DRAFT: CHAPTER 7 - REGULATORY ASSURANCES

This chapter addresses regulatory assurances to Permittees and private landowners under the MSHCP Amendment, during the permit term. The regulatory assurances ("No Surprises") inferred to the Permittees are provided for under the authority of the Endangered Species Act and are intended to limit the costs and clarify expectations and responsibilities associated with conservation/mitigation measures, particularly if circumstances should change or unforeseen circumstances arise. However, these assurances do not limit or constrain the USFWS, or any other public agency, from taking additional actions to protect or conserve species covered by the MSHCP, at no additional cost to the Permittees. The assurances to private landowners within the Plan Area clarify the intentions and limitations of the DCP in acquiring and placing conservation easements on private properties for incorporation into the Reserve System.

7.1 Assurance to the Permittees – The No Surprises Rule

The federal No Surprises Rule of 1998 (63 FR 8859) and associated amendments to federal regulations (50 CFR 17.3, 17.22, and 17.32) provides assurances to ESA Section 10 permit holders. The rule states that if a Permittee is properly implementing an HCP that has been approved by USFWS, no additional commitment of resources or restrictions, beyond what has already been specified in the plan, will be required by the federal government, should unforeseen circumstances arise. If the status of a Covered Species unexpectedly declines, the primary obligation for undertaking additional conservation measures lies with the federal government, other government agencies, or other non-federal landowners who have not yet developed HCPs. If circumstances change during the duration of the permit, i.e. as discussed in section 7.2, actions required of the Permittees are outlined to delineate and clarify the modification required.

However, the USFWS may, in the event of unforeseen circumstances, require additional measures provided they are limited to modifications within the Reserve System or to the HCP's operating conservation program for the affected species, and that these measures do not involve additional financial commitments or resource restrictions without the consent of the permittee. The assurances provided by the No Surprises Rule are also not absolute, as specified in the ESA's "Permit Revocation" rule. The "Permit Revocation" rule states that if a Covered Species is threatened with extinction, assurances may be nullified and the USFWS may revoke the HCP permit. The USFWS may exercise this authority even if a permittee is in compliance with the terms and conditions of the permit, if continuation of the permitted activity would appreciably reduce the likelihood of the survival and recovery of the species.

A key component of the No Surprises Rule is the distinction between "changed circumstances" and "unforeseen circumstances." Changed circumstances are defined in the No Surprises Rule as "changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the USFWS and that can be planned for." The regulations require that potential changed circumstances be identified and assessed in the HCP and that preventive and remedial measures be developed as well in response. In this way, the USFWS has the assurance that Permittees will take specific actions if changed circumstances arise, and the Permittees have the assurance of understanding their potential future responsibilities if the changed circumstance arises.

Unforeseen circumstances are defined in the No Surprises Rule as "changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the Service at the time of the conservation plan's

negotiation and development, and that result in a substantial and adverse change in the status of the Covered Species." Because they cannot be anticipated, unforeseen circumstances are not planned for specifically. If an unforeseen circumstance does arise, the USFWS must demonstrate that the unforeseen circumstance exists, based on scientific evidence. The USFWS may determine that additional conservation and mitigation measures are necessary to address the unforeseen circumstance. However, the USFWS cannot require the commitment of additional land, water, or financial resources or impose new restrictions on the use of natural resources. Rather, the USFWS will work with the Permittees to address the circumstance by implementing or adjusting measures that maintain the original terms of the HCP to the maximum extent possible. HCP resources may be redirected to meet these needs. Federal agencies also may take additional actions at their own expense to protect the Covered Species.

7.2 Changed and Unforeseen Circumstances

The USFWS and the Permittees agree that the changed circumstances defined in this section of the MSHCP Amendment represent all changed circumstances to be addressed by the Permittees. These changed circumstances provisions reflect changes in circumstances that can reasonably be anticipated to occur to the Reserve System which the Permittees have established to offset impacts from Covered Activities.

The changed circumstances discussion begins with an overview of climate change trends and projections for the Plan Area because each changed circumstance relates to climate change. Following this overview, each of the changed circumstances listed below are presented in detail:

1. Extreme Heat
2. Precipitation Changes
3. Repetitive and Severe Fire
4. Invasion by Invasive Species
5. New Species Listing
6. Disease

Each of the defined changed circumstances includes an assessment of risk, a description of preventative measures, and a summary of planned responses. Preventative measures are undertaken by the Permittees to reduce the potential for occurrence of the changed circumstance, and/or that reduce the potential for damage to the habitat resulting from a changed circumstance. Planned responses are the specific responses that will be undertaken in the event of a changed circumstance. Planned responses will not include any actions beyond those expressly identified in this chapter, nor for any event not specifically identified as a changed circumstance.

Each changed circumstance description also includes an explanation of the point at which a change reaches the point of not being reasonably anticipated and therefore becomes an "unforeseen circumstance" that does not require specific preventative measures or planned responses. There are a few instances where this threshold is not defined because there are too many unknowns at this point in time.

Finally, in some cases changed and unforeseen circumstances may arise beyond what is analyzed in this chapter. Illegal or accidental incidents like oil spills or wastewater releases may occur, though they cannot be reasonably planned for. Take caused by one of these events would not be covered by the MSHCP and would be managed by other permitting authorities under Section 7 of the Endangered Species Act. However, if these types of events cause habitat

conditions to change within the Reserve System, it may be considered a changed or unforeseen circumstance to be managed by the MSHCP.

7.2.1 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified. . . by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer" (IPCC 2023). The effects of climate change are becoming increasingly evident in the Plan Area and are projected to continue throughout the Permit Term. Precipitation patterns are expected to become more extreme, with prolonged dry periods followed by heavy rain and flooding. An overall decrease in precipitation and changes in rainfall and snowpack are expected to impact water availability and change habitats in the region. Similarly, average temperatures have already increased in the region and the trend is projected to continue, with ongoing increases in the number of extremely hot days. Climate change has contributed to expansion of the number and extent of invasive species and larger, more severe and more frequent wildfires, which further alter habitats and increase risks to Covered Species. Furthermore, as the climate changes and a variety of pressures increase, Covered Species become more susceptible to disease. As the climate changes and habitats and ecosystem processes are altered, non-covered species will become vulnerable and may be listed under the Endangered Species Act, which could require an amendment to the MSHCP to cover more species. Amid these challenges, climate change is likely to result in changed human behavior in relation to energy use and farming practices, such as irrigation, groundwater pumping, and overall land conversion, which could require additional modifications to the MSHCP.

Anticipated climate change trends and effects were analyzed for the Plan Area and particular to individual species as part of Chapter 3 Covered Species. This analysis is found in the Climate Change Worksheets, Appendix E. The analysis addressed how ecosystems and species may adapt to climate change, how Covered Activities interact with climate change, and what management measures and biological goals and objectives can enable the MSHCP to adequately monitor, prepare for, and respond to climate change.

7.2.2 Extreme Heat

Temperatures are projected to rise in the Plan Area during the Permit Term because of climate change, including more frequent hot days (>32.2°C or 90°F) and extreme hot days (>37.8°C or 100°F; Pan et al. 2011) which will result in increased average temperatures. These changed circumstances are likely to result in habitat changes and may significantly affect Covered Species.

7.2.2.1 Risk Assessment

Over the course of the 21st century, average temperatures in the Great Basin and Mojave Deserts have increased by 1 to 4ºC/1.8 to 7.2ºF (Redmond 2010). Studies predict that in parts of southern California deserts that are ecologically analogous and adjacent to the Plan Area, temperatures will continue to increase by at least 2ºC/3.6ºF by mid-century (Stralberg et al. 2009, Snyder and Sloan 2005, Snyder et al. 2004, Bell et al. 2004). Similarly, in Clark County, average annual temperatures are projected to increase by 1.2ºC/2.1ºF relative to baseline conditions (Kalansky et al. 2018). More individual days with extreme heat are predicted in California and Nevada deserts (Pan et al. 2011). A \ dynamic downscaling study (a process that converts coarse spatial resolution variables into finer resolution data) performed by Pan et al. (2011) utilized a sophisticated mesoscale climate model (Weather Research & Forecasting Model) to downscale

two previous global analyses (Global Forecast System Model, 28-km grid and Parallel Climate Model, 25 to 60-km grid) to encompass California and Nevada at the 4-km grid level. This analysis projected that approximately half of the Plan Area will experience a mean of 20 additional extreme heat days (> 37.8ºC/100ºF) annually by mid-century (~2050) compared to the beginning of the century (~2000).

Extreme heat could have wide ranging effects on Covered Species, resulting in decreased reproduction and increased mortality (Breshears et al. 2021, Elmore et al. 2017). Plants may experience lower water turgor, stunted growth, susceptibility to desiccation, and reduced seed set (Breshears et al. 2021, Hatfield and Prueger 2015). Wildlife may reduce activity to avoid extreme temperatures and may experience increased physiological stress and increased susceptibility to disease (Elmore at al. 2017). For example, prolonged periods of abnormally hot weather (heat waves, generally 2-5 days) may negatively impact the reproductive success of Mojave desert tortoise though various pathways, from physiological stress to altering sex-ratios of offspring (Butler, 2019).

Extreme heat will increase human energy use to power cooling systems, which could necessitate the development of energy infrastructure to support long-term changes in energy use (Bell et al. 2024). Human activity may shift from daylight hours to evening and nighttime when temperatures are cooler, which may also increase the need for artificial lighting. These activities are anticipated to alter habitat quality and thereby decrease Covered Species long-term viability. Conversely, extreme heat could ultimately decrease the demand for development if emigration from the County exceeds immigration due to an inhospitable climate.

7.2.2.2 Preventative Measures and Planned Responses

While preventing extreme heat is beyond the scope of the MSHCP Amendment, measures can be taken to accommodate habitat and species range shifts, primarily in elevation but also in absolute location and aspect use within the Reserve System. Thermal refugia can be incorporated into the restoration design for riparian and upland habitats. In addition, ensuring connectivity within the Reserve System to allow species and habitats to shift to future climate refugia and potential future suitable habitat is important. The current Reserve System incorporates a range of heterogeneous habitats and elevations (~1,000 ft to ~6,000 ft), including elevations higher than areas currently occupied by Covered Species, which can allow for horizontal and vertical migration (Feldmeier et al. 2020). For example, the Desert Tortoise Protective Corridor Reserve Unit, which encompasses 42,974 acres in the southwest portion of the Plan Area, was designed to function as a key corridor (horizontal migration) for the desert tortoise. The Stump Springs Special Management Area (SMA) was expanded in the MSHCP Amendment to include important habitat connectivity areas in the Reserve System and elevations >4,000 feet to allow for elevational range shifts (vertical migration) of Covered Species. Habitat quality, connectivity, and Covered Species monitoring will provide data on species range shifts and inform appropriate management responses (Biological Objective 2E), which may include reconsideration of priority restoration areas and design, or otherwise redirecting MSHCP resources to respond to elevational or geographic range shifts of Covered Species due to extreme heat.

7.2.2.2 Changed and Unforeseen Circumstances

It is difficult to define unforeseen circumstances for extreme heat because we cannot anticipate how species will respond. However, based on existing data, average annual temperature increases above 2.1ºF are unexpected and will be considered an unforeseen circumstance (Kalansky et al. 2018, Stralberg et al. 2009, Snyder and Sloan 2005, Snyder et al. 2004, Bell et

al. 2004). Average annual temperatures for Clark County between 2019 and 2023 were 17.6ºC/63.7ºF, 18.4ºC/65.2ºF, 19ºC/66.2ºF, 19.1ºC/66.4ºF, and 17.5ºC/63.5ºF, respectively (NOAA 2024). Data collected through the Monitoring and Adaptive Management Plan (MAMP) (e.g. biological and botanical surveys) will enable the DCP to detect effects of extreme heat on Covered Species and their habitats. For example, Covered Species of plants may have low to no seed production and there may be no germination of seed under extreme heat conditions. Extreme heat has also been shown to be lethal to desert passerines in Nevada via dehydration (Albright et al. 2017). Planned responses will be developed depending on the effects detected.

7.2.3 Changes in Precipitation Patterns

As temperatures rise with climate change, precipitation patterns are expected to become more extreme, with longer, drier periods creating drought conditions and heavy, sustained precipitation leading to flooding. This novel, extreme precipitation pattern could alter habitats and harm Covered Species.

7.2.3.1 Risk Assessment

Precipitation estimates within the Plan Area over the next half century vary by model. In general, it is predicted there will be less precipitation, compared to the previous century, in the spring and summer months and more precipitation in the winter months in California and Nevada deserts (Kalansky et al. 2018, Pan et al. 2011, Redmond 2010). Although models predict more precipitation in winter months, the amount of snowpack is expected to decrease by approximately 15% by mid-century due to rising minimum temperatures (Pan et al. 2011). Already, the onset of snowmelt in the Great Basin, north of the Plan Area, is occurring 10 to 15 days earlier compared to 50 years ago (Ryan et al. 2008). Further, annual precipitation is projected to decrease by up to 5% in the northern portion of the Plan Area and up to 10% in the southern portion of the Plan Area (Runkle et al. 2022).

Greater variability in precipitation in the southwestern United States (Diffenbaugh et al. 2008) is predicted to lead to a drying trend (Seager et al. 2007), which in turn will result in decreased runoff and streamflow (Milly et al. 2005). In Clark County, precipitation is highly variable year-to-year and annual totals are driven by rare extreme precipitation events (95th percentile or above), which are themselves variable by region (Kalanskly et al. 2018). Average annual rainfall in Clark County ranges from <5 to >25 inches. Similarly, rainfall totals for extreme events range from <4 to >40 inches. Approximately 30 more of these 95th percentile precipitation events and 15 more 99th percentile precipitation events are expected in 2010-2039 compared to baseline conditions taken from 1976-2005 (Kalansky et al. 2018). More frequent or longer dry periods than typically seen over the last century, interspersed with more frequent (>2/year) storms of higher-than-average precipitation (50mm/hour), winds, etc. may ultimately increase the frequency of both droughts and floods within the Plan Area (Yu et al. 2023).

Table 7-1. Predicted Change in Clark County Rainfall by the End of the Century. Rainfall is projected to increase in the winter (0.2 to 0.6 inch per year) and decrease during the spring and summer, with the greatest declines in the spring (-0.02 to -0.04 inch per year). Fall precipitation is expected to change the least. Table recreated from Kalansky et al. 2018.

30-year Period	Winter	Spring	Summer	Fall	Annual
Historical Model Ave	2.2 in	1.6 in	1.4 in	1.5 in	6.7 in
2010-2039	0.2/0.3	-0.1/-0.2	0/-0.1	0/0.1	0.1/0.1
2020-2049	0.2/0.3	-0.1/-0.2	-0.1/-0.1	0/0	0.1/0
2030-2059	0.3/0.3	-0.1/-0.2	0/-0.2	0.1/0.1	0.4/0.1
2040-2069	0.3/0.2	-0.2/-0.3	0/-0.1	0.1/-0.1	0.2/-0.3
2050-2079	0.3/0.2	-0.1/-0.3	0/-0.1	0/0	0.2/-0.2
2060-2089	0.2/0.3	-0.2/-0.4	0/-0.1	0/0	0.1/-0.3
2070-2099	0.2/0.6	-0.1/-0.4	0/-0.2	0.2/0.1	0.3/0.1

Increased variability in precipitation (amount, timing, and duration) and more severe and frequent floods could lead to local population declines of Covered Species and the permanent alteration of habitat quality. In addition to physiological stress resulting from seasonal deviations in water availability (which could result from seasonal changes in precipitation, onset and amount of snowmelt, and duration and intensity of prolonged periods of above average heat), variability in precipitation could disrupt the reproductive success of covered plant species by disrupting the timing of phenological events (Hassan et al. 2023). Prey availability for carnivores could also be reduced if the timing of precipitation significantly alters plant growth needed to support populations of herbivorous species. More frequent and severe precipitation may result in flooding, erosion, and scour which can cause the temporary and/or permanent conversion of habitat quality in floodplains, as well as local declines of Covered Species populations in affected areas (Anderson 1983). The timing of extreme precipitation may result in direct mortality of Covered Species and may alter nesting behavior of birds such as the Yuma Rail (Anderson 1983).

Longer, more frequent, and more intense droughts may affect Covered Species and habitat by decreasing ground water availability (Bradford et al. 2020) and decreasing surface flows (Siirila-Woodburn et al. 2021). A decrease in water availability could result in the conversion of riparian and desert wash habitat, which would affect distribution of Covered Species that rely on these habitat types (Anderson 1983). For example, the Muddy River is a spring-fed feature; lowering of the groundwater table may affect downstream riparian habitat and water surface flows. Spring-dependent and riparian Covered Species may experience significant water stress during droughts. Decreased humidity levels and canopy cover in riparian corridors could adversely affect habitat quality, including prey abundance for riparian bird species.

Changes in soil properties resulting from drought conditions may adversely affect Covered Plant Species and reduce foraging opportunities for Covered Wildlife Species. Increased evapotranspiration and loss of soil moisture may lead to increased soil salinity. Ground subsidence resulting from the lowering of the water table may also result in the disturbance of soils and soil crusts and provide further opportunities for colonization by invasive plants.

Variability in precipitation could also alter the irrigation needs and timing for human activities, such as agriculture, golf courses, or other landscaping and recreation activities (Asif et al. 2023). Greater infrastructure or development to provide reliable water sources, as well as alterations to water use policies may be needed to address a less predictable water supply (Siirila-Woodburn et al. 2021). Agricultural systems may need to be converted to alternate crops or land uses based upon groundwater availability. The Southern Nevada Water Authority manages water use and is responsible for water permitting and mitigation in Clark County. Although water use is not a Covered Activity in the MSHCP Amendment, changes in water use may change habitat conditions for Covered Species. Furthermore, the cost of development could increase as water becomes

scarcer, which could impose a limit on future development. More frequent and severe floods may increase the need for water quality monitoring and post-flood cleanup programs, as well as alterations to disaster planning and prevention programs. Infrastructure repair and maintenance to address flood damage may cause significant economic stress.

7.2.3.2 Preventative Measures and Planned Responses

Measures to prevent drought or flood extend beyond the scope of this MSHCP Amendment, but these events can be anticipated and responses planned. Habitat alteration in DCP's Riparian Reserve Units caused by extreme precipitation will need to be inspected to determine the extent to which Covered Species and/or their habitats have been affected. If deemed necessary, the DCP will establish and implement protective measures and repairs to secure sites, such as installing fencing or pumps. Additional remediation measures will be developed to address site recovery, such as erosion control, reseeding, and replanting. Within 1 year of the flood event, an assessment will be made to evaluate whether additional habitat restoration is necessary. The recovery of the site will be monitored annually for a time frame specified in the 1-year assessment.

If adverse effects of drought on Covered Species and/or habitat are suspected within the Reserve System, monitoring of Covered Species and habitat quality will be used to determine whether corrective actions are necessary. Corrective actions could include habitat restoration, invasive species management, supplemental watering, and seed collection.

7.2.3.3 Changed and Unforeseen Circumstances

Precipitation changes will be considered a changed circumstance until one or more of the following thresholds are met or exceeded, at which point changes will be unforeseen:

- Two or more 100-year flood events occur within 10 years of each other. The Federal Emergency Management Agency (FEMA) defines a 100-year flood as the flood event that has a 1 percent chance of being equaled or exceeded each year.
- Prolonged drought results in desiccation of 30% of individuals of a Covered Plant Species with no seed production, and no signs of new germination are noted for 5 years for annual species, or 10 years for perennial species.
- Prolonged drought or flooding results in the permanent conversion of more than 20% of an ecosystem type within the Reserve System in the span of 5 years or less, or the destruction of a key connectivity corridor in the Reserve System.
- Flooding results in the extirpation of more than 40% of the population of a Covered Species.
- Water levels at Lake Mead increase to inundate known populations of threecorner milkvetch (TNC 2007) for two consecutive years.
- A significant decrease in annual winter precipitation occurs. Most precipitation models anticipate an increase in winter precipitation levels.

7.2.4 Repetitive & Severe Fire

Increasingly repetitive and severe fire is expected to occur in the Plan Area during the Permit Term as a result of changing precipitation patterns and increased frequency and duration of periods of abnormally hot weather, and drought. Changing vegetation due to these evolving conditions is also anticipated to contribute to more severe wildfires. Increased incidence and severity of wildfires has the potential to degrade habitat and undermine Covered Species' viability and recovery, particularly in certain ecosystems.

7.2.4.1 Risk Assessment

In the Mojave Desert, larger and more frequent fires are predicted as a result of high winter rainfall, resulting in increased productivity of non-native annual grasses, coupled with low summer rainfall, resulting in hot, dry conditions (USGS 2011). Invasive plants such as red brome (*Bromus madritenis* ssp. *rubens*), Mediterranean grass (*Schismus barbata*) and mustards, including Sahara mustard (*Brassica tournefortii*) and African malcomia (*Malcomia africana)* have increased the probability of larger and more frequent wildfires (D'Antonio and Vitousek 1992, Brooks et al. 2004, TNC 2007). In some areas of Clark County, repeated fires have eliminated perennial plants and converted native plant communities into non-native annual grasslands, perhaps irreversibly (Brooks and Matchett 2003, Brooks and Matchett 2006, Brooks et al. 2003). This process creates a positive feedback loop between repeated fires and the establishment and expansion of non-native annual grasses. Although most models predict an increase in fire frequency, some models (TNC 2011, Westerling and Bryant 2008) predict fine fuel buildup will be reduced by the increased frequency of drought, which would decrease the frequency and intensity of wildfires. This scenario seems unlikely given the current spread of non-native annual grasses but may occur in areas without grass invasions.

More frequent, larger fires in Mojave desert scrub and blackbrush ecosystems as a result of invasion by and expansion of non-native grasses and mustards, could further promote the expansion of invasive grasses and mustards. This synergistic effect between fire and expansion of invasive non-native grass and mustard species could lead to the conversion of Mojave desert scrub, blackbrush, and Joshua tree woodland to non-native grassland. Fires could destroy above-ground plant tissue and native seed banks of non-fire adapted native blackbrush ecosystem species. Severe fires may also damage or destroy cryptogamic crusts in Mojave desert scrub ecosystems, which are critical for the maintenance of seed banks and soil-surface nutrient levels, and which facilitate the water retention necessary for Covered Species occurring on gypsum soils (Mistretta et al. 1996). This conversion of habitat would also reduce habitat availability of forage species for Covered Species occurring in Mojave desert scrub, such as the Mojave desert tortoise.

Fires in low to mid-elevation shrublands can lead to decreased short-term evapotranspiration, resulting in increased ground water recharge and post-fire runoff and erosion. This runoff could result in changes to riparian geomorphology, sedimentation, and water chemistry (NatureServe 2021). Fires may also promote the spread of tamarisk and other invasive species in riparian ecosystems, facilitating fire spread and leading to increased fire frequency, and reduced habitat quantity and quality for Covered Species (Shafroth et al. 2002, Dwire and Kauffman 2003, Busch and Smith 1995).

A more severe fire regime could lead to a decrease in human activity in recently burned areas, and a corresponding concentration of human activities in unburned areas. More frequent, larger fires may also trigger the need for an increased emphasis on fire management activities, as well as the development of new water quality standards and management strategies in post-fire riparian ecosystems.

7.2.4.2 Preventative Measures and Planned Responses

Fire prevention will focus on managing the spread of invasive plant species (Objective 1A), including non-native grasses and mustards known to increase fire risk. Weed management will be addressed as part of the Cooperative Management Agreement (CMA) for each SMA and will identify essential areas for weed control to promote resiliency, redundancy and representation of

Covered Species. Weed management responsibilities described in each CMA will be developed through consultation between the DCP and BLM, with consideration of existing BLM fire management and prevention plans.

The DCP will work with Clark County Vector Control and other appropriate agencies/entities to develop an Early Detection Rapid Response (EDRR) Program for newly detected non-native and potentially invasive plant species on County lands and right of ways (Objective 2D). Each CMA will include measures contributing to the EDRR Program. At the wildland-urban interface (WUI), measures will also be taken to curb potential ignition sources. If roads must be placed adjacent to natural areas, fencing, reduced speed limits, warning signage, and a minimum 15-foot setback as measured from the back of the curb will be implemented to reduce the risk of fire ignition (Avoidance and Minimization Project Design Measure PDM-2).

To prepare for an increase in the severity and intensity of wildfires, seed collection of Covered Plant Species will be attempted, when practical, or transplantation or vegetative propagation, if determined suitable for certain species or sites (PLANT-1, PLANT-2, PLANT-3). Collected seeds will be integrated into the Rare Plant Propagation efforts for use in responding to landscape scale disturbances such as invasive species infestations and altered fire regimes. Seed collection efforts are described in Appendix B. An increased habitat restoration effort may also be needed to ensure the resiliency, redundancy, and representation of Covered Species habitat, especially those with formally designated critical habitat within the Plan Area.

7.2.4.3 Changed and Unforeseen Circumstances

Repetitive and severe fire will be considered a changed circumstance until they result in the permanent conversion of more than 15% of total habitat within the Reserve System for one or more Covered Species in a span of 5 years or less, or the destruction of a key connectivity corridor. A model by Eichenwald et al. (2020) analyzing climate data from 1986 to 2008 calculated that, on average, 3.6% of habitat area for 24 federal-listed vertebrates, including desert tortoise transitioned from suitable to unsuitable in any given year; thus, a 15% decline in 5 years or less would exceed the observed historical background rate of habitat loss. Key corridors will be identified within the first three years of MSHCP implementation for non-volant (i.e. incapable of flight), but highly mobile Covered Species such as desert tortoise and Gila monster, and within the first five years for Covered Plant Species (Objective 2E).

7.2.5 Invasion by Invasive Species

Invasive plants and wildlife already occur in the Plan Area and have the potential to expand their distributions and become more prevalent over time as the climate changes. Invasive species can negatively impact Covered Species by competing for resources, altering ecosystem processes, and contributing to the exacerbation of other threats, like wildfire and predation. Invasive species may not provide nutritional forage for Covered Species compared to native vegetation, which can influence the growth rate of individuals and weaken the immune responses of individuals. Actions may be taken to reduce threats posed by invasive plants and wildlife.

7.2.5.1 Risk Assessment

Many invasive plant and wildlife species currently occur within the Plan Area and pose a variety of direct and indirect threats to Covered Species. It is unlikely that many of the existing invasive species in the Plan Area will be eradicated during the Permit term. In addition, new invasive species will likely establish populations and others will expand their range within the Plan Area

during the Permit Term. Invasive plant species are likely to negatively affect Covered Species by altering ecosystem processes, such as nutrient cycling, hydrologic cycles, frequencies and intensity of wildfires, and erosion and sediment deposition (Bossard et al. 2000). Invasive annual grasses and mustards are likely to increase the size, frequency and intensity of wildfires. Invasive plants will likely degrade aquatic and riparian habitats and may result in permanent conversion to habitats unsuitable for some Covered Species. Invasive wildlife species, such as the house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*), are likely to impact some Covered Species by competing for resources. Other invasive wildlife species, such as the common raven (*Corvus corax*) and the American crow (*Corvus brachyrhynchos*), directly affect desert tortoise populations through predation. Covered Bird Species are likely to be impacted by brood parasitism of the invasive Brown-headed cowbird (*Molothrus ater*). Displacement of native ants and other native invertebrates by the Argentine ant (*Linepithema humile*) is likely to indirectly affect Covered Species by altering food resources, or directly through injury or predation of Covered Species. Covered Species dependent on wetland and riparian habitat could be negatively influenced by wild horses (*Equus caballus*) and burros (*E. asinus*) through alteration of riparian areas and reduced forage. All ecosystems and habitat features associated with the Covered Species are at risk of increased pressure from invasive plant and wildlife species due to climate change.

7.2.5.2 Preventative Measures and Planned Responses

As described in the Avoidance and Minimization Measures (Section 6.2), and the MAMP (Section 6.4.1.1.1), the Plan Administrator will take the following steps to manage invasive species at or below the baseline conditions:

- Invasive species management will be addressed as part of each SMA's CMA, to identify essential areas for weed control to promote resiliency, redundancy and representation of Covered Species.
- Project design measures and general construction measures, such as GCM-5, will be implemented for all construction projects to minimize impacts to habitats of and temporary stressors to Covered Species, and reduce potential for introduction or spread of invasive species during construction.
- The DCP will work with Clark County Vector Control and other appropriate agencies/entities to develop an Early Detection Rapid Response Program for County lands and right of ways within the first 3 years of MSHCP implementation.

Additionally, non-native wildlife will be managed in collaboration with BLM, as described in the CMAs for each SMA. Two SMAs overlap with BLM Herd Management Areas (HMAs): Stump Springs overlaps with the Wheeler Pass HMA (containing 47-66 wild horses and 20-35 wild burros) and Bird Springs Valley overlaps with a portion of the Red Rock HMA (containing 16-27 wild horses and 29-49 wild burros; BLM March 2022). If non-native wildlife negatively impact Covered Species in the Reserve System, DCP will alert BLM, per CMA protocols. Although BLM is ultimately responsible for wild horse and burro management, the County may erect fences or implement other management practices to protect sensitive habitats as determined in consultation with BLM through CMA management.

7.2.5.3 Changed and Unforeseen Circumstances

No unforeseen circumstances exist for invasive plant or wildlife species. The adaptive management process will allow for management of any newly established invasive plant or wildlife species or change in conditions or distribution of existing invasive species. Early eradication of invasive species in the Plan Area will occur through The Early Detection and Rapid Response

Program, developed by DCP in collaboration with Clark County Vector Control. The Early Detection and Rapid Response Program will include worker and public education, invasive species monitoring methods, and response protocol for newly identified invasive or potentially invasive species (Chapter 6.4).

7.2.6 Change in Disease Prevalence or Virulence

The risk of disease to Covered Species may increase as the climate changes, as may the susceptibility of Covered Species and their habitats to disease. It is important to recognize species currently at risk of disease, and to identify changes in prevalence and virulence of new or increasingly detrimental diseases in the Plan Area.

7.2.6.1 Risk Assessment

Because Covered Species typically have small or declining populations, they are at a higher risk of collapse due to disease; therefore, exposure to a newly occurring disease or a disease that has increased in virulence may be imminent threats to many Covered Species. For example, the upper respiratory tract disease currently threatening desert tortoise populations is likely to increase in prevalence and virulence in conjunction with increased stress caused by climate change.

7.2.6.2 Preventative Measures and Planned Responses

Preventative measures and planned responses presented in this MSHCP Amendment will minimize the risk to Covered Species from a disease outbreak or disease introduction, and from increased pressures from Covered Activities. DCP will coordinate with NDOW, NDF and USFWS to establish a notification system for disease outbreaks and introductions. If a known high-risk disease outbreak occurs, or its virulence is detected to have increased, or if a first occurrence of a known high-risk disease is identified within the Plan Area, disease prevalence and virulence monitoring will be incorporated into Covered Species monitoring through adaptive management, as described in the MAMP (Section 6.4.1.2). For the upper respiratory tract disease, desert tortoise handling protocols incorporate sanitary techniques and other protective measures to prevent disease spread (USFWS 2024). If a disease outbreak occurs, Reserve System landowners, the agencies, and the Science Advisor Panel will be consulted on a response plan as part of the adaptive management process.

7.2.6.3 Changed and Unforeseen Circumstances

A 40% decline in the population of a Covered Species in the Reserve System due to a disease is an unforeseen circumstance. In that event, the DCP, the USFWS, and the Science Advisor Panel will be consulted on a remediation plan.

7.2.7 New Listing of Species Not Covered by the Plan

Climate change will drive changes to conditions in the Plan Area, including to the magnitude, pace, and impacts of fire, temperature, precipitation, invasive species and disease. These changes may increase or accelerate risks to species, potentially necessitating ESA-listing for new species which are not currently covered by the MSHCP Amendment. If a new species is listed, or is proposed for listing, and MSHCP implementation could adversely affect the newly listed species, this will be considered a changed circumstance and will be dealt with accordingly.

7.2.7.1 Risk Assessment

As a part of the development of this MSHCP Amendment, the list of Covered Species was reevaluated. The purpose of this reevaluation was to reduce the number of Covered Species so mitigation actions and resources can be prioritized to focus on species most at risk within the Plan Area during the Permit Term. A variety of factors were considered, but an element of the reevaluation was to consider species for incorporation into the Covered Species list that are not currently federally listed under the ESA but may become listed during the Permit Term because of habitat degradation and population declines. Following this reevaluation process, 26 species are now included as Covered Species.

The following species are now Covered Species under this MSHCP Amendment because they have the potential to become ESA-listed during the Permit Term due to habitat degradation and population decline.

Table 7-2 Listing Status of Covered Species

Listing Status	Species
Not Federally Listed	banded Gila monster (*Heloderma suspectum cinctum*)
	golden eagle (*Aquila chrysaetos*)
	western burrowing owl (*Athene cunicularia hypugea*)
	gilded flicker (*Colaptes chrysoides*)
	loggerhead shrike (*Lanius ludovicianus*)
	Bendire's thrasher (*Toxostoma bendirei*)
	Le Conte's thrasher (*Toxostoma lecontei*)
	Arizona Bell's vireo (*Vireo bellii arizonae*)
	desert pocket mouse (*Chaetodipus penicillatus*)
	Townsend's big-eared bat (*Corynorhinus townsendii*)
	spotted bat (*Euderma maculatum*)
	sticky ringstem (*Anulocaulis leiosolenus var. leiosolenus*)
	silverleaf sunray (*Enceliopsis argophylla*)
	alkali mariposa lily (*Calochortus striatus*)
	Las Vegas buckwheat (*Eriogonum corymbosum var. nilesii*)
	blue diamond cholla (*Cylindropuntia multigeniculata*)
	Pahrump Valley buckwheat (*Eriogonum bifurcatum*)
	sticky buckwheat (*Eriogonum viscidulum*)
	white margined beardtongue (*Penstemon albomarginatus*)
	Parish phacelia (*Phacelia parishii*)
	St. George blue-eyed grass (*Sisyrinchium radicatum*)
	Joshua tree (*Yucca brevifolia*)
Under Federal Review	Mojave poppy bee (*Perdita meconis*)
	threecorner milkvetch (*Astragalus geyeri var. triquetrus*)
Federal Candidate Species	monarch butterfly (*Danaus plexippus*)

Given this reevaluation of species for coverage by the MSHCP Amendment and the incorporation of many species not currently federally listed but having the potential to become listed during the Permit Term, the risk of additional species being ESA-listed that are not currently covered by the MSHCP is minimized. Nonetheless, the preventative measures and planned responses described in the following section will be implemented to mitigate the risk of potential changed circumstances.

7.2.7.2 Preventative Measures and Planned Responses

Overall, implementation of the Conservation Strategy and the associated BGOs and MAMP is considered a general preventative measure because it maintains or improves habitat quality for Covered Species while avoiding, minimizing and mitigating impacts to Covered Species habitat from Covered Activities. Given the range of ecosystems and habitats protected as part of the Conservation Strategy, non-covered species that could be ESA-listed in the future will benefit from the Conservation Strategy as well. If the Conservation Strategy is implemented effectively and adaptive management is applied, the risk of new ESA-list species is minimized.

If the USFWS finds that listing is warranted for a new species, they will notify the DCP. This notification will trigger a planned response under the MSHCP Amendment. The planned response will begin with mapping the species' habitat within the Plan Area, quantifying the area of habitat, and determining its conservation risks and needs. The DCP will determine how the Conservation Strategy can be modified to accommodate the conservation risks and needs of the species.

If a new species is ESA-listed, the Permittees, with assistance from USFWS, will evaluate the potential effects of Covered Activities on the newly listed species and any designated critical habitat. If there is potential for adverse effects to occur during implementation of Covered Activities, the Permittees will implement measures identified by USFWS to avoid the likelihood of take of the newly listed non-covered species, or modification of the newly designated critical habitat, until the HCP and ITP are amended to include such species, or until USFWS notifies the Permittees that such measures are no longer needed. The Permittees will coordinate with USFWS to make the newly listed species a Covered Species through an MSHCP and ITP Amendment, or apply for individual take coverage for activities resulting in impacts to the species or its habitat. The MSHCP may need to include new avoidance and minimization measures for the newly Covered Species and quantify qualified acres of impacts and mitigation through the Reserve System to ensure the species habitat is adequately maintained and improved. If the Permittees choose to not include the newly listed species in the MSHCP Amendment, individual project proponents will need to apply for individual take coverage for the newly listed species under the ESA for project activities.

7.2.7.3 Changed and Unforeseen Circumstances

If a new species listing requires habitat to be conserved beyond the lands currently within or proposed for the Reserve System, it will be considered an unforeseen circumstance. This could occur because a newly listed species requires habitat not currently included in the Reserve System, or because habitat within the Reserve System becomes degraded or altered to a point where it no longer supports the survival of the newly listed species. Neither of these scenarios are reasonably expected within the Permit Term; therefore, there are no unforeseen circumstances.

7.3 Assurances for Private Landowners

The MSHCP provides assurances to private landowners to clarify rules governing how the DCP can acquire and place conservation easements on properties for inclusion into the Reserve System.

Willing Sellers

Land will only be acquired by the DCP for the MSHCP Reserve System from willing sellers. The DCP will not require a landowner to sell or put a conservation easement on their property for the MSHCP. The DCP will not use condemnation or eminent domain to acquire properties. The DCP also cannot require changes to land use or zoning designations to facilitate implementation of the Conservation Strategy. No single parcel of land is required to satisfy the MSHCP Conservation Strategy. The DCP will pay acquisition and easement prices that reflect market rates for comparable properties.

Public Notification of County Acquisitions

When the County acquires property for the Reserve System, as with all County acquisitions, notice will be given to the public through the publication of the Board of County Commissioners agendas. The public may provide comments through this process.

No Public Access to Conservation Easements Held by Private Landowners

The public will not be allowed to access privately-owned properties incorporated into the Reserve System through a conservation easement. Access will be granted to the DCP and their contractors, however, to conduct necessary monitoring and management, consistent with the MAMP.

References

Albright, T. P., D. Mutiibwa, Alexander. R. Gerson, E. K. Smith, W. A. Talbot, J. J. O'Neill, A. E. McKechnie, and B. O. Wolf. 2017. Mapping evaporative water loss in desert passerines reveals an expanding threat of lethal dehydration. Proceedings of the National Academy of Sciences 114(9):2283–2288.

Anderson, S.H., 1983. Yuma clapper rail recovery plan. US Fish & Wildlife Service.

Asif, Z., Z. Chen, R. Sadiq, and Y. Zhu. 2023. Climate Change Impacts on Water Resources and Sustainable Water Management Strategies in North America. Water Resources Management 37(6):2771–2786.

Bell, J.L., Sloan, L.C., Snyder, M.A., 2004. Regional changes in extreme climatic events: a future climate scenario. J. Clim. 17, 81e87.

Bell, M. L., A. Gasparrini, and G. C. Benjamin. 2024. Climate Change, Extreme Heat, and Health. New England Journal of Medicine 390(19):1793–1801. Massachusetts Medical Society.Bossard, Carla C., John M. Randall, and Marc C. Hoshovsky, eds. Invasive plants of California's wildlands. Univ of California Press, 2000.

Bradford, J. B., D. R. Schlaepfer, W. K. Lauenroth, and K. A. Palmquist. 2020. Robust ecological drought projections for drylands in the 21st century. Global Change Biology 26(7):3906–3919.

Breshears, D. D., J. B. Fontaine, K. X. Ruthrof, J. P. Field, X. Feng, J. R. Burger, D. J. Law, J. Kala, and G. E. St. J. Hardy. 2021. Underappreciated plant vulnerabilities to heat waves. New Phytologist 231(1):32–39.

Brooks, M.L., D'Antonio, C.M., Richardson, D.M., Grace, J.B., Keeley, J.E., DiTomaso, J.M., Hobbs, R.J., Pellant, M., and Pyke, D., 2004. Effects of invasive alien plants on fire regimes. BioScience 54, 677e688.

Brooks, M.L., Esque, T.C. and Duck T. 2003. Fuels and fire regimes in creosotebush, blackbrush, and Interior chaparral Shrublands. Pages 17 in U. F. S. Report for the Southern Utah Demonstration Fuels Project, Rocky Mountain Research Station, Fire Science Lab, Missoula Montana., ed.

Brooks, M.L., and J.R. Matchett. 2003. Plant community patterns in unburned and burned blackbrush (*Coleogyne ramosissima* Torr.) shrublands in the Mojave Desert. Western North American Naturalist, 283-298.

Brooks, M.L., and J.R. Matchett. 2006. Spatial and temporal patterns of wildfires in the Mojave Desert, 1980-2004. Journal of Arid Environments 67S: 148-164.

Bureau of Land Management [BLM]. 2022. Nevada Herd Management Areas. https://www.blm.gov/programs/wild-horse-and-burro/herd-management/herd-management-areas/nevada

Busch, David E., and Stanley D. Smith. 1995. "Mechanisms associated with decline of woody species in riparian ecosystems of the southwestern US." Ecological Monographs 65.3: 347-370.

Butler, C. J. 2019. A Review of the Effects of Climate Change on Chelonians. Diversity 11(8).

D'Antonio, C.M., Vitousek, P.M., 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annu. Rev. Ecol. Syst. 23, 63e87.

Diffenbaugh, N.S., Giorgi, F., and Pal, J.S., 2008, Climate change hotspots in the United States: Geophysical Research Letters, v. 35, 5 p., doi:10.1029/2008GL035075, accessed March 28, 2011, at http://www.purdue.edu/eas/earthsystem/ Diffenbaugh_GRL_08.pdf.

Dwire, Kathleen A., and J. Boone Kauffman. "Fire and riparian ecosystems in landscapes of the western USA." Forest Ecology and Management 178.1-2 (2003): 61-74.

Eichenwald, A.J., M.J. Evans, and J.W. Malcom. 2020. US imperiled species are most vulnerable to habitat loss on private lands. Frontiers in Ecology and the Environment 18(8) 439e446.

Elmore, R. D., J. M. Carroll, E. P. Tanner, T. J. Hovick, B. A. Grisham, S. D. Fuhlendorf, and S. K. Windels. 2017. Implications of the thermal environment for terrestrial wildlife management. Wildlife Society Bulletin - Record Set Up In Error 41(2):183–193.

Feldmeier, S., B. R. Schmidt, N. E. Zimmermann, M. Veith, G. F. Ficetola, and S. Lötters. 2020. Shifting aspect or elevation? The climate change response of ectotherms in a complex mountain topography. Diversity and Distributions 26(11):1483–1495.

Hassan, T., R. Gulzar, M. Hamid, R. Ahmad, S. A. Waza, and A. A. Khuroo. 2023. Plant phenology shifts under climate warming: a systematic review of recent scientific literature. Environmental Monitoring and Assessment 196(1):36.

Hatfield, J.L., and J.H. Prueger. 2015. Temperature Extremes: Effect on Plant Growth and Development. Weather and Climate Extremes 10(A), 4e10.

Kalansky, J., Sheffield, A., Cayan, D., Pierce, D. 2018. Climate Conditions in Clark County, NV: An Evaluation of Historic Projected Future Climate using Global Climate Models: accessed June 24, 2024 at https://www.wucaonline.org/assets/pdf/pubs-clark-county-climate-report.pdf.

Lee, H., et al. 2023. IPCC, 2023: Climate Change 2023: Synthesis Report, Summary for Policymakers. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland. Accessed December 19, 2024 at https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_AnnexesIndex.pdf.

Milly, P.C.D., Dunne, K.A., and Vecchia, A.V., 2005, Global pattern of trends in streamflow and water availability in a changing climate: Nature, v. 438, no. 7066, p. 347-350.

Mistretta, O., Pant, R., Ross, T.S., Porter, M. and Morefield, J.D., 1996. Current knowledge and conservation status of *Arctomecon californica* Torrey & Frémont (Papaveraceae), the Las Vegas bearpoppy. *Status report prepared for Nevada Natural Heritage Program, Department of Conservation and Natural Resources, and US Fish & Wildlife Service, Nevada State Office, Section-6 funds provided through Project Agreement EP-3-8*.

NOAA National Centers for Environmental information, Climate at a Glance: County Time Series, published July 2024, retrieved on June 20, 2024 from https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/time-series

Pan, Linlin & Chen, Shu-Hua & Cayan, Daniel & Lin, Mei-Ying & Hart, Quinn & Zhang, Ming-Hua & Liu, Yubao & Wang, Jianzhong. 2011. Influences of climate change on California and Nevada regions revealed by a high-resolution dynamical downscaling study. Climate Dynamics. 37. 2005-2020. doi:10.1007/s00382-010-0961-5.

Redmond, K., 2010, Climate variability and change in the Great Basin—Observations and projections, in Workshop Clearinghouse—Natural resource needs related to climate change in the Great Basin and Mojave Desert: Research, adaptation, mitigation: accessed March 28, 2011, at http://www.wr.usgs.gov/workshops/ccw2010/abstracts.html.

Rostal, David & Wibbels, Thane & Grumbles, Janice & Lance, Valentine & Spotila, James. 2002. Chronology of Sex Determination in the Desert Tortoise (Gopherus agassizii). Chelonian Conservation and Biology. 4.

Ryan, M.G., Archer, S.R., Birdsey, R., Dahm, C., Heath, L., Hicke, J., Hollinger, D., Huxman T., Okin G., Oren R., Randerson, J., and Schlesinger, W. 2008. Land Resources, in The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States: A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. Washington, DC, USA, 362 p.

Seager, R., Ting, M., Held, I., Kushnir, Y., Lu, J., Vecchi, G., Huang, H.-P., Harnik, N., Leetmaa, A., Lau, N.-C., Li, C., Velez, J., and Naik, N. 2007. Model projections of an imminent transition to a more arid climate in Southwestern North America: Science, v. 316, no. 5828, p. 1181-1184.

Shafroth, Patrick B., Juliet C. Stromberg, and Duncan T. Patten. 2002 "Riparian vegetation response to altered disturbance and stress regimes." Ecological applications 12.1: 107-123.

Siirila-Woodburn, E. R., A. M. Rhoades, B. J. Hatchett, L. S. Huning, J. Szinai, C. Tague, P. S. Nico, D. R. Feldman, A. D. Jones, W. D. Collins, and L. Kaatz. 2021. A low-to-no snow future and its impacts on water resources in the western United States. Nature Reviews Earth & Environment 2(11):800–819. Nature Publishing Group.

Snyder, M.A., Sloan, L.C., Bell, J.L. 2004. Modeled regional climate change in the hydrologic regions of California: a CO2 sensitivity study. J. Am. Water Resour. Assoc. 40, 591e601. doi:10.1111/j.1752-1688.2004.tb04445.x

Snyder, M.A., Sloan, L.C. 2005. Transient future climate over the western United States using a regional climate model. Earth Interact. 9. Article No. 11.

Stralberg, D., Jongsomjit, D., Howell, C.A., Snyder, M.A., Alexander, J.D., Wiens, J.A., Root, T.L. 2009. Re-Shuffling of Species with Climate Disruption: A No-Analog Future for California Birds? PLoS One 4 (9), e6825. http://dx.doi.org/10.1371/journal.pone.0006825.

The Nature Conservancy [TNC]. 2007. A conservation management strategy for nine low elevation rare plants in Clark County, Nevada. The Nature Conservancy, Nevada Field Office. Reno, Nevada. 289 pp. plus appendices.

U.S. Fish and Wildlife Service [USFWS]. 2024. Temporary Captive Care of Mojave Desert Tortoises (Gopherus agassizii). Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Las Vegas, Nevada: accessed December 19, 2024 at https://www.fws.gov/sites/default/files/documents/2024-11/2024-mojave-desert-tortoise-captive-care.pdf.

Yu, G., Hatchett, B.J., Miller, J.J., Berli, M., Wright, D.B. and Mejia, J.F., 2023. Seasonal Storm Characteristics Govern Urban Flash Floods: Insights from the Arid Las Vegas Wash Watershed. *Journal of Hydrometeorology*, *24*(11), pp.2105-2123.