly in association with canyons and arroyos (Campbell 1976). Habitats tend to be hilly and rocky. Along the Gila River, Gila Monsters are found in association with bluffs, rocky slopes, and arroyos (Beck 2005). Gila Monsters also may occur sparingly in Madrean Evergreen Woodland, primarily where this vegetation type borders semidesert grassland (Beck 2005). Belfit (1978) reported that Gila Monsters in New Mexico prefer relatively coarse gravelly conglomerate soils and areas of loam and sand. Of paramount importance is availability of suitable refuge shelters, which occur in rock cavities and crevices, pack rat mounds, and burrows created by other reptiles or mammals. Rock shelters are generally more stable than soil burrows (Beck and Jennings 2003).

Home range sizes vary enormously, ranging from approximately 6 ha to 147 ha (Beck 2005). There is considerable overlap in home ranges among individuals, and males tend to have larger home ranges than females, a difference that is more pronounced during the spring and summer months (Beck 2005, Kwiatkowski et al. 2008).

2.1.5 Shelter Use

Gila Monsters use shelters (refugia) for thermoregulation, water conservation, protection against predators, access to foraging areas, and access to mates (Beck and Jennings 2003, Davis and DeNardo 2007, Gienger et al. 2014). Individuals show strong fidelity to particular shelters, and, with the exception of male/female cohabitation, both sexes defend shelter sites against conspecifics (Beck and Jennings 2003, Beck 2005). More than 95% of an individual's lifetime may be spent in a shelter site (Beck 2005). In part because foraging areas must be in proximity to shelters, the availability of suitable shelters likely is a limiting resource for this species.

Beck and Jennings (2003) investigated Gila Monster shelter use in New Mexico for six years (1992-1998). Individuals spent significantly more time in areas with a higher density of potential shelters, and selected shelters based on specific characteristics, which varied seasonally. During the late spring and the dry early summer, shelter vapor pressure (humidity) significantly influenced shelter selection. Winter shelters tended to be rockier, deeper, and had south-facing entrances on slopes with southern exposures.

Specific winter shelters tended to be used for extended periods, whereas individuals changed shelter sites as frequently as every few days during the summer months.

2.1.6 Physiological Ecology

The seasonal activity period for Gila Monsters in New Mexico extends from March through September (Beck and Lowe 1994, Beck 2005). Surface activity usually peaks during April and May, with a second peak in late July and August, corresponding to the seasonal monsoon. Physiologically, the species' thermal activity range (body temperature) is from 17-37 ^{o}C, with a preferred temperature of approximately 30 ^{o}C. Gila Monsters seek refuge as temperatures approach 38 ^{o}C, and become paralyzed at 44 ^{o}C. They are rarely active at body temperatures less than 24 ^{o}C. Adults may be active at any time of day, although their daily activity peaks in early morning and evening (Beck 2005). On cold, sunny mornings, Gila Monsters often bask at shelter entrances.

Gila Monsters appear to be better equipped to withstand cold than hot temperatures. Their intolerance of excessively hot temperatures may be due to the need to minimize evaporative water loss through the skin and cloaca. Gila Monsters have high rates of water loss in comparison to other arid adapted lizards, and when thermally stressed they regulate their body temperature by expelling water through the cloaca rather than panting like other lizards (DeNardo et al. 2004).

Davis and DeNardo (2010) determined that Gila Monsters are capable of enduring drought conditions through behavioral and physiological adjustments. Important survival strategies include increased activity at cooler times of day and selecting shelters for favorable temperature and humidity characteristics. In addition, Gila Monsters can store water in their urinary bladder for later use as a physiological reservoir to moderate dehydration (Davis and DeNardo 2007). Most of their water needs are met through food intake and metabolic water production. Gila Monsters do not appear to require free standing water, but drink when water is available (Beck 2005).

2.1.7 Reproductive Phenology and Biology

Relatively little is known about Gila Monster reproduction in the wild (Beck 2005, Zylstra et al. 2015). Males vie for access to females through ritualized combat. The proximate objective of these contests (which can last for hours) is to maintain a superior position by pressing and holding the opponent to the ground (Beck 2005, Gienger and Beck 2007).

Mating most likely takes place in shelters during April and May. Egg laying has not been observed in the wild, but captive females lay eggs in July and August. Clutch sizes of captive females average 5.7 eggs (Beck 2005), ranging from 5-13 eggs (Smith 1995). It

has not yet been established whether eggs hatch during the fall or the spring, and consequently the incubation period is also unknown. Females probably lay eggs every 2 to 3 years.

Humidity and temperature levels are important for successful incubation. Beck (2005) has speculated that nesting burrows likely are selected on this basis, and therefore may be an additional limiting factor in Gila Monster distribution.

For the first few weeks of their life, hatchlings rely on egg yolk stores for energy and may remain close to the nesting site for weeks to months before dispersing. Juvenile Gila Monsters grow rapidly, reaching sexual maturity at 2-3 years of age (Smith et al. 2010). Adult survivorship in this species is comparatively high, and adults in the wild may live for more than 20 years (Beck 2005). An 18 year mark-recapture study in southern Arizona recorded annual adult survivorship ranging from 72.5-93.5%, averaging 85.0% (data from B. Martin and C.H. Lowe, reported in Beck 2005).

2.1.8 Movements and Spatial Ecology

The Gila Monster is a relatively slow lizard that moves in an undulating fashion, alternately swinging the front and rear ends of its body from side to side in a lumbering gait. Its average rate of travel is about 250 m/hr, with a top speed of 1.9 km/hr (Beck et al. 1995). Gila Monsters typically move less than 300 m in a single activity bout, but may travel more than a kilometer as they leave or return to a critical overwintering shelter site (Beck 1990, 2005; Sullivan et al. 2004; Kwiatowski et al. 2008).

Gila Monster home range sizes are highly variable, ranging from <1 ha (Sullivan et al. 2004) to 104.8 ha (Beck and Jennings 2003). Typically, Gila Monster center their activities and home ranges on refuge shelters.

2.1.9 Food Habitats

Gila Monster diets consist almost exclusively of the contents of bird, mammal, and reptile nests (Beck 1990, 2005; Jones 1983). Principal prey species include juvenile rabbits and ground squirrels, eggs and nestlings of quail, doves and other birds that nest on or low to the ground, and eggs of other reptile species. The Gila Monster's forked tongue is a chemosensory organ that facilitates prey detection. They are not known to envenomate their prey; thus the venomous bite likely evolved as a defense mechanism (Beck 2005).

Gila Monster prey is patchily distributed in the landscape and varies seasonally in abundance. An adult Gila Monster requires approximately 525 g of food per year as a maintenance diet, and may consume up to one-third of its annual caloric needs in a single meal. Several physiological and behavioral adaptations allow the species to

survive under those conditions. Fat is stored in the tail and body cavity, allowing individuals to go long periods without eating. Additionally, the standard metabolic rate of Gila Monsters is among the lowest of any lizard, and long bouts of inactivity further limit energy expenditure (Beck and Lowe 1994).

2.1.10 Predators

Adult and/or juvenile Gila Monster predators include foxes, coyotes, bobcats, mountain lions, badgers, hawks, owls, roadrunners, ravens, kingsnakes and rattlesnakes (Beck 2005). In addition, domestic dogs and cats prey on the species where Gila Monsters occur near human habitations.

2.1.11 Threats

Gila Monster populations rangewide have been impacted to varying degrees by (1) habitat loss and alteration (Beck 2005); (2) road mortality (Nowak 2005, Andrews et al. 2008); (3) predation by dogs and cats (Beck 2005); and (4) illegal collection and/or killing (Sullivan et al. 2004, Beck 2005). The extent to which these factors constitute significant threats to population persistence is context and location specific. In New Mexico, it is probable that road mortality and illegal pet trade collection have the capacity to stress or endanger local populations (NMDGF 1985). In particular, roads passing through Granite Gap and Antelope Pass in the central Peloncillo Mountains allow convenient access to known Gila Monster populations (Fiitzgerald et al. 2004) and have also been the sites of numerous recorded roadkills over time. However, that Gila Monster populations continue to exist at both sites may indicate that these negative factors have not been operating with sufficient intensity to jeopardize the affected populations.

Potential future threats to Gila Monster populations in New Mexico include climate change (Sinervo et al. 2010) and alternative energy developments such as large solar arrays, if situated within occupied habitat (Jones et al. 2016). Projected manifestations of climate change in the Southwest include Increasing ambient temperature trends and more frequent and intense periods of drought (Seager et al. 2008, NMDGF 2016). Elevated temperatures can lead to increased thermal stress in lizards, which in turn can reduce foraging rates and increase mortality rates (Sinervo et al. 2010). Drought conditions can also limit lizard foraging patterns and habitat use, thereby additively increasing physiological stress (Beck and Jennings 2003, Ryan et al. 2016, Sears et al. 2016). Because of their physiology and desiccation intolerance, Gila Monsters may be particularly vulnerable to climate change (Giermakowski and Snell 2011). Experimentation with water supplementation (Davis and DeNardo 2009) and artificial shelters may prove productive in partially mitigating effects of climate change on this species.

2.2 POPULATION ASSESSMENT

2.2.1 Population Trends

Gila Monster occurrence in New Mexico was not confirmed until the published accounts of Shaw (1950) and Koster (1951), both of which mentioned multiple observations of the species along the Gila River in the vicinity of Red Rock and in the central Peloncillo Mountains. Little changed in our understanding of Gila Monster distribution in New Mexico over the ensuing five decades (Campbell 1976, Degenhardt et al. 1996). Campbell (1976) compiled a list of 43 specimens and acceptable sight records of Gila Monsters from New Mexico, 37 of which were from the Gila River and central Peloncillo regions. Twenty years later, Degenhardt et al. (1996) stated that the species *"is commonly encountered in and near the Red Rock Wildlife Area in Grant County and at Granite Gap in Hidalgo County. Records of occurrence … east of a line drawn from Silver City southward to Animas may represent displaced, released, or escaped captive individuals. To understand the distribution of H. suspectum in New Mexico, additional areas of suitable habitat east of the known range need to be investigated."* Since that time, there have been few efforts to survey any New Mexico sites specifically for occupation by Gila Monsters. Because Gila Monsters spend much of their time in below ground shelter refugia and occur at naturally low densities, they are extremely difficult to locate in the absence of focused survey efforts conducted during the season of peak activity.

Population trends in New Mexico are currently unknown. Beck (2005) estimated the density of the Red Rock Wildlife Area population at 5 individuals per square kilometer, one of the highest densities reported anywhere in its range. No other appropriately quantitative density estimates exist for this or other populations in New Mexico. Degenhardt et al. (1996) posited that Gila Monster populations in New Mexico appeared to be stable, but offered no supporting data. The Red Rock and Peloncillo populations have been known since at least the early 1950s. The continued persistence of these populations to the present time may be indicative of stability and of a relative absence of significantly detrimental threats operating on these habitats and populations.

Red Rock Wildlife Area is managed by NMDGF, which, combined with information from Beck and Jennings's multi-year study (Beck and Jennings 2003, Beck 2005), makes it the best understood population in the state. However, given additional casual sight records from elsewhere along the Gila River, it is likely that the lower Gila River watershed supports a much broader and robust population (or populations) than is currently known (Figure 2).

No reliable population density estimates exist for Gila Monsters for any portion of the central Peloncillo Mountains. Outside of the Red Rock and the central Peloncillos, little is known about the distribution and density of this species in New Mexico, though it is clear that it occurs elsewhere. The apparent gap in the distribution between Red Rock and the central Peloncillo Mountains is most likely attributable to lack of sampling effort, as areas with suitable vegetation types and other habitat features are present. Finding additional Gila Monster populations through this gap (Gila River across Red Rock Mesa and Lordsburg Mesa) would indicate a strong likelihood of long-term persistence and connectivity into the future.

2.2.2 Use and Demand Trends

Illegal collection of Gila Monsters is a principal concern throughout the species' range. Populations in portions of the central Peloncillo Mountains, particularly at Granite Gap and Antelope Pass, are most easily accessed by road and likely over time have been most vulnerable to collectors, the impacts of which are unknown. However, as Beck (2005) noted: *"The secretive habits of helodermatid lizards, and their general rarity in nature, have made it difficult for them to be exploited to the same extent as many other wildlife species."*

2.2.3 Past Management

Regulatory Actions: The species was listed as endangered in New Mexico in 1975 under the Wildlife Conservation Act. It has no federal protections apart from those offered by the Lacey Act of 1984, under which it is illegal to import, export, transport, sell, receive, acquire, or purchase any wildlife that was obtained in violation of any state or tribal law or regulation. Collecting or killing Gila Monsters is prohibited in all states in which it occurs. Thus, the Lacy Act confers broad authority to federal officials. The Gila Monster is also a CITES Appendix II species (UNEP 2016), a designation that restricts international trade without an export permit. *H. s. suspectum* is listed as threatened by the Republic of Mexico (SEMARNAT 2010), and is a Tier 1A Species of Greatest Conservation Need in Arizona (AGFD 2012).

Management Actions:

No direct management actions have been taken with regard to Gila Monsters or their habitat in New Mexico.

2.3 ECONOMIC IMPACTS

No adverse economic or social impacts related to conservation or management of Gila Monsters are anticipated in association with recovery planning. Recovery activities will be focused on state (NMDGF) and federal lands (primarily BLM).

Under the provisions of the Wildlife Conservation Act, the NMDGF does not have authority on lands not owned by NMDGF to prevent habitat-altering activities that might have an adverse effect on state-listed species, or to require activities that would benefit the species. Actions proposed to achieve recovery of Gila Monster would have to be coordinated with all stakeholders, including federal land management agencies, and any actions that would be carried out on private lands would require voluntary cooperation of the landowner or land manager.

3.0 Recovery and Management Strategy

The verified historical distribution of Gila Monsters in New Mexico included portions of the central Peloncillo Mountains and the Gila River watershed from Gila Middle Box downstream to the Arizona state line (Figure 2). Consequently, these areas, coupled with potentially suitable habitat on Redrock/Lordsburg Mesa, constitute the core recovery area of this plan (Figure 3). While it is conceivable, and even likely, that Gila Monster populations occur elsewhere in Hidalgo, Grant, Luna, and Doña Ana Counties, lack of verification in the historical record precludes any reasonable justification for relying on areas outside the confirmed historic range for recovery planning. However, if we find the species to be more broadly distributed than previously known, future management actions and/or elements of the recovery plan will be reconsidered and revised as warranted by new information.

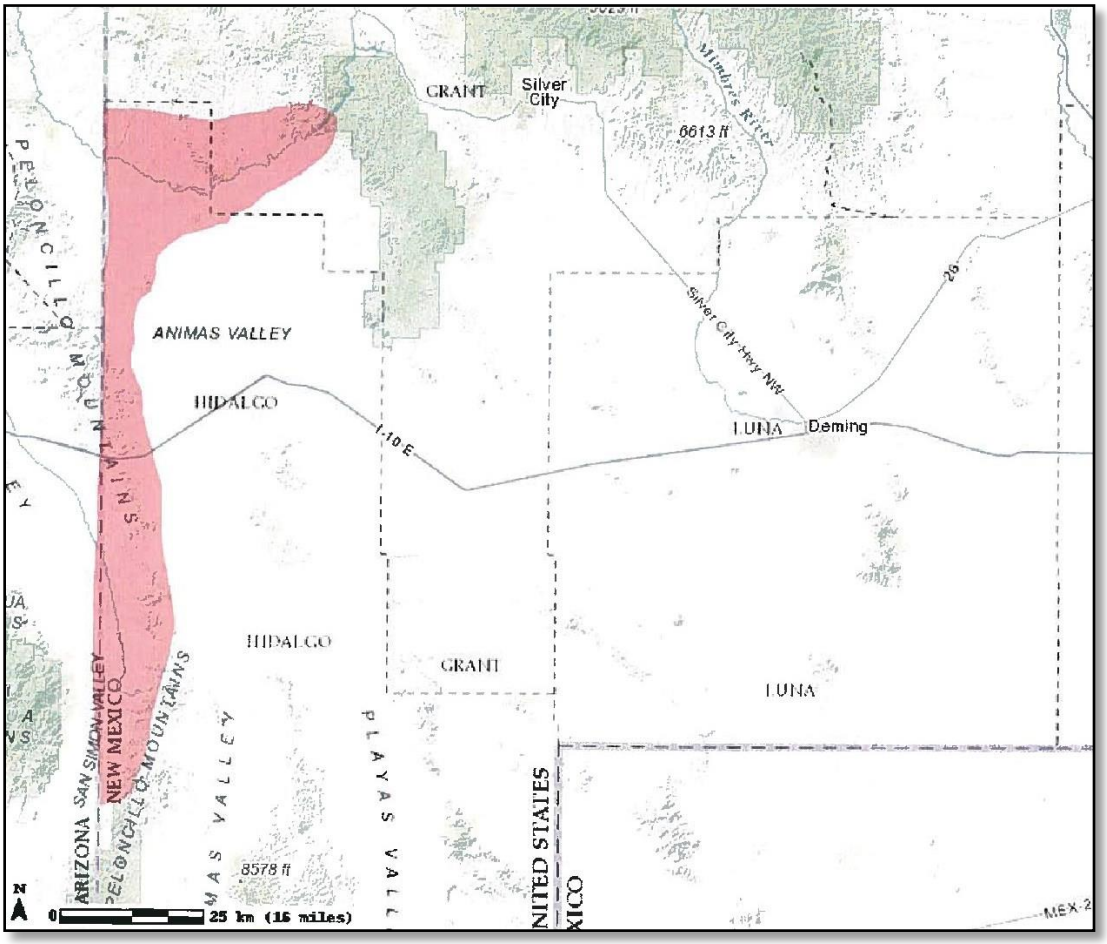

Figure 3. Approximate core recovery area for Gila Monster in New Mexico (red shaded polygon).

Recovery Goal:

Recovery of Gila Monsters in New Mexico will be accomplished when it is demonstrated that the core recovery area (Figure 3) contains populations of sufficient viability to reasonably ensure long-term persistence of the species in New Mexico.

Objective 1:

Determine the current distribution, density, and age structure (size class distribution) of a sufficient sample of subpopulations of Gila Monsters in the core recovery area to reliably estimate current status and viability. This information will provide a baseline from which to evaluate future trends and attainment of the recovery goal.

Objective 2:

Determine the extent of suitable habitat in the core recovery area and establish priorities for habitat and population maintenance and security.

> Note: Ideally this recovery plan would identify minimum numeric population sizes that would need to be maintained in order to ensure persistence. We are unable to do so at this stage in the recovery process due to lack of basic data that would allow us to set defensible targets. If the core recovery area is found to be inadequate to ensure long-term persistence of the species, additional portions of the potential Gila Monster range in southwest New Mexico will be surveyed for occupancy, and the recovery plan revised accordingly.

Recovery Issues and Strategies:

Issue 1 – Diverse land ownership

The core recovery area comprises land under private, state, and federal ownership. However, well over half of the total area is federal public land managed by the Bureau of Land Management (BLM).

> Strategy 1. Due to land ownership patterns, recovery actions and strategies should focus on NMDGF's Red Rock Wildlife Area and on large tracts of federal public land. BLM Wilderness Study Areas should be targeted as potentially high-value conservation and recovery sites for this species.
>
> Strategy 2. Design a public participation program to assist in filling Gila Monster distribution gaps. Elements of such a program might include a broad-based information campaign, use of social media, and development of an iNaturalist (www.inaturalist.org) project page where the public can post photographs and locations of Gila Monster observations.

Strategy 3. Collaborate with federal agencies (BLM, USFS, US Border Patrol) to develop a simple system for field personnel working in southwestern New Mexico to report Gila Monster observations to NMDGF.

Issue 2 – Need to develop survey and monitoring methods

Systematic methods of surveying and monitoring Gila Monster site occupancy and/or abundance are not well-established (Beck 2005). Moreover, due to the limited surface activity of this species, its low detectability even during favorable months of the year, and its occurrence at comparatively low densities, only a sample of subpopulations can realistically be monitored.

Strategy 1. Work with the Gila Monster Recovery Plan Advisory Committee to (1) develop survey and monitoring methods appropriate to the core recovery area, and (2) select appropriate subpopulations and habitat areas for monitoring to achieve the goal and objectives of this recovery plan.

Strategy 2. Test the utility of high-quality burrow scopes (e.g., Smith et al. 2009, Stober and Smith 2010) in improving detectability of Gila Monsters on surveys designed to reveal site occupancy and/or relative abundance.

Strategy 3. Obtain tissue samples from various subpopulations to evaluate population genetic structure as an aid to developing conservation strategies for the core recovery area.

Issue 3 – Extent of suitable habitat

The distribution of habitat suitable for occupation by Gila Monsters within the core recovery area is unknown.

Strategy 1. Describe and quantify critical habitat components at occupied sites.

Strategy 2. Develop a working ecological niche model or other predictive habitat occurrence model to guide future survey efforts both within and outside the core recovery area.

Issue 4 – Threats to persistence

At present, it is likely that road mortality and illegal collection of Gila Monsters constitute the principal threats operating on Gila Monster populations in the core recovery area. Road mortality occurs most prominently where paved roads intersect occupied habitats in the central Peloncillo Mountains region and there likely is no way to

effectively minimize this. Public education and law enforcement may mitigate illegal collection.

Strategy 1. Information on identification and legal status of the species should be distributed to the public within the range of the Gila Monster in New Mexico.

Strategy 2. Protection from illegal collecting or wanton killing should continue to be strictly enforced by NMDGF Conservation Officers. Collaborate as feasible with Arizona Game and Fish Department.

Strategy 3. If feasible, design and implement a study to systematically evaluate Gila monster roadkill frequency and sex/age class composition in the central Peloncillo region.

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5.0 Approvals

4/5/17

Stewart Liley, Wildlife Management Division Chief
New Mexico Department of Game and Fish

Date

4/5/17

Alexandra Sandoval, Director
New Mexico Department of Game and Fish

Date

4/5/2017

Paul M. Kienzle, Chairman
New Mexico State Game Commission

Date

6.0 Appendices

6.1 ADVISORY COMMITTEE MEMBERS

Jack Barnitz – Bureau of Land Management, Las Cruces District

Daniel Beck – Central Washington University

Ken Boykin – New Mexico State University

Jordan Duncan – NMDGF Conservation Officer, Silver City

Reuben Gay – Coronado National Forest, Douglas Ranger District

Tom Giermakowski – University of New Mexico

Matt Goode – University of Arizona

Chris Henke – ERO Resources, Denver

Randy Jennings – Western New Mexico University, Silver City

Buddy Jensen – Biologist (retired, US Fish & Wildlife Service), Virden

Ian Latella – University of New Mexico

Leland Pierce – NMDGF Herpetologist

Mason Ryan – University of New Mexico

Howard Snell – University of New Mexico

Justin Winter – NMDGF Conservation Officer, Deming