

Page	Chapter	Line Number	Comment	Created By	Response	Questions
1	Intro	43	note that “throughout” is appropriate as JTs only occur in very small portions of the Geat Basin and Sonoran desert. I would say “...in parts of...”	Esque, Todd C	Edited.	
1	1	43	"Deserts" should be capitalized where used as part of a formal place name, correct? Similarly throughout document.	Lynn Sweet	Edited and updated throughout document.	
2	1	1	I have revised this thinking based on additional reading and phrased it differently in my manuscript that is in preparation. I suggest you take a quick look at Keeler-Wolf 2007 to fortify this part. My previous stance was the long-held view, but Keeler-Wolf did a quantitative analysis and is citeable – so deserves mention.	Esque, Todd C	Updated section 3.5.3 Vegetation as follows <i>Previous research indicated that “Joshua tree Woodland” is not considered a replicable vegetation community (Rowlands 1978: 54); but more recent research describes the Joshua tree woodland alliance in California as vegetation communities with greater than 1 percent cover of Yucca brevifolia and/or less than 1 percent absolute cover of Juniperus spp. or Pinus spp. in the tree canopy, with associations generally defined by the degree of disturbance from wildfire and grazing (Sawyer et al. 2008: 301–303). We consider this delineation to also be appropriate for Y. jaegeriana. Depending on the classification system, geographic location, and type of disturbance, Joshua trees can be a component of the following vegetation communities: Sonoran-Colorado desert scrub, Mojave-Sonoran creosote bush scrubland, Mojave middle elevation desert, Mohave desert scrub, pinyon-juniper woodland. Specially they occur in vegetation associations with blackbrush (Coleogyne ramosissima), Larrea divaricate (chapparral), L. tridentata (creosote bush), Artemisia tridentata (Great Basin sagebrush), Hilaria rigida (big galleta grass), Acamptopappus sphaerocephalus (rayless goldenhead), perennial grasses, Gutierrezia microcephala (sticky snakeweed), Cylindropuntia acanthocarpa (buck horn cholla), and Sphaeralcea ambigua (desert mallow), the later three being disturbance-related shrub species (Rowlands 1978: 164–173; Sawyer et al. 2008: 301–303).</i>	
2	1	1	I appreciate that this is supposed to be succinct, but “the yucca moth” may be too generic for the non-specialist and they could be confused as there are many other species of yucca moths. I would suggest something that reflects that each Joshua tree species is pollinated by a specific species of yucca moth.	Lynn Sweet	<i>Joshua trees are part of an obligate mutualism and each species is pollinated by a specific species of yucca moth, which is solely responsible for pollination outside of a narrow zone of hybridization.</i>	
2		14	The Agavaceae is no longer recognized as a family, but a clade (the Agavoideae) within the Asparagaceae	Yoder, Jeremy B	Edited.	
3			Insufficient time provided to review this chapter. [Update: Review completed 7/23/2022]	Lynn Sweet	Acknowledged. See additional comments below from second peer review period.	
4	2	10-11	adding “drought” to fire and flood would really flesh this out and be total relevant to your discussions in this SSA	Esque, Todd C	Edited. <i>Resiliency is the ability of a species to withstand stochastic events and normal year-to-year variations in both environmental conditions (i.e., temperature, rainfall, and periodic disturbances such as drought, wildfires, or floods) and demographic conditions (i.e., mortality, fecundity; (Redford et al. 2011: 40).</i>	
5			Insufficient time provided to review this chapter. [Update: Review completed 8/2/2022]	Lynn Sweet	Acknowledged. See additional comments below from second peer review period.	
7			Insufficient time provided to review this chapter. [Update remaining incomplete review 8/5/2022]	Lynn Sweet	Acknowledged. See additional comments below from second peer review period.	
8	4	20&30	referring to Joshua tree height. I believe it was simplified to 10m in the Executive Summary or Introduction (this document is not readily searchable for me), so maybe pick the higher number and say “up to ##m tall” for simplification and accuracy	Esque, Todd C	Kept the height ranges in this section to highlight the differences between species. Pg 1, section 1.1 was edited as follows: <i>It is often the tallest plant on the landscape where it occurs, growing up to 39 feet [ft: 12 meters (m)] tall depending on the species, but is not typically dominant in terms of vegetation cover (Esque 2022b: pers. comm.).</i>	
10	Exec Sum	17	Tense agreement “occurs”	Lynn Sweet	Edited	
10	Exec Sum	32	“Yucca” in yucca moth, as a common name, does not need to be capitalized throughout.	Lynn Sweet	Edited	
10	3	29-30	referring to the age of a single Joshua tree, here is says 1,000, while I believe previously the SSA says 1,500. Might be good to pick one or the other.	Esque, Todd C	Removed reference here and elsewhere to 1,000 years based on comment Esque comment below, pg. 46. Edited as follows : <i>One Joshua tree in California is thought to be more than several hundred years old.</i>	

10	3	30	Is there a citation for the maximum age listed? These estimates (and similarly, fables about species) have a way of making an lasting impression, and it's important that we know how supported this is. Based on growth rate estimates, this seems like an extreme outlier. Is this worth mentioning here?	Lynn Sweet	Agreed. Reference to 1,000 year old trees or older have been removed.
11	Exec Sum	14	Identify which century you are referring to on the first mention.	Lynn Sweet	Edited to include the end of century (2100)
11	Exec Sum	16	Please define the authority (presumably the IPCC, and CMIP5?) for these scenarios here. I suggest this is relevant even in the executive summary as they are presented out of context. State briefly how you avoided bias in the selection of the climate simulation model(s) to use? For instance, e.g. "hot/dry" or "warm/wet" in relation to ensemble means.	Lynn Sweet	<i>We did not develop a new model specifically for Joshua tree and instead utilized existing models that varied depending on the parameter evaluated (e.g. land use, invasive grass cover, and climate variables). All data considered were based on Representative Concentration Pathway (RCP) greenhouse gas concentration scenarios adopted by the Intergovernmental Panel on Climate Change (IPCC) with the exception of invasive grass cover.</i>
11	Exec Sum	22	Please separate estimates for each species here, as you do below. This can be done succinctly.	Lynn Sweet	Edited.
11	3	20	It would be useful to also contrast this from species that may "disperse" clonally. In Joshua trees, this method of reproduction lacks the dispersal benefit of sexual reproduction for this species, because parts of plants do not detach and disperse. For example other species reproduce and disperse via asexual reproduction, cholla species, Arundo donax, etc. I believe it's relevant to mention here prior to discussion of dispersal later on, as this limits population spatial movement for primarily-clonal populations.	Lynn Sweet	<i>Asexually reproduction is not a means of dispersal in Joshua trees because the vegetative growth does not detach and reestablish away from the adult tree as is observed in other species such as (Cylindropuntia sp.) cholla and Arundo donax (giant reed).</i>
11			don't see evidence for the claim that clonal reproduction is adaptation.	Godsoe, William	Clonal reproduction allows for asexual reproduction and persistence under conditions where recruitment may not be suitable.
12	Exec Sum	33	What "limitation" of climate model do you refer to here? Be specific? Temporal? Scale/resolution? Uncertainty?	Lynn Sweet	<i>We acknowledge uncertainty in our future projections due to current information gaps, the inherent uncertainty in future climate projections particularly for precipitation, the potential for climate refugia and microclimates that are often not identified in coarse scale climate modeling, and the difficulty forecasting potential demographic changes for such a long-lived species</i>
12	Exec Sum	14-16; 26-27 indicated?	In Appendix F, lines 5-7 of the caption, you state that you were unable to make quantitative estimates of acreages that will be occupied into the future, due to the disparate methodology of the models considered. Why and how, then, here are acreage estimates of future suitable habitat	Lynn Sweet	A new model was not developed. See explanation of methodology pages 110-111 and appendix F. The updated text for Appendix G reads <i>The following bioclimatic models were evaluated in our assessment of the potential effects of climate change on Joshua trees (Thomas, In review; Thomas 2012, Comer et al. 2013 and Cole et al. 2011). We included the general results of these models for the future climate scenarios as described in section 8-1, with the exception of Thomas, In review. We had intended to utilize the available GIS data from these models to provide a more accurate assessment of the acreage of suitable and unsuitable habitat at the scale of the analysis unit. However, we were unable to move forward with this approach due to inconsistencies between the distributions used in the various models and our current understanding of the species' distribution. For example, large portions of the current distribution were not modeled ranging from 6 percent (Thomas, In review) to 30 percent (Comer et al. 2013). Moreover, in one study (Thomas 2022, In review) a large portion (~46 percent) of Joshua trees occupied habitat was modeled as currently unsuitable according to their modeled baseline distribution. To illustrate the issue, the following figures represent the modeled future distributions from these studies under the climate scenarios indicated, relative to our understanding of the current distribution of Joshua trees (indicated by the gray polygons).</i>
12	3	30-35	admittedly masting year is a moving target, but 2022 is the last masting year before the release of this document.	Esque, Todd C	Edited. <i>Recently, masting events were recorded in 2013, 2018/2019, 2022; there is variation across the range and single masting events typically do not occur range-wide. In 2013, 80 percent of the trees were in bloom on average, based on a study of 10 study sites across the Mojave Desert (St. Clair and Hoines 2018, p. 5). However, only 40 percent of the trees were blooming at cooler sites (Cima Dome and Walker Pass) and may have been due to the higher number of clones at these locations (Esque 2022a, pers. comm.).</i>
12	3		This very likely differs by Joshua tree species. I've seen differences in distance to parent tree for putative sprouts in Y. b. vs. Y. j. If you include this you may cite this reviewer, Sweet pers. comm.	Lynn Sweet	<i>Research studies have used a distance of 3.3 ft (1 m; Barrows and Murphy-Mariscal 2012) to 6.6 ft (2 m; Sweet et al. 2019) from an adult tree to distinguish seedlings from clones; and there is some indication that the distance of clones from adult trees may be species specific (Sweet 2022, pers. comm.). However, this limit has not been tested through a genetic study making it difficult to determine clones from juvenile trees. Earlier work in blackbrush vegetation community indicated that Joshua tree roots may extend up to 36 ft (11 m) from adult trees (Bowns 1973: 41), but additional research is required to inform the average rooting depth and distance of each species of Joshua tree.</i>

12	3	19-24	This statement reads as if flowering isn't largely synchronous. In western Joshua trees, most of the population is either flowering or not flowering in a given year. Similar to Smith, I agree that an odd tree may be flowering in most years, (and likewise, not all trees flower in a given year) but my personal observation from living next to Joshua Tree National Park for 6 years is that it's fairly synchronous. I lack the time to find a reference; perhaps CA phenology project has the data. Perhaps the information from the very knowledgeable source cited was referring to Eastern trees and was mischaracterized here.	Lynn Sweet	Modified as the sentence suggests a higher proportion flowering in any given year. <i>Although large masting events do not happen very often, there is typically a small number of trees flowering in most years (Smith 2022, pers. comm.)</i>
12	3	33	This is incorrect for Yucca brevifolia. The last large bloom event in and surrounding Joshua Tree National Park was an anomalously-long bloom November 2018-March 2019. This was documented in Brenskelle et al. Scientific Reports, 2021. Please note that I cite this paper here only for the documentation of the flowering event; the analysis may be flawed as it was not produced in communication or collaboration with the University and NPS scientists who collected the data (iNaturalist data) on which it was based as part of their own research project. There are likely issues with using these data without taking into account the intentional spatial bias in the observations made as part of the study assumptions and study design.	Lynn Sweet	Edited. <i>Recently, masting events were recorded in 2013, 2018/2019, 2022; there is variation across the range and single masting events typically do not occur range-wide. In 2013, 80 percent of the trees were in bloom on average, based on a study of 10 study sites across the Mojave Desert (St. Clair and Hoines 2018, p. 5). However, only 40 percent of the trees were blooming at cooler sites (Cima Dome and Walker Pass) and may have been due to the higher number of clones at these locations (Esque 2022a, pers. comm.).</i>
13	3	8-21	consider defining diapause. it is used twice in this paragraph and each time the sentences seem a little less understandable than the rest of the section. Try to untangle physiology versus life stage	Esque, Todd C	Edited. <i>Larvae feed more or less sequentially through the seeds in a chamber of the seed pod and encountering an infertile seed causes the larvae to exit the pod and diapause, a period of suspended development typically during a period of unfavorable conditions (Ziv and Bronstein 1996: 64; Harrower and Gilbert 2018: 13).</i>
13		36	"... because their ovipositor is not long enough to reach the pistil" has things somewhat turned around; the ovipositor in "T. synthetica" is "too long" for successful oviposition on "Y. jaegeriana", because it does unnecessary damage to the ovules in the floral ovary. This should trigger a floral abortion response, which does indeed effectively eliminate both moth oviposition success and any seeds that would result from pollination.	Yoder, Jeremy B	<i>Seed production in Y. jaegeriana is the result of pollination exclusively by T. antithetica since T. synthetica moths are unable to pollinate Y. jaegeriana, because their ovipositor is too long resulting in damage to the ovules in the floral ovary (Starr et al. 2013: 10).</i>
15	2	30-33	A biologically-meaningful timeframe necessary to detect changes would generally not be, as stated, one to several centuries, as conclusions regarding these topics have been derived from many studies done by government as well as academic scientists, accomplished within the lifetime of individual scientists. This is an overly broad and somewhat misleading statement; perhaps it was could be rephrased if I am misunderstanding what you are trying to say. Population trends can and have been detected in long-lived species using modern demographic analysis. See Harper and White, 1974, Annual Review of Ecology and Systematics or for example, Plath, Evans & Rathbun. Am. Nat. 1988; McLaughlin and Zavaleta 2011 Global Change Biology.	Lynn Sweet	Deleted "so a biologically meaningful timeframe to detect changes in population growth trends, population extirpation, and habitat colonization events may take one to several centuries". New text reads: "Joshua trees can live several hundred years and have a generation time of at least 50 to 70 years (Esque et al. 2015: 89). There is increasing uncertainty as persistence is modeled into the future; therefore, we will use timeframes for future model forecasts that are available for threats identified in this assessment and will project species viability at the end of the century.
15	3	17	'that' should be 'than'	Esque, Todd C	Edited
15	3	30-31	There is a phrase about ensuring viable seed that is attributed to P&H 1994. I don't know what they said exactly, but suggest that it makes more sense to say, "in effect reducing the predator load, and potentially increasing the probability of viable seed" because we don't really know if it ensures enough viable seed for perpetuation under all circumstances	Esque, Todd C	Edited
15	3	17	The statement including the word "that" would make more sense as a contrast if instead, the word "than" was meant to be used in its place.	Lynn Sweet	<i>During a rangewide study of Joshua trees evaluating yucca moth abundance and reproduction across 16 sites sampling a range of elevations and abiotic parameters, both increased moth abundance and seed set were observed at higher elevations and latitudes than the JTNP research presented above (Smith 2022, pers. comm.).</i>
15	3	7	The St. Clair and Hoines study covered both species of Joshua tree, and the difference from the Harrower and Gilbert study is that the former looks at inter-site differences (comparing site temperature across sites, lumping the two species in analysis; see Figs 1 and 5), and the latter investigated an elevational gradient, looking at essentially intra-regional differences. These two approaches are at different scales and are not comparable.	Lynn Sweet	Modified text to highlight differences between the scale of each study. <i>The research in JTNP described above characterizes potential variations in reproductive strategy and moth abundance across an elevation gradient at the southern limit of Yucca brevifolia; but different studies come to slightly different conclusions about what is driving reproductive success depending on what measure of reproduction and the geographical scale evaluated.</i>

15		21	Unfortunately the insect larva depicted in Fig 3-4 is not a yucca moth; the larvae of the two Joshua tree pollinator species are green with some pink shading rather than brown, and do not have discrete head capsules, as this one does. I suspect it's a beetle, but insect larval IDs can be quite challenging. (A couple of beetle species lay eggs in Joshua tree flowers and fruits, so it's certainly possible this was indeed extracted from a Joshua tree fruit.)	Yoder, Jeremy B	Deleted photo.
16	3	24-26	I do not recall previously seeing the latin for the following - Mohave Ground Squirrel - spelled with an 'h' rather than 'j', (Xerospermophilus mohavensis), round-tailed ground squirrel (X. tereticaudus), and rock squirrel (Otospermophilus variegatus)	Esque, Todd C	<i>There are five squirrel species documented to predate and potentially disperse Joshua tree seeds: Mohave ground squirrels (Xerospermophilus mohavensis), white-tailed antelope squirrels (Ammospermophilus leucurus), California ground squirrels (Otospermophilus beechyi), round-tailed ground squirrels, and rock squirrels (Lenz 2001: 65; Borchert and DeFalco 2016: 832).</i>
16	3	~27	I checked Borchert and DeFalco - they state that desert woodrats do not facilitate seed dispersal, because they are not scatter hoarders. They do mention the pinyon mouse (Peromyscus truei) as a Joshua tree disperser, and either Borchert or maybe Waitman or maybe VanderWall state that P. truei scatter cache single seeds.	Esque, Todd C	<i>Pinyon mice (Peromyscus truei), Merriam's kangaroo rats (Dipodomys merriami), agile kangaroo rats (Dipodomys agilis), and the San Diego pocket mouse (Chaetodipus fallax) cache seeds in their burrows in the ground, which facilitates germination (Borchert and DeFalco 2016: 832).</i>
16	3	23	I would not use "predate" but rather	Esque, Todd C	<i>There are five squirrel species documented to consume and potentially disperse Joshua tree seeds..</i>
16	3	39-41	regarding attributed to Cornett about his observation challenging the wind hypothesis by Waitman et al - while Cornett may challenge the research, the observation does not. Coyotes can move seeds too, and that is not discussed here - much more likely than wind - especially based on the replicated experiments in a wind tunnel	Esque, Todd C	<i>Fruits have also been hypothesized to be dispersed by wind, ungulates, as well as, coyotes. As Joshua tree fruits dry out they are hypothesized to be transported by desert winds (Simpson 1975: 34), though subsequent research noted that wind dispersal is unlikely because wind speeds required to move Joshua tree fruits and seeds across the soil surface were higher than those typically found in the Mojave Desert (Waitman et al. 2012: 6). Seed dispersal may be carried out by ungulates documented to feed on Joshua tree fruits, including bighorn sheep, cattle (Lenz 2001: 64), mule deer (Keith 1982: 42), horses, burros (Lenz 2001: 64). None of these ungulates are tall enough to reach fruits in larger, older Yucca brevifolia trees, and to what extent they serve as Y. jaegeriana seed dispersers remains unknown. Seeds of other plant species have been documented to be viable after passing through the digestive tracts of animals; but it is not clear if that is the case with these seed predators and Joshua tree. Recent observations of juvenile trees greater than 600 m from the nearest adult (Cornett 2022a, pers. comm.) indicate that slightly further dispersal distances may be possible due to the mechanisms above; but are considered rare events.</i>
16	3	40	Similar to the note about tree maximum age, I would advise caution in introducing this specific number here without more information, and without putting it in context, such as the location of this observation, and how the distance was measured. I appreciate the contribution of natural history observations to the understanding of the species, however typical dispersal distance in practice needs to be further studied empirically and dispersal of these distances are not known to be a common occurrence based on the other literature cited. Some of the information on page 29 would be helpful here.	Lynn Sweet	See response above.
17	3	1-2	although mentioned in the lead sentence the pleistocene megafauna are not detailed. However, I see you covered this later in detail. Maybe make a reference to that as you have for other topics	Esque, Todd C	Deleted reference, see text above.

			Many of my later comments (likely duplicative) will suggest further explanation is necessary, and those are likely relevant to this section of the Methodology chapter. As this is the methodological basis for the conclusions, please recognize that the particular climate scenario and global climate model (GCM) chosen highly influences the outcome of species distribution models, and therefore, more explanation is necessary here. Please describe here how the authors of the models you are using chose the GCM used, and how you (or they) avoided bias. The word "plausible" implies that some simulations/downscales were ruled out as implausible, or else this is irrelevant to state. To say that they are part of a spectrum is also to leave out whether these were biased towards any particular end of a multi-factor spectrum. You could refer to the number of models considered, and where they sit with regard to the ensemble mean. If the e.g. Cole or Thomas model was used for this analysis, the particular climate scenario and GCM they used. I have further suggestions on the same topic concerning "Figure 6-8."	Lynn Sweet	
18	2	20-37		Esque, Todd C	This template language on how we structure future conditions was not edited. Additional explanation for the modeling is included on pgs. 107-111. Appendix F was also added that includes the specific models and timeframes for the JT models evaluated, to address the reviewers concerns.
18	3	35	researches should be researchers	Esque, Todd C	Edited
18			would benefit from a few additional sentences on what mycorrhizae are and why they are important.	Godsoe, William	<i>The roots of Joshua tree seedlings are colonized by a suite of arbuscular mycorrhizal fungi with species associations varying by plant community, elevation, and other abiotic conditions (Harrower and Gilbert 2021, entire). Mycorrhizal fungi provide plants access to mineral and micro-nutrients in exchange for carbon photosynthate produced by the plant. These relationships can confer benefits to inoculated plant species including increased growth and survival, and through improved disease and drought resistance. A recent study of Yucca brevifolia mycorrhizal fungal associations in JTNP, indicate a potential for decreased growth at low elevations in the first few months following germination, due to the carbon demands necessary to build seedling's mycorrhizal network (Harrower and Gilbert 2021: 14).</i>
20			One thing that emerges from the Esque citations is just how long the generation time can be because of the rare opportunities for reproduction. This makes it extremely difficult to obtain enough data to explicitly model population growth. I think this concern is not highlighted enough.	Godsoe, William	Addressed under section 5.0 Species Needs. 5.2.2 Abundance <i>Joshua trees require populations of sufficient abundance to be maintained over time with stable or increasing population growth. Sufficient abundance is achieved through survival of young age-classes to adult, successful reproduction, and recruitment to support the next generation. There must be adequate survival at all life stages to support an abundant adult population. We currently lack a population viability analysis and information on the abundance at each age class required to maintain a resilient population. It is particularly difficult to model population growth due to the long generation time and rare reproduction opportunities.</i>
21	3	25	you could cite Esque et al. 2003 instead of Esque 2022b pers comm as citations are held in higher regard than pers comms	Esque, Todd C	Edited
21			Information from harrower and gibert is summarized in several different places, it might be clearer to summarize this all in one place.	Godsoe, William	Acknowledged. This section is structured around by the life cycle and life stage.
22	3	14	this description among deserts is more accurate than the one I previously commented about - might make sure they are consistent	Esque, Todd C	Acknowledged.
22			Clarify claim "earlier references indicated" does that mean later references agree, or are agnostic on the subject.	Godsoe, William	Sentence deleted. Not pertinent to the point of the paragraph.
23		1-12	Observed distribution on the landscape is indeed likely to be a better indicator of tolerances, especially for mature trees, than the 1983 lab study by Smith et al.	Yoder, Jeremy B	Acknowledged.
24	3	21	Spelling, summer.	Lynn Sweet	Edited
26	3	22	dominate should be dominant, also as previously mentioned I suggest re-visiting Keeler-Wolf 2007 and considering his quantitative take on joshua trees and their place in communities. I am writing about this in our In Prep paper and using this citation	Esque, Todd C	Edited. See previous comment referencing page 2 above
26	3	23	Are you referring to Holland types or USNVC accepted types here? Please note the authority. I see you cite Sawyer further down; make it more clear here what USNVC/MCV levels you are using, e.g. group and alliance.	Lynn Sweet	Acknowledged.
27	4	24-36	probably should cite Waitman et al. in this paragraph to be parallel with attributions in the rest of the document	Esque, Todd C	Acknowledged.

29	3	32	the stand in x was not replaced with the inches of precip "current reads monthly precipitation in excess of x in)	Roe, Aaron M	Edited. <i>Joshua tree seeds appear to germinate and emerge any time after a rain (Went 1948: 250), although monthly precipitation in excess of 1.1 in (2.9 cm) is indicated as important for maintaining soil moisture for recruitment (Reynolds et al. 2012: 1652; Borchert and DeFalco 2016: 835) .</i>
29	4	25-28	This is discussing spatial or biogeographic distribution and you should omit the qualitative characterization of climate here. The climate niche breadth information that is described in more detail above for the consideration of the reader (e.g. 10C degree span of variation in mean temp of the warmest month). This is desired in lieu of this casual characterization, this being a "wide" variety of climate conditions. Whether this is a broad range of climatic tolerance in comparison to similar plant species is not presented for context.	Lynn Sweet	Acknowledged and deleted following text. <i>Joshua trees appear to have adapted to the variety of desert climate conditions given the wide range of vegetation communities (Rowlands 1978: 54), soils, elevation, and precipitation gradients exhibited in the areas where the species are found. However, the distribution of Joshua trees does not extend to the lowest parts of the Mojave Desert where it is hottest and driest, such as Death Valley and Cadiz Valley, California.</i>
29		18	A 500m x 500m grid should produce cells that are a quarter of a "square" kilometer.	Yoder, Jeremy B	Edited
31	4	19	Regarding, the statement about joshua trees not getting to St. George, Utah. Not sure what the point is with this statement, but they do make it into the Dixie Valley where St. George occurs, so it is splitting hairs and a little misleading. Rowlands did not have the resources we had to confirm sightings just on the edge of Bloomington, Utah which is a suburb of St. George. The are used in the highway median and those did not get there on their own	Esque, Todd C	Deleted reference to St. George and added reference to Esque 2022a, pers. comm. (USGS Distribution data)
31	4	24	I would add to the end of this sentence, however, this area has a higher error rate because of the poor satellite imagery and lack of ground truthing, and should be considered and analyzed carefully	Esque, Todd C	<i>The hybrid zone decreased slightly relative to the historical distribution; however, this area has a higher error rate because of the poor satellite imagery and lack of ground truthing.</i>
33	3	5-6	statement is written as negatively correlated with lower temperatures. As a double negative would indicate that there is a positive relationship between density and increasing temperature and I'm not sure that is what is intended	Roe, Aaron M	Edited. <i>In a study of 10 sites throughout the Mojave Desert, tree density was found to be negatively correlated with temperature and ranged from 20 trees per hectare in the warmer sites to the south and up to 280 trees to the northwest near Walker Pass (St. Clair and Hoines 2018: 6), although Walker Pass may include a high number of clones (Esque 2022b, pers. comm.).</i>
34			has estimates of tree density based on Esque while another part of the document above uses a different paper for estimates, and comments on the role of clonal reproduction. Perhaps this should be consolidated.	Godsoe, William	Acknowledged.
35	3	13-14	How many randomly selected points were used to calculate	Roe, Aaron M	Edited. <i>Data presented below are based on taking 100 randomly selected points within each analysis unit and summarizing applicable climate parameters available in the ClimateNA dataset for the period of 1991 to 2020 (Wang et al. 2016).</i>
36	3	Table 3-9	Recommend adding a box and whisker plot to show the distribution of climate variables across the ranges of the species	Roe, Aaron M	Acknowledged. The data is presented using box plots by analysis unit in Figure 4-6.
36	3	8-11	were the the MSP to MAP percentages calculated from the summary statistics of each or creating new summary statistics on the distribution of the point by point ratios	Roe, Aaron M	Percentages are based on summary statistics. <i>Similarly, rainfall was characterized for each species based on the mean annual precipitation (MAP) and mean summer precipitation from May to September (MSP; Table 3-2). Annual precipitation for Yucca brevifolia is higher than Y. jaegeriana. The relative contribution of summer rainfall to annual precipitation varied by species. Summer rainfall accounts for approximately 21 percent of the rainfall within the distribution of Yucca brevifolia and 33 percent for Y. jaegeriana.</i>
40	5	30	would 'life cycle' be 'life cycles' to address both species' life cycle?	Esque, Todd C	Edited
40	5	30-32	instead of joshua trees 'require' I suggest joshua trees 'have'	Esque, Todd C	Edited
41	5	27	the sentence with MSP might be revisited. First, I think you should spell out MSP on first time use, second I think you want to delete the word, "calculating" for the sentence to make sense	Esque, Todd C	<i>To describe summer precipitation we utilized the mean summer precipitation over the months of May to September, for the years 1991 to 2010 (MSP; Wang et al. 2016). Within the range of Yucca brevifolia the mean summer precipitation was 1.5 in (3.7 cm) and ranged from 0.4 to 3.7 in (1.1 to 9.4 cm). For Y. jaegeriana the median summer precipitation is higher than Y. brevifolia with a median of 3.0 in (7.5 cm) and a range from 1.2 to 5.8 in (3.1 to 14.8 cm). MSP represents a lower estimate of summer rainfall because it includes the months of May and June and spring rainfall is typically limited throughout range of Joshua trees.</i>
41	5	Table 5-1	Consider delete the redundant qualifiers of "appropriate" or "abundant" for some rows and not others, or add these to all. This would also need to be done in Figure 5-1.	Lynn Sweet	Acknowledged.
41	5.1.1	7-11	soil substrate - A citation would be good here. maybe one of the keeler-wolf publications.	Esque, Todd C	Acknowledged. We typically do not provide citations in this section because the information and references are provided earlier in the document.

42	5	24	section 5.1.5 may need close attention starting at this line. First - mean temperature during the coldest moth of each year for comparison is clear. But the next sentence is unclear. for the next sentence wouldn't you want to say, "extreme winter temperature 'each year' over the last 30 years - otherwise it sounds like there is one number for the past 30 years and that is now what your analyses are explaining. Also -26.9 dF is really really cold, and it must be a typo as it does not match dC. You might check I think I saw this referenced somewhere else but got distracted and did not follow through on the comment. Similarly for the other species -23.6 dF does not occur in the Mojave Desert There must be a conversion problem in the calculations pretty sure I saw this number somewhere in the doc previously	Esque, Todd C	To characterize the minimum temperatures the species have experienced and potential temperature thresholds for Joshua tree and the yucca moths, we used the extreme minimum temperature recorded over the last 30 years (EMT). EMT was one of the parameters characterized and the data is correct in Chapter 3. It may not be appropriate to address these extremes in the species needs; therefore reference to this parameter in this section has been deleted.
42	5	45	regarding the sentence beginning with - "We have no information..." suggest placing this at the end of the paragraph because it is unrelated to the rodent discussion. Also suggest clarifying that this is about animals other than rodents - you already mentioned ungulates, and mentioning that inherent in this hypothesis is the requirement that the seeds are not destroyed by passing through the animal, but possibly merely scarified. We discuss this in some detail in the Discussion of Waitman et al. 2012.	Esque, Todd C	<i>Rodent seed-caching is required to remove mature fruits from the tree and mechanically open the indehiscent fruits to expose the fertile seeds for germination. Although this is a habitat requirement, seed-caching can result in higher seed predation under drought conditions because a larger number of seeds are consumed. Several rodent species locate their caches below shrubs that provide appropriate microclimate conditions to support germination and establishment of seedlings and also protect them from herbivores. We have no information on whether the seeds are viable after they are consumed and pass through the digestive system of rodents or other potential seed dispersers such as ungulates and coyotes.</i>
42	5	2	Verify germination window or qualify more clearly if this is variable. This seems to say that seeds germinate in summer contrast to the information in Chapter 3, page 17, lines 27-28.	Lynn Sweet	Acknowledged. This section describes why each species need is required/important. You are correct that germination can occur in response to rainfall throughout the year and is acknowledged under annual precipitation above.
43	5	8	dominate should be dominant	Esque, Todd C	Edited
43	5	24	This may be one of the really key functions of nurse shrubs considering work showing the impacts of herbivory in a restoration context by DeFalco and Esque, I'm not sure if it's published.	Lynn Sweet	Acknowledged.
43			5.1.8 there are no citations in this section.	Godsoe, William	Acknowledged. We typically do not provide citations in this section (Species Needs) because the information and references are provided earlier in the document.
44	5	16	How is this differentiated from survival, and does it relate to density in this context? This seems redundant/self-evident as written. Reminding the reader about the spatial scale relevant to the review may help.	Lynn Sweet	Acknowledged. This is section is part of the structure of the SSA analysis. Added density considerations to the following sentence <i>There must be adequate survival at all life stages to support an abundant adult population and sufficient density to support sexual reproduction.</i>
45	5	6	dispersal - dispersal is also the primary means by which species have responded to climate change across millenia, even though our current understanding does not explain how this might have happened.	Esque, Todd C	<i>Dispersal of propagules is important for gene flow to maintain appropriate levels of genetic variability. Dispersal also allows for potential colonization of sites following disturbance. Long-term dispersal and migration is a potential response to climate change across millennia, though dispersal is limited in Joshua trees.</i>
45			There are few citations concerning grazing, could the report clarify if we know that grazing is a small threat or if we do not know at present.	Godsoe, William	comment references pg. 53, 6.4.1 Grazing. Grazing is classified as an on-going, low magnitude threat.
45			Perhaps the discussion should include information on how likely catastrophes are to be uncorrelated across Joshua tree's distribution. As we see large, long-term droughts in california, why should we expect multiple population within the mojave to be redundant.	Godsoe, William	Add the following clarification. <i>Although droughts may occur range-wide, the different latitudes, elevations and aspects that Joshua trees occupy provide ecological complexity and the potential for climate refugia such that the entire distribution is not impacted equally.</i>
46	5	20	I don't think I have seen a reference for this 1,000 year life span although it is mentioned more than once. Sounds like an outlier and maybe should be considered carefully	Esque, Todd C	Deleted reference to 1,000 year lifespan. See response to pg 10 comment above.
46	5	21	I would say, "seed predation, low germination rates, and herbivory of young plants"	Esque, Todd C	<i>Individual trees also have the potential for high fecundity over the course of their long lifespan (150 to 300 years) based on seed set, though recruitment is anticipated to be low due to seed predation, low germination rates, and herbivory of young plants.</i>
46	5.3.2		regarding evolutionary potential. If it is possible, you might discuss this with Chris Smith at Willamette University. As the PI for the Joshua Tree Genome Project he has an overview on this topic that might be valuable. I don't think the topic is really covered here. Although I participate in conversations about the data that are being written about, and not sure how much is public at this time.	Esque, Todd C	<i>Joshua trees representation or adaptive capacity was evaluated to assess the species ability to adapt to changing environments. This approach was utilized because genetic information for Joshua trees is not available, though the Joshua Tree Genome Project is underway.</i>

46			It would help be to know what the reference taxa are, what does "moderate" mean, is it relative to other species that may be endangered, other plants?	Godsoe, William	Appendix A summarizes the adaptive characteristics based on Thurman et al. 2020. Joshua tree has roughly an equal number of traits that confirm low, moderate and high adaptive capacity and was therefore characterized as moderate overall.
47	4	22	The data for an additional area in the southern range should be included- the data from Joshua Tree National Park- provided from Frakes, Rodgers, Sweet et al. in 2017 concerning densities in 27 macroplots within Joshua Tree National Park (not all containing Joshua trees) . These data might be cited as appropriate, (Frakes, pers. comm 2017; it's my understanding that it was provided by Joshua Tree NPS prior to quality control and completion) or as Sweet et al. 2019, Ecosphere (same authors) as it was the underlying data for the 14 (9-ha) macroplots that contained Joshua trees included in that study. These data were provided to the Service via email on February 25, 2022.	Lynn Sweet	Addressed under current conditions 7.2.1 <i>The analysis unit condition for demography was modified based on recent studies. Abundance was initially considered high in YUBR South based on high tree density (123.3 trees/ha; Table 7-1). But the data is strongly influenced by high density at Walker Pass (284 trees/ha) along the slopes of the Sierra Nevada, which is reported to have a high density of clones (Esque 2022b, pers. comm.) and is not representative of the habitat throughout the rest of the unit. In addition, preliminary data from a demographic survey of Yucca brevifolia in JTNP indicate there has been a 4.9 percent decline in population abundance at that site in the past 12 years (from 2008/09 to 2021) with mortality observed on 42 percent of the study plots (Graver 2022a, entire). Similarly, at Red Rock Canyon State Park a 46 percent decline in the population was recorded as well as tree vigor and the percentage of young trees (Cornett 2019: 9–10). Based on this information, we consider tree density to be moderate to high condition. Similarly, the data used to characterize condition categories supports moderate recruitment, based on an average of 15 percent juvenile trees. But there is evidence of limited to no recruitment of younger age-classes in this analysis unit (Esque et al. 2010: 11; Cornett 2019: 9), a reduction in the quantity of suitable recruitment habitat (Barrows and Murphy-Mariscal 2012: 34; Sweet et al. 2019: 7), and a lower rate of recruitment relative to mortality (19 seedlings were found compared to 42 trees that died within the survey plots; (Graver 2022a, entire); based on this information recruitment condition was reduced to moderate to high. In consideration of recent evidence of increased mortality, decreased recruitment and moderate to high habitat quantity and quality, we consider YUBR South to be highly resilient to stochastic variability and is forecasted to recover and maintain population resiliency over the course of current environmental variability including prolonged drought.</i>
47	5	6	Minor point but with respect to JTNP, these surveys are being done in collaboration with USGS by NPS staff and university partners (UCR). Just as information, UCR is currently analyzing the JTNP (only) resurvey data in collaboration with the above partners.	Lynn Sweet	Acknowledged
50	6	41-44	Can you make it more clear if the BLM estimates include the energy development private land? It's unclear as written what the 60% figure refers to and if it is meant to say that's in addition to the estimate given above. Perhaps restructure the paragraph to more clearly indicate what the 1 to 3% refers to. Sentence beginning line 43 might be placed earlier to help or the content of page 51 lines 37-38.	Lynn Sweet	<i>Current renewable energy development comprises a relatively small proportion of the distribution of the western Joshua tree within YUBR North (1 percent) and YUBR South (3 percent), based on the current distribution.</i>
51	6.1.2	3-14	A citation for this plan would be good here. I think this is the first time it is mentioned - the PEIS, WEstern Solar Plan	Esque, Todd C	Reference included <i>Similarly, BLM's Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States (Solar PEIS, also known also the Western Solar Plan) identifies areas for current and future renewable energy development (solar energy zones) in Arizona, California, Colorado, Nevada, New Mexico, and Utah (Bureau of Land Management 2012a, entire).</i>
51	6	22	I suggest stating whether there is evidence that this is effective.	Lynn Sweet	<i>Salvaging Joshua trees for presumed translocation elsewhere was identified as a potential mitigation measure; however, we do not have information on the methods including the appropriate age-classes were this approach is most effective.</i>
53	6.1.3	22	I think YUBA - used twice should be YUBR	Esque, Todd C	Edited
53	6.1.4		Grazing - in discussions with some land stewards we have considered that under certain circumstances JT establishment might be facilitated by livestock - but I am checking with those folks to confirm what we do and do not know about this - in checking - there are no citations	Esque, Todd C	Acknowledged. Also included language below. <i>It is also possible that cattle will browse on invasive annual grasses and reduce their cover; but we are not certain if there is a net benefit since cattle disturb the soil, which can promote invasive grasses.</i>
54	6.2	37	Brooks and Matchett - my recollection this is a good meta-analysis of fire frequency and roads. There are better citations to describe the interstitial phenomenon: try Brown and Minnich 1986, Brooks (any of a few dissertation products), Salo - all those products described what you need to cite	Esque, Todd C	Acknowledge
55			L28 makes it unclear if abundance or risk is being modeled, these two quantities should have different units.	Godsoe, William	<i>Edited. The reference uses cover and risk simultaneously. Modeled invasive grass cover was categorized from no risk to high risk (greater than 45 percent cover).</i>
61	6	Figure 6-1	Shouldn't Invasive Annual Grasses link to Altered Fire Regime	Roe, Aaron M	Edited.

62	6.3	21	Re: "Adult joshua trees have a lower..." I really think you should cite DeFalco et al. 2010 here - we actually provided regresssions showing these relationships in that paper.	Esque, Todd C	Edited.
62	6.3	35	There really isn't much of a JT seed bank, so if you mean the other plants' seed bank you might specify	Esque, Todd C	Acknowledge that there is not much of a seed bank but the seeds available would likely be impacted by fire. <i>We also predict that the seedbank of Joshua trees and nurse plants will be negatively impacted.</i>
66	6.3	5	RE:"All levels of fire..." This sentence does not make sense to me. It sounds like a forest fire dynamic, while there can be minor heterogeneity - most of the big fires have a pretty thorough burn throughout...in my experience. Not sure what point is being made with the sentence	Esque, Todd C	<i>All levels of fire severity may result in some patchiness across the burn area with areas where trees, nurse plants, and the seedbank may persist (Klinger 2022, pers. comm). However, other researchers indicated that when a fire comes through an area it will likely burn all the available habitat (Esque 2022, pers. comm).</i>
68	6.4.2		These below zero numbers in Fd, for the Mojave are not possible	Esque, Todd C	This data is based on temperature extremes and are correct based on 100 points sampled within each analysis unit. They have been deleted since they are not relevant to the discussion on climate change.
69	6	43	It should be noted that widespread and thorough control of invasive grasses would be highly impractical considering the extremely limited amount of resources at the discretion of BLM field staff, and there should be no implication that the ubiquity of these grasses are the specific failure of current BLM staff to implement the BMP's mentioned.	Lynn Sweet	Acknowledged. This paragraph is intended to describe applicable mangement and conservation measures. <i>Although invasive grasses are highly pervasive and beyond the ability of any agency to eradicate, invasive grasses are managed on Federal and State lands to varying degrees.</i>
69	6.4.3	19	"Droughts typically last..." do you mean to say something about 1-3 intervening years? ...or something like that. As it is not sure what it means	Esque, Todd C	<i>Droughts typically last for 1 to 3 years; and average or higher rainfall is typically recorded in the intervening period (1 to 3 years).</i>
70	6.4.3	20	This pers. comm. attributed to me - not sure what this refers to	Esque, Todd C	<i>Tree mortality has been observed in the recent past due to extended drought conditions, separate from impacts associated with wildfire (Esque et al. 2010, p. 10; Cole et al. 2011, p. 139). In a recent study a total of 94,635 ac (38,314 ha) of Joshua tree occupied habitat was lost and individuals within the habitat are presumed to have died as a result of drought within the last 20 to 40 years (Esque 2022a, pers. comm.). This refers to the dead tree category in the USGS empirical distribution data.</i>
70		38	low recruitment - I think you should use a citation on that comment	Esque, Todd C	<i>YUBR South is currently experiencing high moisture stress during the recruitment period that correlates with current observations of reduced recruitment, particularly along the southern limit (Harrover and Gilbert 2018: 2; Sweet et al. 2019: 9; Graver 2022a: 1).</i>
71		21-31	Caveats relating to the difference between (SDM-estimated) potential niche and realized niche are well-taken and appropriate.	Yoder, Jeremy B	Acknowledge.
72	6.4.4	11	might want to universal search and replace for YUBA	Esque, Todd C	Edited.
73		10	Average dispersal of 2m/yr doesn't work out arithmetically to ~2km over 60 to 90 years; one of these numbers is off by a factor of about 10, I believe.	Yoder, Jeremy B	Edited. <i>Based on Pleistocene packrat middens, Joshua trees' migration during the Holocene is estimated to be approximately 2 m/yr (Cole et al. 2011: 141).</i>
73			I wonder if there is too much focus on CO2. You might broaden to non-analogue conditions. For example, increased CO2 might help Joshua tree on its own, but what if it helps competing species more than it helps Joshua tree?	Godsoe, William	Acknowledged. Interspecific interactions may also change; this paragraph refers specifically to the assumptions of the bioclimatic models. This section also describes how they do not account for interspecific interactions.
74			What timescale is "temporary"	Godsoe, William	Deleted temporarily as dead, annual grass cover can persist. <i>These pulses of higher vegetative cover may increase the risk of wildfire at low elevations.</i>
74			L38, this is an important worry that projected refugia have burnt.	Godsoe, William	Acknowledged

					To model an increased risk of wildfire, we utilized the current model estimates from Klinger et al. 2021 to predict the proportion of each analysis unit potentially impacted by higher natural ignition probability, higher frequency of wildfire, and higher burn severity (Table 6-1; Figure 6-4), which represents the best available information on current and future wildfire risk. However, Klinger et al. 2021 does not specifically address what portion of the Mojave Desert is likely to burn. To project the proportion of Joshua trees' distribution that may burn by the end of the century (2070-2099), we characterized the average acres burned within each analysis unit over the last 60 years (1960-2020; Table 8-4; Inter-agency Fire Perimeter 2022). On average, 9 percent of the range of Joshua trees has burned, though there is variability across the analysis unit. Based on this estimate, we applied the current wildfire model results to Scenario 1 because the model estimates for projected fire regime are expected to be accurate for the next 30 to 50 years and wildfires, and forecasted a 50 percent increase in wildfires resulting in the potential for wildfires across approximately 12 percent of occupied habitat. Similarly under Scenario 2, we used the same framework and considered how climate change, particularly prolonged drought, may change vegetation dynamics and the risk of wildfire and projected that the area burned would double to approximately 16 percent of occupied habitat. At low elevations, a decreased risk is forecasted due to lower vegetation cover due to drought and a history of more frequent fires, though invasive grass cover and wildfire risk may increase substantial following high rainfall events such as El Niño. High wildfire risk is projected at middle and high elevations due to a drier fuel conditions, the potential for invasive grasses to increase in cover including expanding their distribution to higher elevations, modeled higher burn severity, and the potential for large wildfires. There is uncertainty in where wildfires will occur in the future and the fire return interval; we projected wildfires to occur in middle and high elevation vegetation communities based on the modeled wildfire risk, that includes habitat that could serve as climate refugia.
75			The justification of 12 and 16 percent is not completely clear to me.	Godsoe, William	
76	6	Figure 6-4	The color ramp for this map does not match how we are normally look at this making easy interpretation difficult	Roe, Aaron M	Acknowledged. We are constrained by the GIS tools available.
77			summarizes predictions based on climate change and their limitations. I think this summary is quite reasonable, highlighting how the models summarized in table 6-3 can oversimplify physiology and small-scale habitat variation. However, what isn't clear to me is how strong these effects are likely to be and how much uncertainty they contain.	Godsoe, William	We project that approximately 12 to 16 percent of occupied habitat may burn by the end of the century, roughly double the percent of habitat that has burned in recent years, and areas that have burned are more likely to burn again.
79			First, the review interface is a pain to navigate. The only way I could move within the document was to grab the thing on the right and go up or down. It made it difficult to stay on task. My main comment in the Climate Change section is that there does not appear to be consideration of elevated CO2 effects on Joshua tree seedlings and their tolerance of heatwaves, drought, and freezing events. I did not see a full Literature Cited, which would have been helpful. Otherwise, the SSA is very thorough and I did not detect any other omissions of fact or incorrect information.	Michael E Loik	The following discussion regarding elevated CO2 is located on pg. 84. Increasing CO2 may improve the tolerance of Joshua trees to freezing temperatures, based on laboratory studies that showed that the low temperature that Yucca brevifolia can tolerate decreased by 1.6oC to -11.9oC (10.6oF) under elevated CO2 (Loik et al. 2000: 51). This result suggests that seedlings may have a higher likelihood of surviving cold temperatures under elevated CO2, potentially allowing habitat expansion to higher elevations and northerly latitudes, although it is not clear how seedling will perform in natural conditions (Loik et al. 2000: 51).
82	6	26-28	Citation needed for statement regarding future estimates of annual precipitation being the same as the current. Depending on the exact geographic extent referred to, this is highly depend on the climate GCM used (as later stated a little more clearly on page 83 line 36-37). See Gonzalez et al. 2018, Env. Rsch. Letters, figure 4. This figure illustrates the spread of GCMs and the mean for the RCP's 4.5-8.5.	Lynn Sweet	Paragraph updated to include text below on GCMs evaluated. To evaluate potential changes in future precipitation and drought conditions we evaluated four parameters: annual precipitation, summer precipitation, Hargreaves's climatic moisture deficit index, and the summer heat moisture index from 13 GCMs from CMIP6 utilizing the ClimateNA tool; Figure 6-7; Wang et a. 2016).
83	6		Lenz 2007 is the wrong citation for this statement. The word "refugia" is not contained in this reference.	Lynn Sweet	Reviewer is correct. Updated to Lenz 2001
83	7.1	20	may be old-fashioned, but data are always plural. I have seen it used singularly in other areas - perhaps universal search "data"	Esque, Todd C	Edited throughout document.
84	6	44	Yes, colonize and more importantly, form sustainable, viable populations as opposed to sink or waif populations.	Lynn Sweet	Edited. Joshua trees are generally associated with alluvial fans and bajadas at the base of mountains, and it is not clear if Joshua trees will readily colonize and establish viable populations on steeper, rockier habitat that currently exists at higher elevations. ...sustainable, viable populations?
84	7.1.1	18	"availability of occupied habitat" not sure what this means...if occupied - must be available	Esque, Todd C	revised to quantity of occupied habitat
84	7.1.1	24	the assumption that habitat currently occupied by JTs is a big one in the anthropocene. We have to consider that some long-lived species that do not have recruitment may be the last of their kind in some instances or nearly so. That assumption and possible outcome is really important	Esque, Todd C	Agreed. The next sentence reads: We also acknowledge that Joshua trees may persist in the future in areas where they are functionally extirpated because all or a portion of the species needs are not met.
84	7.1.1	26	meet should be met	Esque, Todd C	Edited.

85	6	18-20	Please state plainly which of the "older" models you have judged to have lower reliability in their projections. Many habitat models, especially at a coarse scale of 1-5km may be fairly robust to imperfect presence data, especially within grid cells (analysis units) and within the known species niche limits.	Lynn Sweet	<i>As a result, some additional occurrences and suitable habitat areas do not appear to be included in the earlier models, which may increase uncertainty in the modeled results (Appendix G). Included in appendix G, where GIS data was available to make the comparison.</i>
86	6	36	This citation should be Smith et al. In Review. This paper includes Sweet. This comment appears to be based on work that Sweet did for this co-authored paper.	Lynn Sweet	Edited, acknowledged and updated in the references cited.
86	7.1.1	15-16	to be accurate I would say this study is proposed - we are not fully funded. We finished one park and proposed others. JTNP has re-sampled the previous USGS work	Esque, Todd C	<i>We also lack historical data and other context to categorize the available demographic data in terms of population resiliency, though a study is proposed to obtain rangewide estimates of abundance, age structure, and survival rates at study sites within the National Park Service system (Esque 2022b, pers. comm.).</i>
88	6	Figure 6-8; * in Appendix F: Thomas 2012, Thomas 2022, Comer, and Cole.	You note here that you have not considered the "lower range" of Thomas et al. 2022. Can you be more specific about what range you are referring to? Is this a lower range of emissions scenario or "lower" latitudinal/geographic range? If the latter, what is the spatial cut-off for where you consider this model's projection to be more supported by underlying data? This is especially critical as this is one of the 4 models that is indicated that is used	Lynn Sweet	Edited. The model was considered but not used in the analysis because of large discrepancies in the current range. <i>Summary of climatic habitat suitability models considered in this analysis. Appendix F provides detailed information on each model including the timeframe and GCMs utilized. We acknowledge that predicted outcomes vary depending on the GCMs used in the model. Our analysis of future conditions is structured around the general consensus in the relative decline in suitable habitat across all models for both a low and high emission scenario. All models were considered with the exception of Thomas et al. (In Review) because there was a large discrepancy between the current distribution and modeled distribution (46 percent of the distribution was considered currently unsuitable; Appendix G).</i>
88	6	Figure 6-8	The Global Climate Model (or other basis) needs to be listed here. As shown in Gonzalez et al. Env. Research Letters 2018, among many other illustrations, there is a difference in the outcome of habitat modeling depending on the GCM used. For example, Sweet et al. 2019 used MIROC, and as downscaled by Flint & Flint (see Sweet et al. Ecosphere 2019), which is a "warm dry" scenario that has been used in other research, but the shortcoming there is the use of just one GCM to demonstrate potential outcomes. If the Service is going to base the ultimate assessment of change in habitat on one or more of the models in this table, there needs to be an explanation of how the GCM was selected for the model used, or whether the model mean was used. Quoting Gonzalez, 2019: (Gonzalez, P. 2019. Anthropogenic Climate Change in Joshua Tree National Park, California, USA.) US National Park Service, Berkeley, CA. "IPCC has coordinated research groups to project possible future climates under four defined greenhouse gas emissions scenarios, called representative concentration pathways (RCPs; Moss et al. 2010). The four emissions scenarios are RCP2.6 (reduced emissions from energy efficiency and of renewable energy, achieving the goals of the Paris Agreement (UNFCCC 2015), RCP4.5 (low emissions), RCP6.0 (high emissions, somewhat lower than continued current practices), and RCP8.5 (highest emissions, no emissions reductions). Climate under each of the four scenarios was projected by up to 33 GCMs. The four emissions scenarios determine the overall range of potential futures. Within each scenario, the spread of projections of the GCMs generates a range of potential futures, characterized here by the average and standard deviation of the GCM ensemble for each scenario."	Lynn Sweet	Acknowledged. The details of each model including the GCM used is provided in Appendix F and additional detail on our methodology for utilizing the climate models is described on p. 110-111. The following text was added to the figure description. <i>Summary of climatic habitat suitability models considered in this analysis. Appendix F provides detailed information on each model including the timeframe and GCMs utilized. We acknowledge that predicted outcomes vary depending on the GCMs used in the model. Our analysis of future conditions is structured around the general consensus in the relative decline in suitable habitat across all models for both a low and high emission scenario. All models were considered with the exception of Thomas et al. (In Review) because there was a large discrepancy between the current distribution and modeled distribution (46 percent of the distribution was considered currently unsuitable; Appendix G).</i>
88	7.2.1	22	should this say, "but we reduced the condition from high to moderate..." or something like that?	Esque, Todd C	

89	6	2-6	I understand that this is a challenge to combine disparate predictions into one conclusion, and this is likely much more complex than it needs to. What would be more useful would be if a new, well-justified, rangewide habitat model were produced for both species using the best-available data, now available. As experts in the study of biology, and habitat, the Service most certainly has the capacity to do so. Failing that, please state on which models, or combination of models, these data are based. In the table on page 88 ("Figure 6-8"), please make clear which models were used for rangewide prediction summary ranges, because as stated, some models, e.g. Barrows & Murphy-Mariscal 2012 did not model the entirety of the range. If these partial-range models are being included in your summary, then please state explicitly how. If not, please either append the table or make it more clear which were used.	Lynn Sweet	A new model was not developed. See explanation of methodology pages 110-111 and appendix F.
89	6	Figure 6-8	The column header for columns 6 and 8 should reflect the RCP mentioned, and be self-explanatory as a header, not duplicative and in lieu of the use of highlighting here. This will help with readability and interpretation.	Lynn Sweet	Included in Appendix F.
90	7.2.1	5	should say to moderate from high??	Esque, Todd C	Edited. <i>But there is evidence of limited to no recruitment of younger age-classes in this analysis unit (Esque et al. 2010: 11; Cornett 2019: 9), a reduction in the quantity of suitable recruitment habitat (Barrows and Murphy-Mariscal 2012: 34; Sweet et al. 2019: 7), and a lower rate of recruitment relative to mortality (19 seedlings were found compared to 42 trees that died within the survey plots; (Graver 2022a, entire); based on this information recruitment condition was reduced from high to moderate.</i>
90	7.2.1	1-9	This end of 7.2.1 including this paragraph seems a little incongruous to me. The para notes low or no recruitment, reduction of suitable recruitment habitat, and at least locally high mortality, yet the final sentence jumps to 'highly resistant to stochastic variability' and goes on to sound pretty good.	Esque, Todd C	Modified as follows: <i>In consideration of recent, localized evidence of increased mortality, decreased recruitment and moderate to high habitat quantity and quality, we consider YUBR South to be highly resilient to stochastic variability and is forecasted to recover and maintain population resiliency over the course of current environmental variability including prolonged drought. The resiliency ranking is based on the condition category scores which do not reflect lower demography based on the ranking thresholds utilized.</i>
90	7.2.2		"...are (should be is) often managed for [?what - JTs?] and are less..."	Esque, Todd C	<i>Additionally, habitat is located primarily on Federal lands where Joshua trees are often considered in facility operations or specifically managed for, and are less likely to be impacted by anthropogenic development.</i>
91	7.2.3	25-26	I don't think that a lack of change in distribution during the Holocene is evidence for the inability to migrate. Hasn't the climate been considered relatively stable during the Holocene?	Esque, Todd C	The warming in the early Holocene is used to describe the large range contraction observed during that time period and the corresponding lack of habitat expansion on several thousand years. See reference in updated language below: <i>Lastly, limited dispersal capabilities have been documented based on the average dispersal distances of the rodent seed dispersers and through the absence of substantial range expansion since the early Holocene (Cole et al. 2011: 138–140).</i>
91	7.2.3	7-8	"shift in place"? could it be "migrate"	Esque, Todd C	Edited. <i>Adaptive capacity was evaluated following Thurman et al. 2021 to characterize Yucca brevifolia's ability to persist in place or shift in space in response to changes in its environment.</i>
91	7.2.3	11-12	"the large area the species occupies, the broad distribution..." Could you say, "broad environmental range (or distribution), because otherwise it sounds redundant	Esque, Todd C	Edited. <i>The large area that the species occupies, the broad latitudinal distribution, and lack of habitat specialization promote higher adaptive capacity.</i>
91	7.2.3	13-14	Re: "Current reductions...or representation." Seems like there needs to be an explanation for this statement - e.g., what information makes this a reasonable assumption?	Esque, Todd C	<i>Recently documented reductions in recruitment and survival are site-specific and we do not have data to support range-wide trends. Therefore we do not anticipated substantially reduce abundance or representation.</i>
92	7.3.1	8-10	may have to come back to fire risk discussion in a conversation	Esque, Todd C	Acknowledged concerns regarding the BLM REA and Landfire datasets. 7.1.1 <i>This data source is consistent with the approach utilized in the previous SSA; though we acknowledge through peer review comments that it may not adequately capture current conditions in all areas of Joshua trees' distribution.</i> 6.3 <i>The fire return interval (the time interval between two fires in the same location) across the majority of the range of Joshua trees is generally greater than 100 years with substantial areas greater than 300 years (Figure 6-3), though the longer term intervals are supported primarily by expert opinion rather than carbon dating or other data sources (Landfire 2022; Sugihara et al. 2006, p. 66).</i>

93	7.3.2	28-29	There is a wide range of diversity (Mojave, Great Basin, Colorado Plateau and Sonoran elements. There is no dimension on either species that stretches 600 miles. It is about 380 miles from Tonopah NV to the I-10 in AZ which provides a good margin south of the actual distribution	Esque, Todd C	<i>The risk of catastrophic loss is very low because the species is spread across a 4.9 million-acre area (1.9 million ha) distributed over a latitudinal gradient of approximately 300 mi (483 km) and includes potentially millions of individual trees.</i>
93	7.3.1	24	"...though there is(should be are) no to limited monitoring studies..."	Esque, Todd C	<i>YUJA East also has lower resiliency overall due to the smaller size of the analysis unit and low tree density and recruitment, though there are no to limited monitoring studies including this portion of the range of Joshua trees.</i>
93	7.3.2	36		Esque, Todd C	<i>The risk of catastrophic loss is very low because the species is spread across a 4.9 million-acre area (1.9 million ha) distributed over a latitudinal gradient of approximately 300 mi (483 km) and includes potentially millions of individual trees.</i>
94	7.3.3	29-42	Regarding Representation - like YUBR, YUJA in the South population have a fairly strong representation of clonal individuals along highway 93 near the easternmost extent of their distribution. There is similarly some clonal representation in the northern unit along the I-15 on Mormon Mesa.	Esque, Todd C	<i>7.3.2 The risk of catastrophic loss is very low because the species is spread across a 4.9 million-acre area (1.9 million ha) distributed over a latitudinal gradient of approximately 300 mi (483 km) and includes potentially millions of individual trees and clones.</i>
96			In my opinion the best way to increase consistency in the report is to convert the effects of each predicted threats into units that are comparable. This is particularly evident in table 8.1 where threats are reported in units of: percentage increase, acres (or ha), and percent of all occupied habitat. Worse, the same threat is sometimes reported in different units.	Godsoe, William	Acknowledged. Units are a function of the data source and percent of the current range or percent increase was added to help make the different sources comparable.
98		7-8	typo here, extra "Region"	Esque, Todd C	Edited
98			i assume the predictions of where wildfires will occur is based on Klinger et al. 2021, that isn't quite clear.	Godsoe, William	This section references the Klinger et al 2019 for wildfire risk and acknowledges the uncertainty in where wildfires will occur. <i>There is uncertainty in where and wildfires will occur in the future and the fire return interval; we projected wildfires to occur in middle and high elevation vegetation communities based on the modeled wildfire risk, that includes habitat that could serve as climate refugia.</i>
98	8.1	29-30	RE: "At low elevations..." this is a bit tricky. There is almost always less native vegetation at low elevation in the desert due to general lack of rainfall ("10-15% cover), and native annuals decompose rather quickly in most instances. Drought will reduce all annual vegetation, but it only takes one good year to bring back dense annuals and then you can have a fire year. In a strong El Nino of multiple years is even more dangerous. The tricky part is that once there is a fire, the perennials are gone leaving an open niche (water availability) for annual weeds, and then the fuel continuity is greater and increases ignition risks.	Esque, Todd C	<i>Updated here with text below and in the invasive grass and wildfire threat discussions. At low elevations, a decreased risk is forecasted due to lower vegetation cover due to drought and a history of more frequent fires, though invasive grass cover and wildfire risk may increase substantial following high rainfall events such as El Niño. 3.2 Invasive Annual Grasses In the future, invasive annual grasses are projected to expand their competitive edge over native species and are likely to benefit under conditions of drought, extreme precipitation events, increased CO2 concentration, wildfire and atmospheric nitrogen (Archer and Predick 2008, p. 25). As a result, we generally predict that the threat of invasive grasses will increase in the future, though extended droughts have also been hypothesized to result in decreased biomass and the potential to shift toward longer fire return intervals in the most arid areas of the Mojave Desert (Comer et al. 2013a: 7). However, invasive grasses respond quickly to extreme rainfall events and can become the dominant cover, particularly in areas with a history of disturbance such as wildfire. 6.3 Increased Risk of Wildfire High rainfall events can also impact post-fire survival. The loss of perennial shrub cover increases the potential for invasion by invasive grasses that more readily utilize available water, resulting in greater fuel continuity and an increase in the probability of wildfires.</i>
99		9-12	The approach described here and in the Appendix may be the best available way to synthesize projections of Joshua tree habitat under future climate scenarios. The Appendix contents really highlight the limitations to resolution in many of these models, and it's a bit frustrating that the most recent, potentially most "state of the art" model, by Thomas et al, is not available for examination in detail. I understand the current status of the work (in review for publication) makes this challenging, but some description of the methods used would greatly aid evaluation.	Yoder, Jeremy B	Acknowledged.
100		23	The choice against including projected range expansions is appropriate given the limited dispersal capacities cited.	Yoder, Jeremy B	Acknowledged

					Yes it is defined in several sections, primarily 8.1 Future Scenario Considerations including partial text below. <i>We applied this general framework to each analysis unit based on its topography and latitude. For example, analysis units at lower elevations and latitudes were projected to have a higher percentage of unsuitable habitat and lower probability of supporting all the species needs in climate refugia, for each scenario evaluated. When evaluating the future condition of climatically unsuitable habitat, we identified habitat areas where Joshua trees may no longer occupy a proportion of the modeled unsuitable habitat resulting in potential range contractions. These areas were generally defined as less than 3,937 ft (1,200 m) elevation, which delineates low elevation and middle elevation vegetation communities (Brooks and Matchett 2006: 153; Klinger et al. 2021: 3). Joshua trees may persist in other areas with occupancy maintained primarily through established trees and asexual reproduction, though recruitment would be very low to nonexistent. Within these degraded habitat areas, we expect that the extinction process may occur over a period of several to many decades such that Joshua trees may continue to occupy habitat where all the species needs are no longer met, including areas that are functionally extirpated. We assume that habitat identified as degraded could include a spectrum of species needs and habitat quality where Joshua trees continue to persist. All the species needs are anticipated to be met within climate refugia including similar tree densities and recruitment as current conditions. Most of the models described above predict some degree of habitat expansion. However, given the limited dispersal of Joshua trees, we consider the potential for habitat expansion to be minimal overall, and did not include potential habitat expansion in our estimates of Joshua trees future distribution described below.</i>
101	8.2.1	15	did you describe the distinction between future occupied area and climate refugia somewhere? Just checking	Esque, Todd C	
101	8.2.1	19-22	This is a complicated sentence that seems confounded without a bit of explanation, or unpacking. Same for next sentence.	Esque, Todd C	<i>We acknowledge the uncertainty in forecasting the species response to unsuitable climate conditions and project that impacts will increase with increasing exposure to unsuitable conditions both in the magnitude of the potential effects and the timeframe over which individuals are exposed to unsuitable conditions. Therefore, we project unsuitable habitat will vary across the analysis unit and include a range of habitat suitability based largely on latitude, elevation, and wildfire history. There is the potential for habitat loss at lower elevations and lower latitudes due to both the magnitude and duration of climate change effects. We project that the species will continue to occupy mid- to high- elevation zones and higher latitudes identified as unsuitable habitat in the models because either the magnitude of the effects of climate change or the exposure timeframe are reduced, though demography metrics are projected to be lower than current conditions.</i>
102	8.2.1	9	there is some mis-wording here	Esque, Todd C	<i>Despite the increase in current threats described above, YUBR North is projected to have high resiliency under Scenario 1, though substantially reduced from current conditions.</i>
102	8.2.1	25; 27; 32	"is" should be "are"; occurs should be occur - all has to do with refugia versus refugium; that should be than	Esque, Todd C	<i>Climate refugia are anticipated to be maintained at higher elevations, on steep slopes and northern exposures including up to 20 percent of the analytical unit. Potential climate refugia occur within middle and high elevation vegetation communities characterized by infrequent wildfires of high severity and up to 12 percent of the climate refugia are projected to burn at least once before the end of the century. Also made changes throughout document.</i>
103	8.2.1	10	While invasive grasses have been discussed a couple of times in this section, I don't believe it was mentioned as one of the factors that were to be considered at the beginning of the section. I read that section a couple of times to confirm that invasive grasses were dropped out. Maybe you want to include them in the introductory part of this section	Esque, Todd C	<i>Scenario 1 is based on a continuation of the magnitude of the current threats to Yucca brevifolia for habitat loss (land use), climate conditions, climate models, invasive annual grasses, and increased risk of wildfire, following the resources and analysis described above. Also, updated each introduction paragraph for each species/scenario.</i>
104	8.2.3	24-26	A statement like this in a research paper would require supporting evidence. I would think this would also be preferred for a SSA.	Esque, Todd C	<i>This statement is based on an assumption made in 8.1 due to the lack of information on the yucca moth, as follows: We also project that habitat suitability for the obligate moth pollinators will vary similarly and generally track with Joshua tree flowering events, though we have limited information on how their populations and range might change under future climate change. We forecast that yucca moths will persist in currently occupied climate refugia and that they may not occur or occur at lower abundance in degraded habitat. Added additional language acknowledging uncertainty: We forecast that yucca moth populations may be maintained in areas where the Joshua trees persist and continue to flower in climate refugia and that populations may not persist or be substantially reduced in habitat with marginal suitability, though there is a high degree of uncertainty with this assumption.</i>
104	8.2.3	27	"though" should be "and"	Esque, Todd C	Edited
104	8.3.1	32;34;36	Climate refugia 'are'; refugia "occur"; climate refugia 'are'	Esque, Todd C	Edited

105	8.3.1	40-43	this is a confusing sentence. First it mentions loss, then, I think actual acreage occupied, then refugia, but in the next sentence goes back to loss. I would lump the loss factoids together	Esque, Todd C	Approximately 1.3-million ac (520,000 ha) is predicted to be occupied in the future, similar to YUJA North, approximately 700,000 ac (280,000 ha) is forecasted to serve as climate refugia and the remaining habitat may be degraded or of marginal habitat quality (Table 8-4). As a result, all demographic parameters are reduced and considered to be low to moderate condition in the future; and higher condition than YUJA North, though it is unclear what level of recruitment is necessary to sustain populations in the future.
106	8.3.1	34-35	Maybe I missed an assumption about Federal lands. This sentence seems to indicate that JTs are not protected on Federal lands	Esque, Todd C	A small proportion of the ranged is conserved and a high proportion of the remaining habitat occurs on Federal land and is unlikely to be developed in the future.
106	8.3.3	39	ecoregions 'at' lower	Esque, Todd C	Text has since been edited and comment no longer applies.
107	8	"Figure 8-3"	Please note in the caption on "figure 8-3" (=Table 8.1?) the geographic bounds characterized in the table (e.g. YUBR North, south, etc.). As in my comment above, ("Drought and Increased Temperatures") there needs to be a more clear methodology laid out for the listed reductions in Joshua tree habitat.	Lynn Sweet	See line 24 above.
107	8	"Figure 8-3"	Drought and Increased Temperatures: What RCP 4.5 and 8.5 GCM (Global Climate Model, or a gridded set of climate data based on the emissions scenarios, there are many) was used to create the climate model for these two species? If there was not a new model created, as it appears not, then please state the methodology used for the model chosen to estimate the impact of climate change on the species. This SSA needs to state exactly which of the models listed in the appendix were used for these estimates, and how. If not the full range of the model projection from one of the published studies, how were they combined to make this estimate?	Lynn Sweet	A new model was not developed. See explanation of methodology pages 110-111 and appendix F.
107	8	10 "Figure 8. it looks like "default", as in this is one of the options that may occur.	How were the items listed under "Current" threats calculated for climate change? For what period of time, (for example, 1980-2010?) relative to what other period of time? Please update the header "Current" to indicate that this is a specific temporal period, not similar to future scenarios. As it reads, this is a specific temporal period, not similar to future scenarios. As it reads, this is a specific temporal period, not similar to future scenarios. As it reads, this is a specific temporal period, not similar to future scenarios.	Lynn Sweet	The data sources for Table 8-1 and 8-2 are described for each threat on pp. 108-111. Current includes the time period from approximately 2010 to 2022 but varies depending on the dataset and threat evaluated.
107	8.3.2	3-5	This sentence probably goes up with Methods if not already there	Esque, Todd C	Yes. See text below from methodology 8.1. <i>However, given the limited dispersal of Joshua trees and uncertainty in the response of the yucca moths, we consider the potential for habitat expansion to be minimal without assisted migration. Therefore, we did not include potential habitat expansion in our estimates of Joshua trees future distribution described below and we forecast that any potential range expansion will not offset the large amount of acreage that are no longer suitable or are degraded.</i>
107	8.3.3	5	to me, YUJA really occur in the eastern Mojave Desert and the ecotones of the Great Basin, Colorado Plateau, and Sonoran deserts. Don't you want to mention Sonoran over here?	Esque, Todd C	<i>Representation, as measured by the ecological diversity, is considerably reduced relative to current conditions, though the three analysis units continue to occupy diverse areas within the Mojave, Great Basin, and Sonoran Deserts.</i>
107		7	instead of "by the ecological diversity", I suggest, 'by ecological diversity'	Esque, Todd C	Edited
108	8	"Figure 8.5"	Correct the table name in the caption and in the text.	Lynn Sweet	Edited
114	9	27	my estimate of the latitudinal range is <300 miles - still impressive and a useful value to publish	Esque, Todd C	Acknowledged and edited throughout document.
115	9	8	renewal should be renewable	Esque, Todd C	Edited.
115	9	10-12	not sure if it is true that loss of habitat will be minimized on certain DoD lands. Recent agreements with USFWS may free the DoD to 'take' more of the footprint within the boundaries of the military lands.	Esque, Todd C	Acknowledged. But we do not have information to describe potential impacts to Joshua trees from these agreements. Removed specific reference to military lands. <i>We also predict habitat loss and disturbance to be minimized on federally managed lands, which currently account for 74 percent of the species distribution.</i>
115	9	15	While Comer models grasses, and Klinger et al. model natural fire, DeFalco et al. 2010 provides the only real data on the risk to JT of wildfire, so I would add that citation to the modeling ones.	Esque, Todd C	Edited

					To model an increased risk of wildfire, we utilized the current model estimates from Klinger et al. 2021 to predict the proportion of each analysis unit potentially impacted by higher natural ignition probability, higher frequency of wildfire, and higher burn severity (Table 6-1; Figure 6-4), which represents the best available information on current and future wildfire risk. However, Klinger et al. 2021 does not specifically address what portion of the Mojave Desert is likely to burn. To project the proportion of Joshua trees' distribution that may burn by the end of the century (2070-2099), we characterized the average acres burned within each analysis unit over the last 60 years (1960-2020; Table 8-4; Inter-agency Fire Perimeter 2022). On average, 8 percent of the range of Joshua trees has burned, though there is variability across the analysis unit. Based on this estimate, we applied the current wildfire model results to Scenario 1 because the model estimates for projected fire regime are expected to be accurate for the next 30 to 50 years and wildfires, and forecasted a 50 percent increase in wildfires resulting in the potential for wildfires across approximately 12 percent of occupied habitat. Similarly under Scenario 2, we used the same framework and considered how climate change, particularly prolonged drought, may change vegetation dynamics and the risk of wildfire and projected that the area burned would double to approximately 16 percent of occupied habitat. At low elevations, a decreased risk is forecasted due to lower vegetation cover due to drought and a history of more frequent fires, though invasive grass cover and wildfire risk may increase substantial following high rainfall events such as El Niño. High wildfire risk is projected at middle and high elevations due to a drier fuel conditions, the potential for invasive grasses to increase in cover including expanding their distribution to higher elevations, modeled higher burn severity, and the potential for large wildfires. There is uncertainty in where wildfires will occur in the future and the fire return interval; we projected wildfires to occur in middle and high elevation vegetation communities based on the modeled wildfire risk, that includes habitat that could serve as climate refugia.
117	9	2	Re:16%...I thought it was 18 in Scenario 2	Esque, Todd C	
118		10	Here and in Table 9-3, I think these summary assessments of current and potential future viability are both supported by the information considered in the report, and in line with my own qualitative understanding.	Yoder, Jeremy B	Acknowledged
118	9	14	says 600 miles, I calculated a generous 282.3 miles from Hiko, NV to Brenda, AZ on I-10	Esque, Todd C	Edited throughout document to approximately 30 miles
105-107	8	All	What is likely supposed to be the tables referred to in the text are mislabeled as "figures". E.g. "Figure 8-3" is presumably supposed to be a table. This makes interpretation of the text unreasonably difficult. There is no table or figure labeled Table 8-1.	Lynn Sweet	Corrected.
73-74	6	41-44/1-17	This paragraph only discusses natural ignition. There should at least be an acknowledgement of the compounding factor of human ignitions. This is particularly important as natural ignitions tend to occur during the monsoon when more lightning but higher fuel moisture. while human ignitions can often occur during early summer after fuels have dried but there is low moisture leading to large high intensity fires (for example the 2020 fires in the Red Cliffs NCA)	Roe, Aaron M	Natural ignitions are discussed on pg. 79. <i>Ignition sources may be higher than predicted in the models due to the high frequency of wildfires along the urban-wildland interface consistent with correlations between increasing human population density and fire ignitions (Keely and Fotheringham 2001, p. 1541). Disturbance and nitrogen deposition are also higher next to developed areas and continued disturbance will contribute to a higher proportion of invasive grasses in areas burned multiple times.</i>
84-85	6	Lines 45-46;	Dispersal distances may be informed in part by prehistoric data; however, data based on presence of species plant matter within middens lacks precision to estimate the distances and rates of colonization due to questions about density or even presence of the species within infilled mapped polygons, such as those shown in Cole et al. that illustrate estimated ancient range areas for the species. Add to this paragraph that colonization is also impacted by how the rate of climate shift itself impacts biological processes. Assuming that the post-LGM changes and the present changes would result in comparable rates of colonization is not supported. The periods are not analogous in terms of velocity of change. Put another way, the velocity of climate change (Loarie et al. 2009 Nature) may be very different in the modern era vs. the Holocene. Speed of climatic change has impacts for colonization, including ability to spread based on generational time, mutualisms, production of seeds, etc.	Lynn Sweet	Edited. <i>Dispersal distances are informed in part by prehistoric data, although we acknowledge the lack of precision in these estimates because the density of trees within Joshua trees prehistoric distribution is unknown and the velocity of current climate change may be faster in the modern era.</i> However, Cole et al 2011 (p. 138) indicates that Holocene change began with a steep increase over 1 to 3 years and extended over 50 years for the > 4oC increase, these seems to be similar to the projected increases that are projected..
xi			In this report two climate change scenarios are examined. The better case scenario (RCP 4.5) gives a global temperature rise of 2-3 degrees celsius, the worse case scenario leads to 5 C increase. I think it would help to clarify the assumptions needed to reach each scenario. For example RCP 4.5 assumes dramatic reductions of greenhouse gas emissions over the near term.	Godsoe, William	<i>All data considered were based on Representative Concentration Pathway (RCP) greenhouse gas concentration scenarios adopted by the Intergovernmental Panel on Climate Change (IPCC) with the exception of invasive grass cover. RCP 4.5 and RCP 8.5 were selected because they provide a plausible range of future conditions considering the potential for both near-term mitigation (RCP 4.5) and continued increases in greenhouse gas emissions (RCP 8.5).</i>

xii	ja	In the current version I'm having trouble reconciling the estimates for the effect of climate change with the predictions across the species' entire distribution. In my view there are two different estimates presented which arguably lead to different conclusions. The paragraph starting on p. Xii L25 suggests that climate change will dramatically reduce the habitat suitable to Joshua tree, leading to degradation "on the order of 60 to 99 percent". In contrast the SSA page xiii L 16 presents a rosier picture with much more of Joshua tree's habitat remaining occupied. These details are easy to miss given the size of the report, but in my view there is a real, unresolved tension between the estimates provided in the executive summary and elsewhere. The best way for me to understand the implications of the report is to combine the predicted impacts of each of the sources of change. These are found in table 8-1. The threats under the milder scenario 1 predict that a large part of the distribution of Joshua tree will become unsuitable. This is because climate change is expected to render 60-80 % of Joshua tree's distribution unsuitable. Under this scenario, fires are expected to burn across 12 % of Joshua tree's habitats. Other threats have a much smaller predicted impact. Under the harsher scenario 2 it is not clear how much of the Joshua Tree's distribution will remain intact. This is because 80-99% of Joshua tree's distribution is predicted to become unsuitable due to climate change. In addition fires are expected to damage 18% of habitats. Other threats have a much smaller predicted impact. Note also that the effects of fire assumed to be roughly double those currently observed, but no error bounds are provided, it isn't clear to me if the effect of fire might be worse than that suggested. In my understanding, table 8-4 assumes that the effects of climate change will be less severe than those predicted by table 8-1. Page 100 provides some explanation about why, but it provides few citations still don't understand where the numbers are coming from in table 8-4.	Godsoe, William	The models describe that large areas will no longer be suitable but there is uncertainty in the species response. We describe our assumptions and the range of potential responses for climate refugia, degraded habitat, and areas of potential habitat loss. Table 8-4 is the summary of our analysis across all threats analyzed. We acknowledge that the area predicted to be occupied is higher than the percentage of unsuitable habitat forecasted under each scenario. Although there is the potential for range contraction, we expect that Joshua trees will continue to occupy a large portion of unsuitable and degraded habitat in the next 50 to 80 years given the magnitude of forecasted threats and the several decade exposure to unsuitable habitat conditions. The remaining occupied habitat outside of climate refugia is expected to be degraded with reduced tree densities and recruitment. Additional detail regarding our assumptions and approach have been added to 8.1.
xiii		I can't quite picture how a 99 percent reduction in current habitats could be consistent with the species persisting in refugia across all the regions under investigation.	Godsoe, William	See response above. Sc 2 forecasted 80 to 99 percent unsuitable habitat with the higher number occurring at low elevations and the lower (80%) at higher elevations including a range of habitat suitability as described above.
xiii		Page xiii the model predicts that under scenario 2, 1.7 million acres +2.3 million acres= 4 million acres total. The current distribution according to page 29 is 9.5 million acres. So page xiii projects that climate refugia will represent 40% of the distribution. In contrast, table 8-1 states that under scenario 2 no more than 20% of the species' current range will represent refugia. It may be as little as 1 %.	Godsoe, William	See responses above. The percent unsuitable habitat in the models was not applied directly. See section 8.1.
7		treats invasive grass cover as a constant when it is highly variable through time, and uses a decade old assessment -Mojave REA may not be the best available science for invasive grass risk in the west [I asked Dan if he could suggest another citation - although I realize you have committed a lot of work to the REA.... he responded:] "I don't know the quality, but this is one more potential recent resource on invasive grass, from USGS EROS folks: https://www.sciencebase.gov/catalog/item/5f0ddd6e82ce21d4c4053e17 USGS Rangeland Exotic Plant Monitoring System - ScienceBase-Catalog. The introduction of exotic plant species into the western United States has caused substantial changes to rangeland disturbance regimes and ecosystem structure and function. For example, exotic annuals... In 2021, they expanded beyond just sagebrush and now include the whole west...also this citation: https://doi.org/10.3390/rs14040807	Esque, Todd C emailed comments 8/5/2022 from Dan Shryock USGS	We acknowledge that the Mojave REA may be the best available science. It was included in part to maintain consistency with the original SSA. 7.1.1 <i>This data source is consistent with the approach utilized in the previous SSA; though we acknowledge through peer review comments that it may not adequately capture current conditions in all areas of Joshua trees' distribution.</i>

		Abundance-abundance data is much more incomplete than implied, and doesn't seem sufficient for a ranking. Recruitment-same goes for recruitment – the St. Clair study has 10 sites; it does not seem representative of the analysis units as a whole; this seems like a major extrapolation here. Ranking-Invasive grass cover is the only measure for habitat quality here? What about level of disturbance and long-term drought conditions that could have been quantified? I don't understand why that material is not part of the current conditions ranking. Or area previously burned (this can also be quantified from available datasets)?	Esque, Todd C emailed comments 8/5/2022	7.1.1 The demographic need for abundance was assessed using the average adult tree density based on two demographic studies that sampled across the range of Joshua trees' distribution (Esque et al. 2010, entire; St. Clair and Hoines 2018, entire), though we acknowledged that there are a limited study sites in several analysis units. and The recruitment condition category was assessed based on one rangewide study sampling of Joshua tree demography (St. Clair and Hoines 2018, entire), though we acknowledged that there are a limited number of study sites in several analysis units. We also acknowledge the suggestion to include drought and burn history. We are not aware of available datasets that could be used to categorize drought conditions; however, drought condition and burn history were considered in our discussion of resiliency, redundancy and representation.
		-I don't see how clonal growth would give protection from wildfire, it can just k	Esque, Todd C emailed comments 8/5/2022	Individuals may persist through clonal growth when the adult tree has died. It is not a protection from wildfire but part of the wildfire response when there is sufficient vigor in the adult tree and root system. Clonal growth that can contribute to persistence and occupancy across the range and we acknowledge that clonal sprouts are vulnerable to subsequent fire events.
		"Hopefully they had one of the geneticists review this as well. Environmental	Esque, Todd C emailed comments 8/5/2022 from Dan Shryock USGS	In the absence of data on genetic variation, we utilize ecological diversity as a surrogate. We acknowledge that extent that it is an adequate surrogate will depend on the species and often we cannot make that assessment until data on genetic variability is available.
		...on the document - does seem weird that drought is considered as a future threat, but doesn't factor into the current conditions ranking. we know that this is the worst drought in 1200 years going on right now	Esque, Todd C emailed comments 8/5/2022 from Dan Shryock USGS	See comment above. We are not aware of a means of categorizing drought condition as low, medium or high for population resiliency but discuss it as a current (6.4.3) and future threat.
		"Just a random note but in Section 3.5.1-Climate (page 22), the report says that the discussion of climate is based on taking 100 random points from each analysis unit. That is a very small number of points to use for that purpose, given what they had"	Esque, Todd C emailed comments 8/5/2022 from Dan Shryock USGS	Acknowledged.
44	6	The western extent is within and in the vicinity of Hungry Valley SVRA near Gorman, CA.	Leah Gardner, State of California	Edited
44	30	Overall, state lands (including 9 state parks managed by CDPH and several properties managed by CDFW) and property owned by local jurisdictions account for 2.7 percent.	Leah Gardner, State of California	Edited
79	6	Increased risk of wildfire. YUBR South is considered at low to moderate risk. Despite the modeling that predicts low frequency and severity of wildfires in the YUBR south, our state parks in this region have had an increase in fires in recent years (see below: table of wildfires in State Parks in this region, 1950 to 2021). Factors that contribute to regional wildfire risk include areas of wildland/urban interface, recreation, roads (high ignition probability), nitrogen deposition, frequent high winds, and a variety of invasive herbaceous species in addition to invasive grasses that provide fine fuels. Locally, fine fuels are provided by a wide variety of invasive species including Brome grasses, Russian thistle, Erodium, various wild mustards (Brassica nigra, Hirschfeldia incana, Sisymbrium altissimum), perennial pepperweed, non-native thistles, and many others. In the Antelope Valley area, we also have a lot of dead and dying California junipers that grown among the Joshua trees and add significant woody fuel. We recommend raising the wildfire threat for this area to Moderate/Medium throughout the document.	Leah Gardner, State of California	Edited YUBR South and YUBR North to moderate risk of fire

67		Threat of invasive grasses. Non-native plant species, primarily including annual invasive grasses, are spread by humans and anthropogenic disturbance and have the potential to substantially degrade desert habitats. While this discussion starts with invasive species in general, the focus quickly shifts to only invasive grasses. A wide variety of invasive herbaceous species can provide fine fuels in addition to invasive grasses. Though varying locally, fine fuels are typically provided by a wide variety of invasive herbaceous species including Russian thistle (<i>Salsola</i> spp.), Filaree (<i>Erodium</i> spp.), various wild mustards (<i>Brassica nigra</i>, <i>Hirschfeldia incana</i>, <i>Sisymbrium altissimum</i>), perennial pepperweed (<i>Lepidium latifolium</i>), non-native thistles (<i>Cirsium</i> spp., <i>Carduus</i> spp., <i>Centaurea</i> spp.), and many others. It may not be possible to quantify the presence and abundance of these species as readily as it is with the invasive grasses. However, we recommend that they should be mentioned as a contributing factor each time invasive grasses are discussed (such as "invasive grasses and forbs") or that a qualifying statement be included here such as: "While a wide variety of invasive species can degrade habitat and provide fine fuels for wildfires, the analysis from this point forward will only focus on invasive grasses."	Leah Gardner, State of California	Edited using text and species described herein.		
95	13	Availability of occupied habitat: "We consider areas currently occupied to indicate areas where the habitat needs are currently being met". Just because an area is currently occupied, it doesn't necessarily translate into providing ideal habitat conditions currently or into the future that will support a sustainable population. For argument against this idea, see page 60 of the Status Review of Western Joshua Tree, March 2022, a portion of which is copied below: "There may be a time delay between the time when an area becomes no longer suitable for a species (crossing an extinction threshold) and when that species is no longer present, (Tilman et al. 1994, Kuussaari et al. 2009, van Mantgem et al. 2009, Svenning and Sandel 2013, Figueiredo et al. 2019). Extinction processes often occur with a time delay and populations living close to their extinction threshold might survive for long periods of time despite local extinction being inevitable (Hanski and Ovaskainen 2002, Lindborg and Eriksson 2004, Helm et al. 2006, Vellend et al. 2006, Malanson 2008, Cronk 2016). Because western Joshua tree is a long-lived species, adults could persist for decades or longer in areas that are no longer suitable for recruitment, or recruitment may continue, but at rates that are ultimately insufficient to maintain the species. Although these areas may be occupied, the presence of western Joshua tree may merely represent a delayed local extinction. The ability of western Joshua tree to reproduce asexually may extend the ability of the species to persist within its range for very long periods of time, and delay local extinction for centuries or millennia, or perhaps preserve it as a relict species from an earlier climate. The ability of western Joshua tree to reproduce asexually and the episodic nature of western Joshua tree recruitment may also mask the ability to determine whether populations have passed a local extinction threshold." We recommend that this cause for uncertainty be explained here and the suitable habitat acreage be reduced by 10% to account for this uncertainty.	Leah Gardner, State of California	We consider areas currently occupied to indicate analysis units where the habitat needs are currently being met, though we acknowledge that species needs such as recruitment may be reduced or limited in some areas. We also acknowledge that Joshua trees may persist in the future in areas where they are functionally extirpated because all or a portion of the species needs are not met. Therefore, we project future areas of habitat degradation separate from climate refugia where species needs are expected to be maintained in the future. We address the extinction process and timeframe under section 8.1 when we describe the approach for incorporating the bioclimatic models including the next below. We applied this general framework to each analysis unit based on its topography and latitude. For example, analysis units at lower elevations and latitudes were projected to have a higher percentage of unsuitable habitat and a lower percentage of the analysis unit that could potentially serve as climate refugia for each scenario evaluated. When evaluating the future condition of climatically unsuitable habitat, we identified habitat areas where Joshua trees may no longer occupy a proportion of the modeled unsuitable habitat resulting in range contractions; and that Joshua trees could persist in other areas with occupancy maintained through established trees and asexual reproduction, although recruitment would be very low to nonexistent. Within these degraded habitat areas, we expect that the extinction process may occur over a period of several to many decades such that Joshua trees may continue to occupy habitat where all the species needs are no longer met, including areas that are functionally extirpated. We assume that habitat identified as degraded could include a spectrum of species needs and habitat quality where Joshua trees continue to persist. All the species needs are anticipated to be met within climate refugia including similar tree densities and recruitment as current conditions. Most of the models described above predict some degree of habitat expansion. However, given the limited dispersal of Joshua trees, we consider the potential for habitat expansion to be minimal overall, and did not include potential habitat expansion in our estimates of Joshua trees future distribution described below. We acknowledge the comment to decrease the suitable habitat acreage in the future due to the potential for portions of the habitat to be functionally extinct, which is incorporated into areas of potential habitat loss and range contractions in our analysis.		
	10	Exec Summary	17	editorial - delete 's' at end of occur(s)	Mindy Wheeler, State of Utah	Edited
	10	Exec Summary	27	short' periods of exposure to cold temperatures conflicts with other places in the document that state the period of cold temps is 'unknown'	Mindy Wheeler, State of Utah	Removed reference to short period in exec summary and on pg 10
	22	3	41-42	Should state definitively the percentage of each type of reproduction (asexual vs asexual) and if unknown state that definitively, may help in defining unknowns on future genetic adaptation capacity	Mindy Wheeler, State of Utah	Added text below. <i>We lack information on the relative contribution of sexual and asexual reproduction and if the proportion varies regionally.</i>
	30	3	40	Are mycorrhizal associations necessary /obligatory across all Joshua trees for survival? Should state definitively yes or no or unknown...	Mindy Wheeler, State of Utah	<i>Joshua trees do not require mycorrhizal fungi but they can improve establishment and survival in the early age classes (Harrower 2022a, pers. comm.).</i>
	37	3	16	Same comment as above, could JTs survive without the mycorrhizal association	Mindy Wheeler, State of Utah	See comment above.

66	6	19	Federal agencies by law should have information on activity and intensity and season of grazing on each allotment. Would be good to have this information to support any conclusions on the overall threat of grazing in different regions of the habitat for JT	Mindy Wheeler, State of Utah	Acknowledged. Unfortunately due to time constraints we were not able to reach out to federal agencies.
67	6	30	This sentence conflicts with Chapter 6, page 93, line 26 and other areas of the document - please state how your analysis came to this conclusion	Mindy Wheeler, State of Utah	Page 93 refers to the invasive grass-wildfire cycle <i>Our analysis indicated that there is limited evidence of an invasive grass-wildfire cycle currently, and Pg 67 refers to grazing Grazing is an on-going, low magnitude threat. The potential impacts to Joshua trees are of low intensity but the impacts are pervasive, occurring across all analysis units. Added text to pg 93 Although grazing may reduce invasive grass cover, grazing is also associated with habitat degradation. Therefore, we do not think that grazing will substantially increase or decrease the impacts of invasive grasses.</i>
85	6	33	Sentence is unfinished?	Mindy Wheeler, State of Utah	Edited as follows. <i>Lastly, physiological effects of increasing CO2 concentration are considered to have minor effects on these models; with the exception of Dole (2003: 141), which showed a slightly higher amount of current distribution remaining occupied due to increased freezing tolerance.</i>
96	7	11	A table would be helpful to more clearly show the relationship of no/low risk, high risk of invasive grasses, the proportion of the analysis unit used (and amount of each of low and high risk) to define habitat quality	Mindy Wheeler, State of Utah	Acknowledged. Added reference to table 7-2 on the next page.
101	7	37	Is 'natural fire regime' generally defined by the area having burned or not in recent history? (last 100 years) or does the definition also take into account the level of invasives in each unit?	Mindy Wheeler, State of Utah	Natural fire regime only accounts for the area burned in the last 100 yrs.
overall			Have there been any studies on increasing night time temperatures and its potential effect on invasive presence and abundance in any of these units? This could further inform invasive issues in JT habitats	Mindy Wheeler, State of Utah	Based on a literature review we did not find any studies evaluating invasive grasses and warming night time temperatures.
overall			I commend your efforts on this complicated issue! Thank you for a fascinating read!	Mindy Wheeler, State of Utah	

	Specie Name	Display Name	Email Address	Review Type	Email Sent	ESA Report Name	DOI Form Received	Modified By	Review Date Due	Item Type	Path	
	Gopher tortoise	Tanya Tavelle	tanya.tavelle@gmail.com	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:39	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Eloise Turley	eloiseturley@earthlink.net	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:39	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Angela Landry	angelalndr@gmail.com	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:41	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	John Burt	jburton@comcast.net	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:41	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Daniel Garland	dgarland@att.net	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:41	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Kurt Huxsolt	kurt@huxsolt.us	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:41	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Robert Johnson	rjohnson@texasgophertortoise.org	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:41	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Will Dillman	willdillman@sc.gov	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:44	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	William Dillman	willdillman@sc.gov	Peer Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:44	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Kari Lejeune	kari.lejeune@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:44	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Nick Hodges	nich.hodges@mms.state.us	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:44	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jane Jensen	jane.jensen@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:44	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Archia Shelton	archia.shelton@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:45	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Marc Roth	mroth@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:45	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Bretts Rehder	brettsrehder@archibold-studio.com	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:48	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Craig Crover	craig@barbun.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:46	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jeffrey Pugh	jeffrey.pugh@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:46	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	A Moore	a.moore@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:47	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Charles Newman	charlesnewman@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:47	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Matt Elliott	matt.elliott@state.ga.us	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:48	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Melissa Martin	melissamartin@south.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:48	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Chris Harris	chris.harris@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:48	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:49	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	David Starnes	dstarnes@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:51	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Brian Neuf	neufb@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:49	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Joan Berni	joan.berni@gmail.com	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:50	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	James McGowan	james.mcgowan@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:50	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Earl McCoy	earlmc@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:50	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Sall Norrell	sallnorrell@aol.com	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:51	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Gregory Kirschner	gregkirschner@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:51	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Buck Vandenberg	buck@vandenberg.net	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:51	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Robert Kirschner	robkirschner@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:52	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Mike Brack	mike@brack.us	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:52	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Toby Selby	toby@selby.us	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:55	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Joel Moore	joelmoore@brack.us	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:55	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Scott Jones	scott@jonesforadventure.com	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:55	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jon Garrison	jon@jonsgarrison.com	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:55	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	James Elliott	jameselliott@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:57	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Daniel Miller	danielmiller@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:58	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	James Conner	connerj@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:58	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jimmy Buck	jbuck@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:58	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Dan Beach	danbeach@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Richard Schiff	richard.schiff@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Kevin Gosholt	kevin.gosholt@usda.gov	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
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	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
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	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
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	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
	Gopher tortoise	Jeff Gooding	jeffgooding@normal.auburn.edu	Partner Review	Yes	Species Status Assessment Report for the Gopher Tortoise	FALSE	6/21/2021 12:59	Hoffmann, Scott L.	7/21/2021	item	status/fec-esa-lists/Reviews
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janget1@uk.edu	Species Status Assessment for Georgia Blind Salamander	Georgia blind salamander	Annette Engel	janget1@uk.edu	Peer Review	Yes	Species Status Assessment for Georgia Blind Salamander	FALSE	8/16/2022 10:10	Wardell, Jonathan A	8/28/2022	Item	status/ent-fact-ssa/Lists/Reviewers
am_will@harbouthill.org	Species Status Assessment for Georgia Blind Salamander	Georgia blind salamander	William Loftus	am_will@harbouthill.org	Peer Review	Yes	Species Status Assessment for Georgia Blind Salamander	FALSE	8/16/2022 10:11	Wardell, Jonathan A	8/28/2022	Item	status/ent-fact-ssa/Lists/Reviewers
richard@trannereenvironmental.com	California Spotted Owl Species Status Assessment Version 2.0	California spotted Owl	Richard Tanner	richard@trannereenvironmental.com	Peer Review	Yes	California Spotted Owl Species Status Assessment Version 2.0	FALSE	8/16/2022 15:38	West, Sabrina	8/12/2022	Item	status/ent-fact-ssa/Lists/Reviewers
punit1@edrim.org	California Spotted Owl Species Status Assessment Version 2.0	California spotted Owl	Phil Leitt	punit1@edrim.org	Peer Review	Yes	California Spotted Owl Species Status Assessment Version 2.0	FALSE	8/16/2022 15:38	West, Sabrina	8/12/2022	Item	status/ent-fact-ssa/Lists/Reviewers
luciofelix@hudson.org	California Spotted Owl Species Status Assessment Version 2.0	California spotted Owl	Lynn Schofield	luciofelix@hudson.org	Peer Review	Yes	California Spotted Owl Species Status Assessment Version 2.0	FALSE	8/16/2022 15:38	West, Sabrina	8/12/2022	Item	status/ent-fact-ssa/Lists/Reviewers
eforsman001@gmail.com	California Spotted Owl Species Status Assessment Version 2.0	California spotted Owl	Eric Forsman	eforsman001@gmail.com	Peer Review	Yes	California Spotted Owl Species Status Assessment Version 2.0	FALSE	8/16/2022 15:39	West, Sabrina	8/12/2022	Item	status/ent-fact-ssa/Lists/Reviewers
chmrc@bgsu.state.ak.us	Species Status Assessment Report for Coal Darter	Coal darter	Chris Haynes	chmrc@bgsu.state.ak.us	Peer Review	Yes	Species Status Assessment Report for Coal Darter	FALSE	8/16/2022 16:44	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
jthronberry@trnc.org	Species Status Assessment Report for Coal Darter	Coal darter	Jason Thronberry	jthronberry@trnc.org	Peer Review	Yes	Species Status Assessment Report for Coal Darter	FALSE	8/16/2022 16:46	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
johnrc5@auburn.edu	Species Status Assessment Report for Coal Darter	Coal darter	Dr. Carol Johnston	johnrc5@auburn.edu	Peer Review	Yes	Species Status Assessment Report for Coal Darter	FALSE	8/16/2022 16:49	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
newellc@bakerheroscience.org	Species Status Assessment Report for Coal Darter	Coal darter	Ben Newell	newellc@bakerheroscience.org	Peer Review	Yes	Species Status Assessment Report for Coal Darter	FALSE	8/16/2022 16:50	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
sam.mcroy@freshwaterlandtrust.org	Species Status Assessment Report for Coal Darter	Coal darter	Sam McCoy	sam.mcroy@freshwaterlandtrust.org	Peer Review	Yes	Species Status Assessment Report for Coal Darter	FALSE	8/16/2022 16:50	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
benrick@uk.edu	Species Status Assessment Report for Smallscale Darter	Smallscale darter	Ben Rick	benrick@uk.edu	Peer Review	Yes	Species Status Assessment Report for Smallscale Darter	FALSE	8/16/2022 17:14	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
khwheeler@trintech.edu	Species Status Assessment Report for Smallscale Darter	Smallscale darter	Kit Wheeler	khwheeler@trintech.edu	Peer Review	Yes	Species Status Assessment Report for Smallscale Darter	FALSE	8/16/2022 17:14	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
kwinn@trintech.edu	Species Status Assessment Report for Smallscale Darter	Smallscale darter	Kristin Wormha	kwinn@trintech.edu	Peer Review	Yes	Species Status Assessment Report for Smallscale Darter	FALSE	8/16/2022 17:15	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
brad@trintech.edu	Species Status Assessment Report for Smallscale Darter	Smallscale darter	Bernie Kuehla	brad@trintech.edu	Peer Review	Yes	Species Status Assessment Report for Smallscale Darter	FALSE	8/16/2022 17:16	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers
wpeffelt0@gmail.com	Species Status Assessment Report for Smallscale Darter	Smallscale darter	Grady Wells	wpeffelt0@gmail.com	Peer Review	Yes	Species Status Assessment Report for Smallscale Darter	FALSE	8/16/2022 17:17	Wardell, Jonathan A		Item	status/ent-fact-ssa/Lists/Reviewers

SSA Report Name
Alexander Archipelago Wolf SSA
Bachman's warbler
Bone Cave Harvestman (<i>Texella reyesi</i> Ubick and Briggs 1992) (Opiliones: Laniatores: Phalangodidae)
Brawleys Fork Crayfish Species Status Assessment
California Spotted Owl Species Status Assessment Version 2.0
Cape Fear Shiner Species Status Assessment
Clay-loving wild buckwheat SSA report
Draft SSA Brandegees' Buckwheat
Florida Pinesnake SSA, Version 1.0
Gopher Tortoise SSA
Gray Wolf Species Status Assessment
Hawaii and Mariana Islands Species
Ivory-billed woodpecker
Longnose Darter Species Status Assessment
Narrow-foot Hygrotus Diving Beetle SSA
Navasota False Foxglove SSA
Oblong Rocksnail SSA
Palo de Rosa Proposed Downlisting and 4(d) Rule
Pearl Darter pCH Rule
Plains Spotted Skunk SSA
Popeye Shiner (<i>Notropis ariommus</i>) Species Status Assessment Version 1.0
Red Wolf Draft Recovery Plan, 1/27/2022
Relict Trillium
Rio Grande Mussels Draft SSA Report
SSA_TRRE_PeerReview_20220307
Salamander Mussel Draft Species Status Assessment
San Marcos gambusia
Scioto madtom
Species Satus Assessment for Georgia Blind Salamander
Species Status Assessement Report for Coal Darter
Species Status Assessment (SSA) report for 3 Utah Milkvetches: Cisco Milkvetch (<i>Astragalus sabulosus</i>), Stage Station Milkvetch (<i>A. vehiculus</i>), and
Species Status Assessment Report for Cascades frog
Species Status Assessment Report for Cascades frog

Species Status Assessment Report for Columbia Oregonian
Species Status Assessment Report for DeBeque Phacelia
Species Status Assessment Report for Rye Cove Isopod
Species Status Assessment Report for Smallscale Darter
Species Status Assessment Report for the Canoe Creek Clubshell
Species Status Assessment Report for the Everglade Snail Kite (<i>Rostrhamus sociabilis plumbeus</i>), Version 1.0
Species Status Assessment Report for the Gopher Tortoise
Species Status Assessment Report for the Illinois Chorus Frog (<i>Pseudacris illinoensis</i>)
Species Status Assessment Report for the Northern Cavefish (<i>Amblyopsis spelaea</i>)
Species Status Assessment Report for the Quitobaquito Tryonia
Species Status Assessment Report for the Rayed Bean (<i>Villosa fabalis</i>)
Species Status Assessment Report for the Roundtail Chub (<i>Gila robusta</i>) in the Lower Colorado River V2
Species Status Assessment Report for the Sand Skink (<i>Neoseps reynoldsi</i>) Version 1.0
Species Status Assessment Report for the Sheepnose (<i>Plethobasus cyphus</i>)
Species Status Assessment Report for the Spectaclecase (<i>Cumberlandia monodonta</i>)
Species Status Assessment Report for the Swale Paintbrush (Glowing Indian paintbrush) (<i>Castilleja oranta</i>)
Species Status Assessment Report for the Yazoo crayfish, Version 1.3
Species Status Assessment for Geocarpon (<i>Geocarpon minimum</i>)
Species Status Assessment for Joshua Trees (<i>Yucca brevifolia</i> and <i>Yucca jaegeriana</i>)
Species Status Assessment for Ute Ladies'-Tresses
Species Status Assessment for West Virginia Spring Salamander
Species Status Assessment for the Dunes Sagebrush Lizard V1.0
Species Status Assessment for the Large-flowered skullcap
Species Status Assessment for the Massachusetts Population of the Northern Red-bellied Cooter
Species Status Assessment for the Miami Cave Crayfish
Species Status Assessment for the Pristine Crayfish (<i>Cambarus pristinus</i>)
Species Status Assessment for the Roanoke Logperch
Species Status Assessment for the San Francisco Bay-Delta Distinct Population Segment of the Longfin Smelt
Species Status Assessment for the Short-tailed Snake (<i>Lampropeltis extenuata</i>)
Species Status Assessment for the Snuffbox (<i>Epioblasma triquetra</i>)
Species Status Assessment for the Sonoran Desert Tortoise
Species Status Assessment for the Toothless blindcat (<i>Trogloglanis pattersoni</i>) and Widemouth blindcat (<i>Satan eurystomus</i>)
Species Status Assessment for the Venus Flytrap
Species Status Assessment for the Large-flowered skullcap

Species Status Assessment of Bushy Whitlow-wort
Species Status Assessment of Gypsum Wild Buckwheat (<i>Eriogonum gypsophilum</i>)

Isely's milkvetch (A. iselyi)