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UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF ARIZONA

WILDEARTH GUARDIANS, Plaintiff, v. UNITED STATES FISH AND WILDLIFE SERVICE and UNITED STATES FOREST SERVICE, Defendants.	CASE NO. 4:13-cv-151-RCC **DEFENDANTS' REPLY IN SUPPORT OF MOTION TO ALTER THE COURT'S DECISION AND TO CLARIFY OR MODIFY THE COURT'S INJUNCTION** **[EXPEDITED REVIEW REQUESTED]**

INTRODUCTION

Plaintiff urges the Court to continue to apply an incorrect standard to the U.S. Fish & Wildlife Service's ("FWS") jeopardy analysis under Section 7(a)(2) of the Endangered Species Act ("ESA"), mandating the agency "provide a route to recovery [for the Mexican spotted owl ("owl")] or a way to accurately assess it," regardless of the resulting manifest injustice of requiring unavailable population trend data. *See* ECF No. 110.[1] In so doing, Plaintiff ignores the applicable legal requirements when analyzing recovery within a Section 7(a)(2) jeopardy analysis – i.e., (1) whether FWS appropriately analyzed if the programmatic forest plans for the six National Forests would *appreciably reduce* the owl's prospects for recovery, and (2) whether FWS used the *best scientific data available* in conducting that analysis. Instead, Plaintiff advances misguided and unsupported theories of what FWS's biological opinions ("BiOps") must require to pass legal muster. Not only are Plaintiff's arguments wrong, most are irrelevant to the motion at hand. Once reviewed using the correct legal standards and context, it is clear that FWS, using the best available data, appropriately found that the U.S. Forest Service's ("USFS") continued implementation of its forest plans would not appreciably reduce the owl's prospects for recovery. Defendants respectfully ask this Court, under Federal Rule of Civil Procedure 59(e), to alter its judgment to correct its legal error and the resulting manifest injustice. In the alternative, Defendants request that the Court modify its current injunction to address only the irreparable harm that Plaintiff has demonstrated (which is none).

ARGUMENT

I. Requiring a "route to recovery" in a Section 7(a)(2) analysis misapplies the law and results in manifest injustice.

Plaintiff's response disregards the actual legal standards required for FWS's consideration of recovery within a Section 7(a)(2) analysis or the manifest injustice resulting from a requirement of reliable population trend data that will not be available

[1] Citations to Court documents reference the page numbers generated by ECF.

until 2023 at the earliest. ECF No. 104 at 3-11.

A. The "appreciably reduce" and "best available science" standards.

In undertaking its jeopardy analysis, FWS must assess not only the effects of USFS's forest plans on the survival of the owl, but also on recovery. *See* 50 C.F.R. § 402.02 (an agency action "jeopardize[s] the continued existence" of a species if it "reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species"); *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 524 F.3d 917, 932 (9th Cir. 2008) (interpreting this regulation to require a consideration of "effects on recovery as well as effects on survival"). The standard used for both survival and recovery within Section 7(a)(2) is the same – using the best available data, whether a proposed action appreciably reduces prospects for recovery.[2]

Here, in analyzing whether the forest plans appreciably reduced the owl's prospect for recovery, FWS used the best available data at the time and noted the following:

1. In 1993, due to a lack of population data, FWS listed the owl based entirely on the loss of vast amounts of old-growth, multi-layered canopy habitat (and the continuing threat of habitat loss) due to USFS's pre-1996 even-aged (shelterwood) timber management and catastrophic wildfire, USFS 20;
2. In 1995, FWS issued a recovery plan with specific protective management recommendations (i.e., to manage for protected, restricted, and other woodland habitats) to protect and recruit old-growth, multi-layered canopy habitat by eliminating the threat of even-aged timber management and designing projects to minimize risk of catastrophic wildfire, FWS 7918, FWS R 1;

[2] The Court here applied the correct "appreciably reduce" and "best available science" standards to its review of whether FWS appropriately considered owl survival and upheld FWS's survival determination. ECF No. 89 at 17-20.

3. In 1996, USFS amended its Forest Plans to incorporate, among other things, the 1995 recovery plan's protective forest management recommendations (i.e., to manage for protected, restricted, and other woodland habitats) to protect and recruit old-growth, multi-layered canopy habitat by implementing uneven-aged, timber management, and designing projects to minimize risk of catastrophic wildfire, FWS 7918, USFS 466-70;
4. USFS had implemented these protective management recommendations for 16 years (from 1996 to 2012) and would continue to do so, FWS 7918; and
5. Known owl distribution (the spatial arrangement of where owls occur and nest across their range) remained stable and additional owl surveys have resulted in the discovery of more known owl nesting sites across a wider area throughout the owl's range, FWS 7905.

Based on this best available data, FWS determined that USFS's continued implementation would not appreciably reduce the owl's prospects for recovery. *See*, e.g., FWS 8737-38 (Lincoln BiOp). After 16 years of implementing the forest plans (which contained most of the 1995 recovery plan recommendations), owl surveys indicated a stable and increasing distribution of owl nesting sites – i.e., not an appreciable reduction of the owl's prospect of recovery "by reducing the reproduction, numbers, *or distribution of that species*." *See* 50 C.F.R. § 402.02 (emphasis added). For this reason, FWS found that, while expected to have minimal short-term adverse effects, USFS's continued commitment to implement an uneven-aged timber management regime and to design projects to minimize the risk of high-severity, landscape-altering wildfire would not only avoid jeopardizing the owl and adversely modifying its habitat but would also likely result in long-term conservation benefits for the owl and move the owl closer to recovery.

In sum, after considering the best available data, FWS properly applied the ESA, its implementing regulations, and applicable case law, and made the reasonable conclusion that the six programmatic forest plans are consistent with the owl's 1995 Recovery Plan and, even without population trend data, will *increase* – i.e., not

appreciably reduce – the owl's chances for survival *and recovery* and, therefore, the six 2012 programmatic forest plans do not jeopardize the owl's "continued existence." 16 U.S.C. § 1536(a)(2). For this reason, the Court should alter its judgment to find that FWS met the requirements of Section 7(a)(2) by determining that the six forest plans would not appreciably reduce the owl's prospects for recovery.

B. Requiring a route to recovery is manifestly unjust.

Defendants demonstrated that requiring an agency to "provide a route to recovery or a way to accurately assess it" in a Section 7(a)(2) jeopardy analysis – i.e., to obtain unavailable population data – results in manifest injustice. ECF No. 104 at 9-11. It is manifestly unjust in two respects: (1) it provides no way for FWS, in reinitiated Section 7 consultation, to correct the alleged error found in the six 2012 BiOps until at least 2023 (and perhaps longer, if the population trend monitoring regime indicates a need to require more data); and (2) it results in the injunction of USFS "timber management activities" in the Lincoln, Santa Fe, Cibola, Carson, Tonto, and Gila National Forests, designed primarily to mitigate risk of catastrophic wildfire to the owl and nearby communities until at least 2023. During this time, with the intensification of high-severity, landscape-altering wildfires, USFS projects designed specifically to reduce the risk of wildfire appear to remain enjoined further endangering the owl and public health and safety. The Court, therefore, should revisit its judgment and uphold FWS's reasonable determination that, based on the best available science, the six programmatic forest plans at issue do not appreciably reduce the owl's prospects for recovery.

C. Plaintiff's arguments ignore the appropriate Section 7(a)(2) recovery standard and do not ameliorate the manifest injustice.

In response, Plaintiff ignores the Section 7(a)(2) recovery standard and instead advances misguided arguments of what FWS's BiOps must require to pass legal muster. The arguments are incorrect and irrelevant to the issue at hand.

1. Broad-scale population trend data does not identify local-scale project effects on the owl population.

Through its proffered declarant, Plaintiff argues that adaptive management on a local scale (site-specific projects) is not possible and "doomed" without broad-scale population trend data. ECF No. 110 at 13-18; ECF No. 110-1 ¶ 3-7. As an initial matter, the scientific community questions the methods and credibility of Plaintiff's "expert" on the topic of owls. *See* Defendants' Exhibit C (Peery, et al., 2019); Defendants' Exhibit E (Hedwall 2 Decl.) ¶ 9. Furthermore, Plaintiff seeks to draw this Court into a "battle of the experts," have the Court conduct its own *de novo* review of the underlying scientific data, and reach its own conclusions. This is improper. *San Luis & Delta-Mendota Water Auth. v. Jewell,* 747 F.3d 581, 603 (9th Cir. 2014); *San Luis & Delta-Mendota Water Auth. v. Locke,* 776 F.3d 971, 993 (9th Cir. 2014). Regardless, Plaintiff's argument is without merit.

Two levels of adaptive management are at play with the owl: local-level adaptive management (for ESA Section 7 jeopardy purposes) and broad-scale adaptive management (for ESA Section 4 recovery purposes). Defendants' Exhibit D (Maes Decl.) ¶ 7; Hedwall 2 Decl. ¶¶ 5, 10-11. Effective adaptive management for Section 7 purposes happens at a local, site-specific level and involves a systematic approach for improving USFS management of owl habitat by analyzing the effects of site-specific management projects (or management practices) on individual owls and local habitat within the site-specific project area. *Id*. Population trend monitoring does not provide the type of data needed for effective localized adaptive management because it provides data at a very broad scale across the entire range of the owl. *Id*. At this broad scale, many different factors affect the owl's population trend: weather (wet years vs. drought years), disease, availability of prey, landscape-altering wildfire, climate change, etc. *Id*. Because these other factors affect the owl across its entire range, they have a significant and much greater effect on owl numbers and trends and, due to the relatively small acreage total of USFS site-specific projects in comparison, these range-wide factors almost completely mask any effect of USFS management practices, positive or negative. *Id*. For example, USFS is not able to effectively determine the effects of its localized management

practices when analyzing population trend data that, perhaps due to a wet season with high prey abundance and low landscape-altering wildfire effects, may indicate a rising owl population trend. *Id*.

Contrary to Plaintiff's assertion, it is simply unworkable to effectively use broad-scale population trend data to identify, for adaptive-management purposes, a localized, site-specific project or a USFS management practice in general that is having either a positive or negative effect on the owl or its habitat. *Id*. Rather, this data's main purpose is to enable FWS to conduct a future delisting analysis, not to assess USFS's local-scale adaptive management or Section 7 obligations. *Id*. USFS meets its Section 7 obligations by implementing uneven-aged timber management, by designing management projects, in consultation with FWS, to minimize risk of high-severity, landscape-altering wildfire, and by monitoring for incidental take of each site-specific project. *Id*.; USFS 385-470. USFS further meets its Section 7 obligations to protect the owl by conducting pre- and post-treatment monitoring for these types of projects to ensure the desired results. USFS 466-69 (monitoring owls and their habitat for at least a year prior to project implementation and two-to-three years post-project implementation). If, after this type of monitoring, it is determined that a particular treatment did not achieve its goal or is found to have some adverse effect on the owl, USFS, in consultation with FWS, can and does change its approach to abate or minimize effects to the owl. Plaintiff's argument that population trend monitoring is "crucial" for adaptive management (or required for ESA Section 7 compliance) or somehow "dooms" adaptive management without it, fails.

2. Broad-scale population trend data provides little value to the programmatic consultation at hand.

Plaintiff also seems to suggest that broad-scale population trend data is the *only* data that will work for a Section 7(a)(2) jeopardy analysis. ECF No. 104 at 13-18. Plaintiff is wrong. Again, an agency action "jeopardize[s] the continued existence" of a species if it "reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing

the reproduction, numbers, *or distribution of that species*". *See* 50 C.F.R. § 402.02 (emphasis added). To be clear, while population trend could be used in this analysis, it is not the only data that can be used in this analysis. As stated, that data is unavailable and, at least with respect to the owl, not likely to be helpful on a local, site-specific level. USFS can use data on reproduction, population numbers, *or* distribution of the owl. The best available data at the time of the decision was survey data indicating that the distribution of nesting/roosting sites was expanding across the range. FWS 7905. This data allowed FWS to reasonably determine that the forest plans would not "appreciably reduce" the owl's prospects for recovery.

Plaintiff's argument that USFS now has sufficient data (three years) to determine a population trend for its Section 7(a)(2) jeopardy analysis, ECF No. 110 at 16, fares no better. First, three years of population trend data is not reliable. *See* Hedwall 2 Decl. ¶ 9; ECF No. 104-1 ¶¶ 8-10; ECF No. 104-2 ¶¶ 26-27. Second, and most importantly, it is unclear how the results of population trend data would help inform FWS decisions regarding jeopardy as it relates to the continued implementation of the forest plans. Plaintiff offers no suggestions. The fact is that increasing, decreasing, or stable trends in owl population (whenever the agencies obtain reliable data) may be driven by factors outside of the control of FWS or USFS and independent of habitat manipulation (e.g., climate change and drought). ECF No. 104-2 ¶ 27. Regardless of long-term trends in owl population, it is clear based on current science that safeguarding and promoting habitat features needed to support the owl through uneven-aged stand management is a priority for conservation. Therefore, even if long-term population trends reveal declining trends (which might preclude delisting), such results would not be construed as grounds for foregoing habitat management actions (i.e., mechanical and managed fire treatments that mitigate risk of catastrophic wildfire) needed to safeguard key habitat elements for the owl.

3. The 1996/2005 BiOps are not premised on population monitoring.

Plaintiff next argues that FWS specifically premised its "no jeopardy"

programmatic BiOps over the years on USFS's commitment to conduct population trend monitoring. ECF No. 110 at 8-12. Not so. As discussed above, population trend monitoring is designed to aid FWS in a future delisting analysis. In conducting its Section 7 analysis on the forest plans at issue, FWS is not reviewing whether the owl should be delisted. Rather, it is analyzing whether USFS's proposed action – the continued implementation of the forest plans – are likely to result in jeopardy to the owl or adverse modification to its designated critical habitat. To that end, like the 2012 BiOps, the 1996 and 2005 BiOps focused on management of habitat based on the needs of the owl.

FWS concluded in 1996 and 2005 that USFS's continued implementation of the forest plans (with their protective management measures) effectively addressed the primary threats that led to the owl's "threatened" listing and improved (and would continue to improve over time) the owl's pre-1996 habitat by protecting and recruiting old-growth, multi-layered canopy forests. The 2012 BiOps were no different in that respect. FWS never based any of the programmatic BiOps on a population trend monitoring program. *See* USFS 724-25 (1996 "no jeopardy" conclusion not based on population trend monitoring); USFS 2338-39 (2005 "no jeopardy" conclusion not based on population trend monitoring); FWS 7917-19 (2012 "no jeopardy" conclusion for the Coconino National Forest not based on population trend monitoring).

The inclusion of the range-wide population trend monitoring in the 1996 and 2005 programmatic incidental take statements, *see* USFS 730; USFS 2341-42, does not change this fact. FWS's analyses in the BiOps and the incidental take statements are different. In the BiOps, FWS analyzes whether the proposed action is likely to cause jeopardy and adverse modification, whereas, in the incidental take statements, FWS evaluates the amount or extent of anticipated incidental take. Failure to comply with a term or condition or reasonable and prudent measure in the incidental take statements does not affect or undermine FWS's jeopardy or adverse modification determination; it simply means that the action agency or applicant is not complying with the incidental take statements and is no longer covered by the take exemption.

Furthermore, the inclusion of this monitoring program in the programmatic incidental take statements merely reflects the agencies' attempt to memorialize both FWS's strategic, programmatic goal of eventually implementing a collaborative, multi-agency population trend monitoring program and USFS's established commitment in the 1996 standards and guidelines to participate to the extent possible in that collaborative program. This was not, as Plaintiff argues, FWS basing its "no jeopardy" determinations on the fact that USFS would fully fund and carry out a population trend monitoring program.

Indeed, Plaintiff's argument is undermined by the fact that the 1996 incidental take statement also includes the requirement that USFS fund and conduct an initial pilot study to assess the feasibility of the range-wide population trend monitoring (as contemplated in the 1995 recovery plan), USFS 730, even though FWS knew of the uncertain nature of this monitoring program. FWS did not premise its 1996 "no jeopardy" BiOp on an uncertain monitoring program that it knew, based on the results of USFS's pilot study, might not be possible or feasible.

This desire to memorialize the agencies' strategic, programmatic goal of generating population trend data through a collaborative, multi-agency monitoring program is further reflected in the 2005 programmatic BiOp. At the time of the 2005 BiOp, the agencies and the recovery team already knew that the population trend monitoring program, as outlined in the 1995 recovery plan, was not feasible. USFS 2048-49. While the agencies wanted to continue trying to find a way to generate population trend data, FWS did not base its "no jeopardy" conclusion on the assumption of a fully funded and implemented population trend monitoring program. And, due to Plaintiff's misinterpretation and the fact that that type of monitoring does not help track incidental take from site-specific projects, the agencies removed the term from the programmatic incidental take statement. Plaintiff's argument fails.

4. BiOps do not "coerce" implementation of a recovery plan.

Finally, Plaintiff argues that FWS is required to force USFS into implementing the

owl's recovery plan – i.e., population trend monitoring – through binding terms and conditions in the BiOps' incidental take statements. ECF No. 110 at 6-7. Unsurprisingly, Plaintiff provides no authority for that proposition because none exists. If an action is not likely to result in jeopardy or adversely modify critical habitat, but is reasonably likely to result in "take" incidental to the proposed action, then FWS attaches an incidental take statement to the BiOp. 16 U.S.C. § 1536(b)(4); 50 C.F.R. § 402.14(i)(1)(i-v). As explained above, because broad-scale population trend data does not help track incidental take on a local, site-specific level, FWS did not include it. That decision was reasonable and supported by the record.

II. Plaintiff has not demonstrated irreparable injury necessary for an injunction.

In its attempt to demonstrate irreparable injury, Plaintiff yet again confuses and blurs the important distinction between broad-scale habitat/population monitoring (for delisting) and local-scale, site-specific habitat/occupancy monitoring (used to determine jeopardy). ECF No. 110 at 17-19. As explained above, broad-scale habitat/population monitoring does not identify effects of local forest management practices on the owl population. Maes Decl. ¶ 7; Hedwall 2 Decl. ¶¶ 5, 10-11. Based on the best available data, USFS implements projects that safeguard and promote habitat features needed to support the owl through uneven-aged stand management (e.g., mechanical and managed fire treatments that mitigate risk of catastrophic wildfire). *Id*. With each site-specific project, USFS monitors both owls and their habitat to ensure a particular project had its desired effect. The information is then used to "adapt" its management practice based on the results. *Id*. USFS is implementing every recommendation in the Recovery Plan. Maes Decl. ¶ 6; Hedwall 2 Decl. ¶¶ 6-8.[3] Plaintiff has not offered any evidence that any specific projects will likely irreparably harm its members' interests. Therefore, Plaintiff is

[3] In any event, while not relevant to the irreparable harm issue here, USFS is taking steps to monitor broad-scale population and habitat trends. Maes Decl. ¶¶ 8-10; Defendants' Exh. F (Joyner Decl.) ¶¶ 2-9; ECF No. 104-1 ¶¶ 8-10; ECF No. 104-2 ¶¶ 24-29.

not entitled to any injunction in this case, and this Court's judgment should be amended accordingly. *Cottonwood Envtl. Law Ctr. v. U.S. Forest Serv.*, 789 F.3d 1075, 1089 (9th Cir. 2015).

III. Plaintiff cannot show that several categories of activities cause Plaintiff irreparable harm, and therefore should be excluded from any injunction.

If the Court continues to believe that an injunction is necessary, any injunction must be narrowly-tailored to remedy to specific violation found and to ameliorate the injury identified by the Plaintiff. Plaintiff has made no such showing and no injunction is appropriate; but in any event, at a minimum, the injunction should be modified to following activities to continue as previously explained, *see* ECF No. 104 at 15-18:

- There are five currently enjoined timber management projects that are partially outside of owl critical habitat, recovery habitat, and Protected Activity Centers. ECF No. 104-2 ¶ 6. The Court should allow *all* timber management activities outside of owl habitat including *but not limited to* those in attachment 2. ECF No. 104-2 ¶ 6.
- Routine vegetation maintenance activities inside owl habitat associated with power lines, trails, ski areas, etc.
- Timber management projects with project-specific forest plan amendments and supporting, stand-alone Section 7 consultation should be allowed to continue. These independent projects have or will have project-specific forest plan amendments that contain updated owl standards and guidelines that align with the 2012 Recovery Plan. ECF No. 104-2 ¶ 14. These specific projects also have their own stand-alone Section 7 consultation – i.e., the consultations are not tiered to the now-invalidated 2012 programmatic BiOps. ECF No. 104-2 ¶ 15. The Court should allow these projects (and others that follow this model) to proceed.
- Due to its small scale, commercial fuelwood cutting and gathering inside owl habitat should be allowed to continue.

CONCLUSION

For the reasons outlined above, the Court should alter and modify its judgment.

Dated: November 5, 2019

Respectfully Submitted,

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UNITED STATES DISTRICT COURT
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WILDEARTH GUARDIANS, Plaintiff, v. UNITED STATES FISH AND WILDLIFE SERVICE and UNITED STATES FOREST SERVICE, Defendants.	CASE NO. 4:13-cv-151-RCC **CERTIFICATE OF SERVICE**

I hereby certify that I electronically filed the foregoing with the Clerk of the Court using the CM/ECF system, which will send notification of such to the attorneys of record.

/s/ Rickey D. Turner, Jr.
RICKEY D. TURNER, JR.

Defendants' Exhibit C

the country, largely because of the lower energy demands for cooling than heating. With respect to residential and transportation energy use, El Paso, Tucson, Las Vegas, and Phoenix all recently ranked among the 25 US metro areas with the lowest emissions out of the 100 largest metropolitan areas in the US (Brookings Institution 2008).

While these cities continue to grow and thrive by many metrics, new investments must be used to help resolve historical inequities: socioeconomically marginalized people often face higher heat exposure, rely on lower-quality infrastructure, have less access to private means of adaptation, and are more excluded from governance processes (eg Harlan *et al.* in press). The path forward must involve processes and strategies that enable all urban residents to meaningfully participate in decision-making structures, avoid dangerous heat exposure, and access clean water.

We invite and encourage continued scrutiny of the experiences of southwestern cities, as their successes and failures in climate adaptation will be instructive for others around the world in the coming decades. While predictions of doom for cities of the American Southwest make for tempting headlines, efforts to highlight the experience of southwestern cities as vital testbeds for urban resilience may prove more beneficial to the global community preparing for future heat and water challenges.

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The conundrum of agenda-driven science in conservation

Conservation biology is a value-laden discipline predicated on conserving biodiversity (Soulé 1985), a mission that does not always sit easily with objective science (Lackey 2007; Pielke 2007; Scott *et al.* 2007). While some encourage scientists to be responsible advocates for conservation (Garrard *et al.* 2016), others worry that objectivity in conservation research may suffer (Lackey 2007). At this time, we believe advocacy by scientists is essential for environmental conservation and, indeed, humanity. It is difficult to envision the state of our environment had scientists failed to encourage policy makers and the public to address emerging conservation problems. Nevertheless, conservation scientists must avoid misusing the scientific process to promote specific conservation outcomes (Wilholt 2009); doing so erodes the credibility of science and can produce undesirable consequences (Thomas 1992; Mills 2000; Rohr and McCoy 2010). We consider intentionally engaging in activities outside of professional norms to promote desired outcomes, as part of either the production or dissemination of science, to constitute "agenda-driven science". The issue of advocacy-related bias in conservation science merits renewed discussion because conservation conflicts in an increasingly polarized world might tempt some to engage in agenda-driven science to "win" a conflict (Redpath *et al.* 2015; Kareiva *et al.* 2018).

Agenda-driven science can take many forms (Table 1). Concealing conflicts of interest when publishing may indicate that scientists are beholden to parties with a vested interest in results (Rohr and McCoy 2010). The intentional misuse of data, misrepresentation of literature, and misinterpretation of results in a manner favorable to one's conservation objectives are also clear manifestations of agenda-driven science (Wilhere 2012). While peer review is the bedrock of science, it can be imperfect and does not always purge poor-quality, agenda-driven science from

Table 1. Elements of agenda-driven science and some examples of activities outside of scientific norms that may be symptomatic of agenda-driven science

Elements of agenda-driven science	Activities symptomatic of agenda-driven science
Undeclared conflicts of interest	Failure to disclose funding sources that might benefit from a specific scientific result
	Failure to disclose involvement in litigation related to a study
Inappropriate use of data and literature	Selective use of data in support of hypotheses
	Publishing incomplete or unvetted data
	Selectively referencing literature to support hypotheses
Drawing unsupported conclusions	Emphasizing certainty and simplicity over uncertainty and complexity
Inappropriate use of social media and reliance on quasi-scientific outlets	Publishing in journals with lax peer review
	Conducting scientific reviews of papers outside of the peer-review process
Inappropriate professional behavior	Pressuring other scientists to retract published papers
	Conducting biased reviews of articles
	Obtaining other scientists' data through the Freedom of Information Act without seeking collaboration

publication and public-policy debates. Further, biased peer review can lead to papers being accepted or rejected because of their perceived conservation implications rather than their scientific merit (Hilborn 2006; Kareiva *et al.* 2018), such as when Vellend *et al.* (2013) demonstrated no net biodiversity loss at local scales but a reviewer recommended the paper be rejected over fears that its results could undercut conservation (see Vellend [2018] for details). Importantly, the proliferation of journals with less rigorous peer review increases opportunities to disseminate agenda-driven science (Bohannon 2013). Intimidation or pressuring of scientists, particularly junior scientists, to suppress research is symptomatic of agenda-driven science – as occurred when senior colleagues of Donato *et al.* (2006) attempted to suppress their study showing negative environmental impacts of salvage logging (Donato *et al.* 2006; see Harden [2006] for details).

Scientists also play an increasingly important role in communicating conservation issues to the public, with the proliferation of social media, including blogs, and online press outlets expanding opportunities to disseminate science. However, attempts to adjudicate scientific debates in the public sphere by, for example, posting reviews of scientific articles on blogs without the oversight of peer review and customary rebuttals may lead to greater uncertainty and is unlikely to resolve conservation conflicts (Harvey *et al.* 2018). Such media outlets greatly influence public opinion and policy, and have been used effectively to stoke doubt about the reality of climate change and the dangers of pesticides (Oreskes and Conway 2010).

Agenda-driven science poses a conundrum to conservation because, as defined here, it implies intent, which is difficult to demonstrate. Each of the potential elements of agenda-driven science described in Table 1 may emerge for reasons other than the intentional misuse of science. A poor analysis that supports a desired conservation outcome may be an honest mistake. Moreover, disagreements about scientific conclusions do not necessarily indicate agenda-driven science; they are both commonplace among well-intentioned scientists and an integral part of the scientific process. However, the specter of agenda-driven science cannot be ignored when such activities co-occur with conflicts of interest and information campaigns intended to marginalize competing studies outside of the peer-review process. We therefore suggest that it is the cumulative frequency and broader patterns of behaviors outside of scientific norms that indicate agenda-driven science. Even so, assessing when scientific activities "cross the line" is subjective and will be open to interpretation. Recently, several authors of this letter have been involved in a scientific controversy involving forest management and the conservation of spotted owls (*Strix occidentalis*) in California, elements of which we believe provide an example of this conundrum (see WebPanel 1).

How then should scientists handle the conundrum of agenda-driven science and minimize its impacts on conservation outcomes? We suggest that increased discussion among conservation scientists is needed to help understand how values can lead to biases and ensure that we as a community conduct objective research and stay true to findings in communications with the public. For instance, as part of their graduate education, tomorrow's scientists could benefit from improved training in scientific ethics and communication to avoid engaging in agenda-driven science and to assist the public in distinguishing between rigorous peer-reviewed science and unmoderated scientific debates. Also needed are broadly accepted tools and procedures for recognizing and responding to agenda-driven science. Journal editors and peer reviewers play a key role in guarding against bias in published science but increased vigilance for signs of an intention to influence policy is also needed. Greater disclosure of personal values (as is the case in other scientific disciplines) as well as conflicts of interest (such as litigation activities and consulting for litigants) would facilitate enhanced scrutiny and awareness within the peer-review process. We also encourage professional societies to combat proactively the spread of misinformation to ensure that agenda-driven science does

not discredit objective science and negatively influence conservation outcomes. Finally, the fostering of a diverse scientific community with a range of values will help maintain objectivity beyond what is possible for individual scientists (Longino 1990). We hope that strategies such as these will help conservation scientists avoid adopting the tactics of those denying the reality of environmental impacts (Oreskes and Conway 2010) – we must be the gatekeepers of our own integrity.

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Supporting Information

Additional, web-only material may may be found in the online version of this article at http://onlinelibrary.wiley.com/doi/10.1002/fee.2006/suppinfo

Principles of translational science education

The influence and acceptance of scientific discoveries and technological advances are linked to the scientific literacy, which remains an enormous challenge to achieve in the modern era (Hurd 1998; Sturgis and Allum 2004). As scientists, teachers, and parents, we wholeheartedly agree with the growing consensus that a promising solution lies in science education reform (DeBoer 2000; National Research Council 2013). Evidence suggests that authentic learning experiences (those that emphasize applying knowledge in real-life contexts) can improve performance in primary and secondary (ie K–12) STEM education (Michael and Modell 2003; Lombardi 2007). In response, innovative initiatives such as the Next Generation Science Standards (NGSS: National Research Council 2013) place experiential learning at the heart of effective education standards to improve student engagement and promote a deeper understanding of core concepts (Bransford *et al.* 2000). Despite strong theoretical support for authentic, inquiry-based learning, our experience interacting with educators suggests that implementation remains difficult due to classroom constraints, pressure to meet standardized testing norms, and a lack of experience in the process of scientific inquiry, a trend that is widely reported in the literature (Au 2007; McDonald and Songer 2008; Bell 2010). Meanwhile, as ecologists we are required to advance scientific understanding while simultaneously building non-academic collaborative partnerships and satisfying outreach requirements (Bodmer 1985; Brewer 2002).

In a Special Issue in *Frontiers*, Enquist *et al.* (2017) presented an integrated approach to socioecological problem solving that emphasized co-production of actionable science by ecologists, decision makers, and stakeholders: translational ecology (TE). Six principles were identified as defining the foundations of TE: communication, collaboration, engagement, commitment, process, and decision framing (WebFigure 1; Enquist *et al.* 2017). While thinking about science education reform and the importance of developing mutually beneficial partnerships between scientists and educators, we relied on the principles of TE to provide a natural framework for organizing our thoughts about science

WebPanel 1. Agenda-driven science? The case of spotted owls and fire

Balancing forest ecosystem restoration and spotted owl conservation

Spotted owls (*Strix occidentalis*) have been at the center of forest management debates in the western US for nearly half a century. The conflict initially revolved around logging of commercially valuable older forests used by spotted owls (Simberloff 1987; Gutiérrez *et al.* 1995; Gutiérrez 2015). More recently, the debate has shifted to the potential for impacts to spotted owls from fuels reduction and forest restoration techniques that, in addition to the increased use of prescribed and managed fire, include logging of small- and medium-sized trees in forests with high canopy closure used by owls as primary habitat (Lehmkuhl *et al.* 2007, 2015; Collins *et al.* 2010; Tempel *et al.* 2014, 2015, 2016). Restoration appears necessary because fire suppression since the 19th century in the dry forests of western North America has resulted in unnaturally high densities of shade-tolerant trees, with a concomitant increase in surface and ladder fuels (ie "departed" forests) (Collins *et al.* 2017; Hagmann *et al.* 2017) – both of which increase the risk of large, severe fires (Calkin *et al.* 2005; North *et al.* 2015; Steel *et al.* 2015).

Spotted owls use these "departed" forests (as well as old-growth forests influenced by natural fire regimes) for nesting, roosting, and foraging, and there is concern by managers that high tree densities in owl habitat exacerbate the risk of large, high-severity fires. Logging and related management activities (eg mastication, chipping) are used to reduce densities of smaller trees and surface fuels, curb severe fire, and restore forest ecosystems, but modify forest structure in a way that may negatively impact spotted owls (Ager *et al.* 2007; Stephens *et al.* 2014; Tempel *et al.* 2014, 2015, 2016). Therefore, a key issue in the ecosystem restoration versus spotted owl conservation debate is the extent to which spotted owls are affected by wildfire. If large, severe fires negatively affect spotted owl populations, some argue that short-term negative effects of fuels reduction treatments on spotted owls may provide long-term benefits by reducing wildfire impacts (Tempel *et al.* 2015). How owls respond to wildfire also has implications for post-fire management such as salvage logging and tree planting; if spotted owls avoid severely burned forests, an argument could be made that these activities can be implemented with limited adverse impacts to spotted owls. Thus, determining the extent to which severe fire affects spotted owls is key for restoring and managing both "green" and burned forests in a region experiencing rapidly warming and drying climatic conditions (Diffenbaugh *et al.* 2015; Mann and Gleick 2015; Williams *et al.* 2015; Crockett and Westerling 2018).

The science of spotted owls and fire

Spotted owls inhabiting seasonally dry forests are expected to be adapted to disturbance regimes characterized by frequent fires that, historically, were typically of low and moderate severity (Gutiérrez *et al.* 1995, 2017). This hypothesis is supported by virtually all research thus far published on the response of owls to low- and moderate-severity fires (Bond 2016; Ganey *et al.* 2017). However, conflicting accounts exist regarding the effects of high-severity fire on spotted owls (Ganey *et al.* 2017). Several studies from one research group (Lee, Bond, and Hanson; hereafter "LBH") indicate that (1) territory occupancy rates (the fraction of historical territories containing spotted owls at time *t*) either are not affected, or are affected to a negligible degree, by high-severity fire (Lee *et al.* 2012, 2013; Lee and Bond 2015a,b; Hanson *et al.* 2018); and (2) spotted owls marked with radio-transmitters do not avoid severely burned patches of forest when foraging (Bond *et al.* 2009, 2016). By contrast, recent studies by four independent research groups (see Table 1 in Ganey *et al.* 2017) reveal negative effects of large, severe fires on spotted owl populations (Jones *et al.* 2016; Rockweit *et al.* 2017) and avoidance of severely burned forests by spotted owls marked with radio-transmitters or GPS tags (Comfort *et al.* 2016; Jones *et al.* 2016; Eyes *et al.* 2017).

Conflicting results may, in part, be attributable to differences in landscape patterns of severe fire among studies. For example, Jones *et al.* (2016) examined changes in territory occupancy by spotted owls following the ~40,000-ha King Fire, which was one of the largest and most homogeneously severe forest fire events in recent California history (Stevens *et al.* 2017). Spatial patterns of severe fire in the larger (~104,000-ha) Rim Fire studied by Lee and Bond (2015a) were relatively heterogeneous by comparison, which may have resulted in less or no impact on territory occupancy (Jones *et al.* 2016; Ganey *et al.* 2017). Similarly, individual territories in Lee *et al.* (2012, 2013) and Lee and Bond (2015b) may not have experienced the same degree of high severity fire as territories in the Jones *et al.* (2016) study, although it is difficult to make direct comparisons owing to limited information provided by Lee and co-authors. Nevertheless, it is not unreasonable to expect that varying spatial patterns of severe fire might affect spotted owls differently, and it would not be surprising if some of the differences in results among the aforementioned studies emerged because the studies focused on fires with different characteristics.

Competing findings may also have resulted from differences among studies in methods employed. Studies suggesting negative effects of severe fire on spotted owl populations were based on designs using color-marked individuals, whereas studies that did not report negative effects were based on unmarked individuals. Thus, studies reporting little or no effect on spotted owls often assigned territory occupancy status by means of nocturnal detections of owls (Lee *et al.* 2012, 2013; Lee and Bond 2015a,b; Hanson *et al.* 2018). However, wide-ranging nocturnal movements by individual owls can lead to the apparent use of multiple territories (ie the same bird detected in

several territories that are actually unoccupied), resulting in assignment (false positive) bias that can dramatically inflate occupancy rates (Miller *et al.* 2011; Sutherland *et al.* 2013) and mask the effect of fire in unmarked owl populations (Berigan *et al.* 2018). In contrast, Jones *et al.* (2016), using data from a long-term demographic study of a marked population of owls, excluded such false positive detections in unoccupied territories and were able to estimate high extinction rates for territories that experienced large (>50%) amounts of severe fire. Also using color-marked owls, Rockweit *et al.* (2017) demonstrated that survival rates of individual owls were lower in landscapes that experienced relatively large amounts of high-severity fire. Thus, occupancy-based studies detected neutral or weak effects of severe fire on unmarked spotted owls (Lee *et al.* 2012, 2013; Lee and Bond 2015a,b) may not have captured the full demographic impacts of severe fire on their study populations.

Understanding why significant differences in results have occurred among spotted owl–fire studies has major implications for balancing ecosystem restoration and species conservation objectives in dry forest ecosystems. If severe fire negatively affects spotted owls and some studies failed to detect the effects of severe fire because they were conducted on unmarked populations, a logical management implication would be that reducing severe fire could benefit spotted owls. If, however, differences in studies are the result of differences in ecological context, where, for example, severe fire primarily impacts spotted owls when these fires occur in large, homogeneous patches, the calculus becomes considerably complex. Specifically, the benefits of reducing severe fire to owls will depend in part on when, and how frequently, severe fire exceeds some currently unknown threshold size and level of homogeneity. We therefore believe much remains to be learned about wildfire effects on spotted owls and additional study is warranted.

Evidence for agenda-driven science in the spotted owl–wildfire debate?

Despite growing consensus among research groups that severe fire can, in some circumstances, adversely affect spotted owls (Ganey *et al.* 2017), those studies demonstrating such negative effects have been contested by a single research group (LBH) whose studies suggest severe fire has little or no effect on owls. Members of this research group also advocate that:

"…the federal timber sales program must be ended in order for ecological management of our national forests and other federal forestlands to occur."
–John Muir Project of Earth Island Institute (2014)

"We propose expansion of the National Park Service model of forest management to encompass all California's US Forest Service lands."
–Wild Nature Institute (2019)

Certainly, advocacy in support of these positions could, in some cases, be justified because fuels treatments and salvage logging have the potential to be detrimental to owl habitat and forest ecosystems, respectively (Lindenmayer and Noss 2006; Ganey *et al.* 2017). However, as detailed below, it is our opinion that LBH appear to have engaged in six activities outside of professional norms in support of their advocacy that promote a narrative that high-severity wildfire does not threaten spotted owls. These apparent activities include: (i) mixing science and litigation without disclosing potential conflicts of interest; (ii) using social media (rather than peer-reviewed journals) to conduct critical scientific reviews of studies that do not support the findings of their own work; (iii) pressuring scientists and graduate students with different research findings to retract their papers or not publish their thesis findings; (iv) conducting erroneous analyses using data they did not collect and with which they were unfamiliar; (v) selectively using data that support their agendas; and (vi) making management recommendations beyond what is reasonably supported by scientific findings. Individually, we consider each of these activities to fall outside of scientific norms. Collectively, however, they may be symptomatic of agenda-driven science involving attempts to understate uncertainty and promote a narrative not fully supported by the scientific literature that aims to influence forest management. As described in the main text of the associated letter, recognizing when scientific activities "cross the line" and enter the realm of agenda-driven science is a "gray area" and is thus subjective. Consequently, we leave it to the reader to decide whether, taken together, these activities constitute agenda-driven science. Following our description of each of the questionable activities exhibited by LBH, we discuss how these six activities can be identified and rebutted in conservation science.

Mixing science and litigation without declaring potential conflicts of interest

Hanson (of LBH) is both a lawyer and a scientist who cites the peer-reviewed publications of LBH in litigation activities opposed to fuels reduction treatments and salvage logging on national forests (eg Earth Island Institute vs US Forest Service 2006). His legal arguments depend on (i) severe wildfire mostly being benign to spotted owls, regardless of scale and extent; and (ii) forest restoration activities posing the primary threat to this species, as he and his colleagues have suggested is the case in many publications (eg Bond 2016; Hanson *et al.* 2018; Lee 2018). Moreover, Bond and Lee are frequently involved in Hanson's cases as expert witnesses who produce declarations arguing that severe wildfire does not substantially impact spotted owls. And, in some cases, court cases have been decided in favor of the plaintiffs and prevented planned forest management, with judgments citing LBH's studies finding that severe fire is mostly benign to spotted owl habitat (Earth Island Institute vs US Forest Service 2006). Nevertheless, these litigation activities – and potential conflicts of interest – are not disclosed in their scientific papers

(eg Lee and Bond 2015b; Hanson *et al.* 2018).

While scientists will inevitably be party to ligation for legitimate reasons, science conducted "to prove a point" in support of litigation is antithetical to the scientific process. We agree with others that agenda-driven science is particularly likely to emerge when science is produced to support litigation (Haack 2008). Indeed, the objectives of attorneys (to advocate on behalf of clients) and scientists (to seek truth) are fundamentally different and individuals engaged in both science and litigation are confronted with a substantial conflict of interest (Murphy and Noon 1991; Noon and Murphy 1994). However, if an individual or a group is centrally involved in both the production of science and litigation (as is the case with LBH), it is difficult to know whether the two processes (science and litigation) are independent, or whether the science is produced in order to provide support to an argument (ie an agenda) in the courtroom. For this reason, we suggest that scientific journals make these potential conflicts of interest more transparent by requiring that authors disclose any litigation activities they have been involved in related to the study they seek to publish, which would facilitate greater scrutiny for signs of agenda-driven science.

Inappropriate scientific rebuttal through social and quasi-scientific media

LBH have engaged in an information campaign via social media and quasi-scientific media outside of the peer-review process to discredit a study published in *Frontiers in Ecology and the Environment* (hereafter, "*Frontiers*") that documented effects of a large, severe fire on spotted owls (Jones *et al.* 2016) (note: several authors of the present letter [Jones, Peery, and Gutiérrez; JPG] were co-authors on Jones *et al.* 2016). Specifically, members of LBH posted a scientific review titled "Jones *et al.* 'Megafire' paper is bad science" as a blog on their website (Wild Nature Institute 2016), with one member posting a similar criticism on social media demanding that Jones and coworkers retract their study (eg Lee 2016). Soon thereafter, the editor of *Frontiers* informed JPG that a Write Back letter, critical of Jones *et al.* (2016), had been submitted to *Frontiers* and that, if the response was accepted, we would be given an opportunity to respond. As this letter has not appeared and we did not receive a request to respond, we can only assume it was rejected for lack of scientific merit. However, shortly after we were informed of the critical response submitted to *Frontiers*, Bond and Lee posted criticisms similar to those made on the Wild Nature Institute blog to the website PubPeer (Bond and Lee 2016). In addition, members of LBH collaborated with a science writer to produce a misleading article in the quasi-scientific online publication *BOOM California*, which mistakenly claimed that the effects of severe fire on owls in Jones *et al.* (2016) were spurious (Khosla 2017). For example, the author inaccurately claimed, among other things, that Jones *et al.* (2016) misclassified the occupancy status of several spotted owl territories without contacting Jones and coworkers to verify this statement or to obtain their perspective. The author also misrepresented the fact that Bond and Lee's rebuttal (Bond and Lee 2016) was presumably rejected from *Frontiers* by only stating Lee had "alerted" the editors of *Frontiers* to the errors in Jones *et al.* (2016).

The proliferation of social media and other online forums has greatly increased opportunities for scientists to engage in professional networking and share science with their peers. While we applaud and welcome these opportunities, we do not believe the adjudication of scientific debates on social and related media is appropriate. Posting scientific reviews of peer-reviewed papers on social media or blogs, for example, does not allow for customary rebuttals or the oversight of peer review. Nor is it appropriate for a scientist to call for retraction of a peer-reviewed paper on social media without having his/her own arguments for such a retraction peer reviewed. Scientists confronted with agenda-driven science via critical reviews on social media and antagonistic online information campaigns face a quandary. Should they respond and defend their work using similar forums? While we recognize that opinions will vary, we believe that scientific debates are unlikely to be resolved in unmoderated forums. Rather, we suggest the best approach is for scientists who find fault with a published paper to respond in peer-reviewed journal forums where they can present a body of well-supported scientific criticism and to which the criticized authors can also provide their formal responses – all within the context of peer review. The promotion of agenda-driven science via the popular press, however, poses a different dilemma, as the target audience is the general public. Given the importance of public opinion in developing effective conservation policy, responding to agenda-driven science via the popular press may be important. Thus, we suggest that scientists take criticisms leveled in the popular press on a case-by-case basis; when there is a considerable risk that the public is being misinformed, setting the record straight is both justified and essential.

Harassment of scientists publishing competing studies

Members of LBH and their funders apply pressure to scientists – including graduate students – that have found negative effects of severe wildfire on spotted owls to retract or not publish their scientific papers (eg GM Jones, pers comm; SA Eyes, pers comm). In their correspondence pressuring scientists to do so, members of LBH employ a "strategy of guilt", arguing that results from these studies are being used by natural resource agencies to promote management actions deleterious to conservation of spotted owls, the implication being that the scientist (or graduate student) is contributing to further jeopardy to the owl.

While critique is an essential part of the scientific process and every scientist has the right to question other scientists about their methods or conclusions in a constructive manner, using guilt about how scientific results will be applied to

conservation is not an appropriate way to resolve conflicts. As scientists, we are obliged to seek the truth and we should not avoid pursuing research simply because someone might misuse it. Moreover, the strategy of guilt is particularly inappropriate when more senior scientists pressure junior scientists, particularly graduate students, into conforming to their own perspective. Graduate students are at a vulnerable career stage, and they are learning to navigate the complex intersections among science, management, and policy. Mentors, institutions, and the broader scientific community should support and defend graduate students and junior scientists whose work is targeted by advocacy groups.

Inappropriate use of other scientists' data

Many, if not most, of the spotted owl–wildfire publications LBH have produced used data they did not collect themselves. Moreover, LBH regularly use the Freedom of Information Act (FOIA) as a mechanism to obtain or try to obtain other researchers' data without seeking collaboration or offering co-authorship (A Franklin, pers comm; D Lesmeister, pers comm; J Keane, pers comm). While open-access data and data sharing are becoming increasingly important in scientific research, we believe that a lack of understanding of the data collected by other scientists has likely led LBH to make analytical errors and draw erroneous inferences about effects of wildfire on spotted owls. For example, the data Lee and Bond (2015b) used to infer high rates of territory occupancy one year after the 2013 Rim Fire had not yet been vetted and contained several hundred errors at the time the data were obtained from US Forest Service biologists (without the consent of the principal investigator; J Keane, pers comm). Further, LBH made no attempt to contact the principal investigator or the biologists who collected the data to detect, understand, or correct data errors (J Keane, pers comm). Hanson *et al.* (2018) also lacked complete information on spotted owl territory occupancy histories when they re-analyzed data collected and published by Jones *et al.* (2016). For example, Hanson *et al.* treated one territory ("PLA0065"; a unique code corresponding with USFS-delineated spotted owl management units) as unoccupied both before (2014) and after the King Fire (2015). However, this territory was field-verified shortly before the fire to be occupied by a banded pair of owls that fledged three young in 2014 and went extinct after experiencing high severity fire across 95% of its area (the burned remains of the banded male were found near the nest site in the spring following the fire). Further, Hanson *et al.* treated a different territory (PLA0039) as occupied before and after the fire, while in fact this territory became unoccupied after the fire. We surmise this error occurred because LBH misattributed an apparent detection of owls in PLA0039 in 2015 to an adjacent (but spatially overlapping) territory (PLA0080) that was the primary nest/roost area being used by spotted owls in that year. Therefore, PLA0039 should have been classified as unoccupied post-fire (Berigan *et al.* 2018). Together, these errors contributed to Hanson *et al.* (2018) concluding that the 2014 King Fire did not negatively impact spotted owls.

The trend toward open-access data in science has both increased transparency and catalyzed scientific advances. However, messy data are inherent in ecological research and faulty inferences can easily result when data are re-analyzed with little understanding of the data collection process. Thus, we consider the repeated use of other's data without their involvement and without a thorough understanding of those data to be inappropriate in conservation research. Indeed, the "ambiguities" of raw ecological data underscore the importance of pursuing collaborative science as part of resolving conservation conflicts. Politically charged science can also be resolved through independent review mechanisms, such as meta-analysis workshops that include outside scientists (Anderson *et al.* 1999).

Selective use of data

Hanson *et al.* (2018) re-analyzed some data from Jones *et al.* (2016), wherein Jones *et al.* reported that extensive severe wildfire can reduce spotted owl territory occupancy. However, Hanson *et al.* excluded the four most severely burned territories from their analysis (91–99% of the area within these territories burned at a high severity: PLA0050, PLA0067, PLA0013, and PLA0065). They thereby eliminated the territories most likely to demonstrate severe fire effects. Moreover, all four territories were occupied in the breeding season prior to the King Fire but were unoccupied following the fire (ie they went extinct). Hanson *et al.*'s justification for excluding these data was that including sites that burned >80% at high severity would disrupt their factorial design intended to distinguish between the categorical effects of severe fire (20–49% vs 50–80% of territory area affected) and salvage logging (<5% vs ≥5% of territory area), because few of these sites experienced <5% salvage logging. However, if the objective of a study is to examine an effect, whether it be fire and/or salvage logging, why exclude data that had potential to test the effect? Rather than treating severe fire and salvage logging as categorical effects, Hanson *et al.* could simply have treated them as continuous predictors of occupancy. This approach would have circumvented the problem they invoked as justification, and strengthened their ability to detect effects (Cottingham *et al.* 2005).

Recognizing whether data have been intentionally used in a selective manner is challenging, and may simply be the product of unintentional poor scholarship on the part of a scientist. Without direct evidence of intent, such actions, then, must be considered within the context of a scientist's broader pattern of behavior. For example, does he/she have a conflict of interest that might compel him/her to make such decisions to exclude relevant, indeed critical, data? In light of the difficulties in detecting such biases, we suggest that editors and reviewers be alert to selective use of data when reviewing studies that criticize oth-

er papers, especially when "re-analyses" of data occur to support such criticism.

Drawing conclusions beyond scientific findings

Lee (2018) conducted a meta-analysis testing for effects of wildfire on spotted owls across 21 published studies and did not detect a significant overall effect of fire on foraging, demography, or territory occupancy. He concluded that:

"Contrary to current perceptions and recovery efforts for the Spotted Owl, mixed-severity fire does not appear to be a serious threat to owl populations; rather, wildfire has arguably more benefits than costs for Spotted Owls."

Lee's conclusion oversteps his results for three reasons. First, the estimated overall (negative) effect of wildfire on spotted owl territory occupancy was nearly statistically significant at the 0.05 level (P = 0.07). Second, meta-analyses that focus on summary effects when among-study variability is high are likely to lead to conclusions that are wrong, perhaps seriously so (Bailar 1997; Borenstein *et al.* 2009). Thus, even if the negative effect of fire on occupancy had been statistically significant, it would have been difficult or impossible to interpret directly because of high variation in estimated fire effects among studies. Indeed, variability in the estimated effect size of fire on occupancy was extremely high by meta-analytical standards as measured by its I^2 value (Higgins *et al.* 2003) of 97.7% ($P < 0.001$), where generalizations should be avoided when I^2 values exceed 50–75% (Higgins and Thompson 2002; Higgins *et al.* 2003). I^2 values were nearly as extreme for the other variables examined (demography = 84.0%, $P < 0.001$; foraging = 84.4%, $P < 0.001$). Moreover, variability in estimated fire effects among studies was greater at burned than unburned territories. This high level of variability betrays generalization, making Lee's conclusion that fire does not threaten owl populations unsubstantiated. Instead, the high variability among studies should have led to the conclusion that effects of wildfire are likely context specific, perhaps related to spatial patterns of burned areas. Third, the conclusion that wildfire does not pose a threat to spotted owls does not take into account that wildfires in many forest ecosystems are predicted to become larger and more severe as the climate changes (Westerling and Bryant 2008; Stephens *et al.* 2013; Liu *et al.* 2013; Millar and Stephenson 2015; Abatzoglou and Williams 2016).

Determining whether conclusions and management recommendations that extend beyond the results of a study were made intentionally is challenging, because interpretation of results can be subjective; even when conclusions are unsupported, intent will often be unknown. However, sweeping conclusions that previous studies are in error, and conclusions that emphasize certainty instead of uncertainty and complexity, are potential signs of agenda-driven science.

Whether deliberate or inadvertent, LBH appear to have engaged in a series of activities, both within and outside of the peer-review process, that have resulted in the under-appreciation of the effects of severe wildfire on spotted owls. This case study underscores the importance of recognizing and understanding how to respond to activities that may be symptomatic of agenda-driven science. In the case of spotted owls, ignoring negative effects of severe wildfire could compromise the ability to conserve this species and restore forest ecosystems that are experiencing increasingly large and severe fires as the climate becomes warmer and drier. Meeting these dual objectives will be complex, but the process is made more complicated and challenging if scientists engage in activities that lead to incorrect scientific narratives rather than collaboratively trying to solve the problem.

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Defendants' Exhibit D

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ARIZONA

WildEarth Guardians, Plaintiff, v. United Fish and Wildlife Service, et. al., Defendants.	)	No. CV-13-00151-RCC

DECLARATION OF RONALD A. MAES

1. I am currently employed by the United States Department of Agriculture, Forest Service, as Regional Threatened, Endangered, and Sensitive Species ("TES") Program Leader for the Southwestern Region ("Region"). I have held this position permanently for 10 months and have detailed into the position for a total of 2 years in the past. I have been involved in the TES program in the Southwestern Region for the past 17.5 years as the assistant TES Program Leader. This has included Endangered Species Act ("ESA") §7(a)(2) consultations for the Region's Land and Resource Management Plans ("LRMPs" or "Forest Plans") in 2004-2005 and 2011-2012. I have also served as a consultation biologist with the U.S. Fish and Wildlife Service ("FWS") for 3 years providing technical support to action agencies, writing concurrence letters for informal consultations, writing biological opinions for formal consultations, and

participating in the species status assessment process to inform all decisions and actions related to listed, proposed, or candidate species. In this capacity as TES Program Leader, I act as technical expert for the Region on conservation and recovery of species and their habitats, and on the impacts of land management actions on threatened, endangered, and sensitive species and their habitats.

2. I have reviewed the Court's September 12, 2019 order which denied in part and granted in part plaintiff's and defendant's motions for summary judgment and imposed an injunction on timber management actions in Region 3 national forests pending completion of formal Endangered Species Act ("ESA") §7(a)(2) consultation with the FWS. I have also reviewed the Defendant's Motion to Alter the Court's Decision and to Clarify or Modify the Court's Injunction and the plaintiff's Opposition to the Defendant's Rule 59 Motion, including the Declaration from Derek Lee.

3. There are well-defined processes with ESA §7(a)(2) consultations, the listing process outlined in ESA §4(c), the recovery process listed under ESA §4(f), and the proactive conservation and recovery actions (ESA §7(a)(1)) that are discretionary during the ESA §7(a)(2) consultation process, typically included as Conservation Recommendations. Conservation recommendations are the Services' non-binding suggestions resulting from formal or informal consultation that: (1) identify discretionary measures a Federal agency can take to minimize or avoid the adverse effects of a proposed action on listed or proposed species, or designated or proposed critical habitat; (2) identify studies, monitoring, or research to develop new information on listed or proposed species, or designated or proposed critical habitat; and (3) include

suggestions on how an action agency can assist species conservation as part of their action and in furtherance of their authorities under section 7(a)(1) of the Act. [50 CFR §402.02]

4. When the FWS concludes that an agency action may adversely affect a listed species, a Biological Opinion ("BiOp") is issued with an Incidental Take Statement ("ITS") that specifies the impact, i.e., the amount or extent, of such incidental taking on the species. [50 CFR 402.14(i)(1)(i)] The ITS will contain Reasonable and Prudent Measures ("RPMs") with their implementing Terms and Conditions ("T&Cs") to minimize the impacts of the action on listed species. [50 CFR §402.14(i)(1)(ii)] Monitoring required in the ITS is confined to monitoring the impact of the action by reporting on the progress of the action and its impacts to the species. [50 CFR §402.14(i)(3)] Hence, the 2012 BiOps requirement to monitor the progress of projects implemented consistent with the direction of the LRMPs is appropriate, i.e., implementation monitoring and reporting.

5. Section 7(a) (1) of the ESA says that "Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act." Section 7(a)(1) does not have regulations promulgated to direct implementation of this subsection of the ESA. So, this absence allows for discretion for how federal agencies may implement a program that aids in the conservation and recovery of species listed as threatened or endangered under the ESA. There is no legal means by which the FWS may require a "coerced" implementation of recovery actions through the non-discretionary RPMs and their implementing T&Cs that result from the ESA §7(a) (2) formal consultation

process. Contrary to the Plaintiff's beliefs, only the allowable incidental take, RPMs, and the T&Cs of a ESA §7(a)(2) non-jeopardy BiOp are binding and enforceable.

6. The LRMPs primarily result in beneficial effects to the MSO. When the MSO was listed in 1993 (see Federal Register 58:14248-14271), the greatest identified threat to the species was the destruction and modification of habitat from timber harvest and fire. The timber harvest method used in the Region prior to 1996 was shelterwood management which resulted in even-aged stands. The MSO was found to occupy areas with high canopy closure, high stand density, and a multilayered canopy resulting from an *uneven-aged stand* (emphasis added). Other characteristics include downed logs, snags, broken top live trees that are indicative of an old grove and absence of active management, specifically the absence of active shelterwood management. In 1996, the USFS amended the LRMPs ("1996 Amendment") to incorporate the management recommendations (Standards & Guidelines) in the 1995 MSO Recovery Plan (USFS 466-70). The recommendations or Standards and Guidelines (S&Gs) described MSO habitats and established methodology for identifying occupied, reproductive, and potential nesting and foraging habitat, establishing breeding territories (protected activity centers), protecting habitat, developing potential habitat, and shifting away from shelterwood management. The S&Gs included surveying for owls and inventories of suitable habitat prior to project implementation. They included limits on treatments within Protected Activity Centers ("PACs"), suitable, and potential habitat. The 1996 Amendment identified three levels of habitat management for the MSO: protected, restricted, and other forests and woodland types. Protected areas include delineated PACs and mixed conifer and pine-oak forests with slopes greater than 40% where timber harvest has not occurred in the last 20 years. Restricted areas

include all mixed-conifer, pine-oak, and riparian forests outside of protected areas. The 1996 Amendment also identified other forest and woodland types that include all ponderosa pine, spruce-fir, woodland, and aspen forests outside protected and restricted areas. The S&Gs for protected areas are very restrictive but do allow some treatments to abate fire risk in PACs and to reduce the threat of stand-replacing wildfire. The 1996 Amendment also recommends management activities in restricted habitat to ensure a sustained level of owl nest/roost habitat well distributed across the landscape and to create replacement owl nest/roost habitat where appropriate while providing a diversity of stand conditions across the landscape to ensure habitat for a diversity of prey species. The S&Gs include one general guideline for other forests and woodland types: Apply ecosystem approaches to manage for landscape diversity mimicking natural disturbance patterns, incorporating natural variation in stand conditions and retaining special features such as snags and large trees, utilizing appropriate fires, and retention of existing old growth in accordance with forest plan old growth standards and guidelines. The S&Gs also describe "monitoring changes in owl populations and habitat for ***delisting*** (emphasis added)" as a collaborative effort with all other responsible, resource management agencies. Simply put the USFS incorporated all the management recommendations in the 1995 MSO Recovery Plan to protect the species from further declines resulting from timber management and stand-replacing wildfire as well as recommendations for conserving and recovering the species and its habitat. Therefore, if one concludes that the LRMPs that incorporate the protective and proactive management recommendations as S&Gs are flawed and shouldn't result in beneficial effects to the MSO, then one must also conclude that the management recommendations in the 1995 Recovery Plan are flawed.

7. There are different types/levels of monitoring discussed within the 1995 recovery plan, and the relevancy (if any) of the different types/levels of monitoring to the adaptive management discussed in the 1995 recovery plan. Figure III.B.1, *see* FWS R 105, is a picture of a stool with three legs – i.e., management recommendations, habitat monitoring, and population monitoring – representing the three broad components of the plan. USFS 134. Each of these broad components are required for delisting and each component has its own monitoring. USFS 135-40, 156-66. As explained below, only the "management recommendations" component and its accompanying monitoring has any real relevancy to adaptive management:

- **Local-Scale Management Recommendations**: this component meets the first and second requirements of Section 4(f)(1)(B) of the ESA in providing "a description of such site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the species" and "objective, measurable criteria which, when met, would result in a determination . . . that the species be removed from the list." FWS R 21. The 1995 recovery plan accomplishes this by recommending that USFS (1) deemphasize even-aged timber management (i.e., implementing the habitat management guidelines for protected, restricted, and other forest and woodland habitats) and (2) implement site-specific projects designed to abate or minimize the threat of high-severity, landscape-altering wildfire. Three types of protective monitoring are required within the "management recommendations" component:
    - **Local-Scale Incidental Take Monitoring**: requires USFS to monitor incidental harm/harassment (take) of the owl when implementing site-

specific projects. This type of monitoring is essential for the owl's protection and conservation. USFS conducts this monitoring.

- **Local-Scale Pre- and Post-project Monitoring**: requires USFS to monitor site-specific areas to locate owls, determine nest/roost areas, and determine if a particular project had its desired effect. This type of monitoring is essential for the owl's protection and conservation. USFS conducts this type of monitoring. The data gleaned from this type of monitoring can be and is used to for adaptive management. If, after this type of monitoring, it is determined that a particular treatment did not achieve its goal or is found to have some adverse effect on the owl, USFS, in consultation with FWS, can and does change its approach to abate or minimize its owl impacts.
- **Local-Scale Cause-and-Effect Monitoring**: this 1995 recovery plan recommendation is designed to assess the effects of thinning and burning within owl protected activity centers (PACs) specifically. FWS R 108-10. This type of monitoring is useful in determining whether thinning and burning within owl PACs achieve beneficial outcomes for the species. The data gleaned from this type of monitoring can be used for adaptive management

- **Broad-Scale Population Trend Monitoring**: unlike the "management recommendations" component, this component of the 1995 recovery plan meets only the second requirement of Section 4(f)(1)(B) of the ESA in providing

"objective, measurable criteria which, when met, would result in a determination . . . that the species be removed from the list." FWS R 21. The recovery plan calls for monitoring to assess owl population trends across the range. FWS R 99-103. The data generated from this type of monitoring is broad-scale and does not provide information regarding site-specific owl numbers, but allows FWS to determine the trend of the population in order to assess delisting. Range-wide population trends may be driven by numerous factors unrelated to USFS forest management activities like drought, climate change, uncharacteristically severe landscape-scale wildfires, etc. USFS 009539 SUP1. These factors may, in fact, have far greater impact on owl numbers and trends than USFS management practices. With the numerous significant factors affecting range-wide trend, it is nearly impossible to use this type of data to then pin-point a localized site-specific project or USFS management practices in general that are having either a positive or negative effect on the owl. In other words, population trend data does not provide the necessary cause-and-effect information that allows for adaptive management. Rather, this type of monitoring and data allows FWS to determine the trend of the population and habitat in order to assess delisting, not adaptive management. USFS 128; USFS 158; USFS 9540-42 SUP; USFS 9648-56 SUP. As explained in ECF No. 104-1, USFS is conducting broad-scale population trend monitoring.

- **Broad-Scale Habitat Trend Monitoring**: same basic configuration and purpose as population trend monitoring. FWS R 99-103. For the same reasons, the data

generated from this type of monitoring cannot be used for local, site-specific adaptive management.

In summary, while only the "management recommendations" component provides any data for adaptive management at the local, site-specific scale, all three components are essential for any future delisting analysis or adaptive management modifications to the Recovery Plan itself if the monitoring information indicates that populations and habitat range-wide are decreasing despite the implementation of the management recommendations, i.e., broad-scale adaptive management of the recovery process.

8. With respect to the monitoring the effects of treatments, up to the late 2000s, the USFS took a hands off approach to management in MSO PACs. Treatments of this type were typically confined to those in wildland-urban interface areas (See Attached 2009 Perk-Grindstone Report). With the revision of the MSO Recovery Plan and the need to address the increasing threat associated with stand-replacing wildfire, the USFS has increased implementation of projects within MSO habitat. The projects contain monitoring plans to assess impacts to MSO, for example, the Flagstaff Watershed Protection Project, the Four Forest Restoration Project, and others that are currently in the analysis or consultation process with the FWS. They include the Luna Restoration Project, the Rio Puerco Restoration Project, and the South Sacramento Restoration Project, for example. The monitoring plans identify treatment PACs and paired untreated PACs to compare and determine what impacts may result to individuals from the treatments (See Appendix B in the attached Biological Opinion for the Flagstaff Watershed Protection Project).

9. A demographic study on the Lincoln National Forest began to collect vital information on a population of MSO. This study was the basis for and provided the empirical data to revise the management recommendations in the 2012 Recovery Plan for the MSO, First Revision. The following excerpt is from an article resulting from the demographic study and published in The Journal of Wildlife Management titled Demography of Mexican Spotted Owls in the Sacramento Mountains, New Mexico (Ganey et al. 2014)[1]:

> Reproductive output was highly variable for 2004–2011, whereas annual apparent survival and recapture rates were less variable among years. Annual rates of population change exceeded 1.0 for both sexes from 2005 to2009, and empirical observations of numbers of territorial owls supported the model-based trend estimate. Abundance of territorial owls was strongly related to reproduction within the study area, suggesting that population change was driven largely by internal processes. Population viability analyses suggested that population growth was likely to continue in the short term if current conditions persist. The positive growth rates observed in our study populations are encouraging, and may indicate that current recommendations for recovering this owl are succeeding.

10. The USFS had the opportunity to acquire additional information on treatment impacts to the MSO in the Sacramento Mountains, but could not continue due to limited resources in 2011. The USFS did, however, collect over 10 years of pre- and post-treatment, microhabitat data in MSO habitat on several forests to assess changes/impacts to habitat components (referred to in some documents as microhabitat monitoring) typically outside of MSO PACs. The collection of this data was suspended in the late 2000s due to an inability by the FWS and RMRS to analyze the data collected. However, this information is considered

[1] Ganey, J.L., G.C. White, J.P. White, S.C. Kyle, D.L. Apprill, T.A. Rawlinson, and R.S. Jonnes. 2014. Demography of Mexican spotted owls in the Sacramento Mountains, New Mexico. Journal of Wildlife Management 78(1):42-49. Although this study was published after the conclusion of the 2012 BiOps, the data was collected from 2003-2011 and was available to the USFS and the MSO Recovery Team. See also attached letter requesting continued support.

implementation monitoring and is not at the core of the Court's order or the Plaintiff's case against the FWS and the USFW. The primary concern is the population trend monitoring described in the 1995 MSO Recovery Plan. See also ECF Document 110-2.

11. The Plaintiff states that the only actions that remain enjoined by this Court's Order are actions in MSO habitat. This is factually incorrect. We still have hazard vegetation, routine maintenance, commercial fuel wood, and projects with portions that contain some recovery habitat remain enjoined. WEG only stipulated to allow those activities listed in attachment 1 and 3. There are activities outside MSO habitat that were not listed in 1 and 3. There are also projects partially outside MSO habitat (attachment 2) that WEG has not agreed to exclude. We are asking the Court to exclude ALL activities outside MSO habitat whether they are listed on an attachment or not.

12. The Plaintiff again appears to be confusing and conflating the need for population trend monitoring data needed for the delisting process with studies, research, or implementation monitoring on the site-specific treatment effects to MSO. [ECF Document 110, Page 18, Line 6-22] They seem particularly concerned with mechanical treatments. The areas that have been subjected to mechanical treatment are relatively small and the impacts may be masked by other factors that impact MSO populations. The plaintiff does concede that other actions in MSO habitat are not a concern. {ECF Document 110, Page 17, Line 17] They do not, however, disclose which treatments they believe are not a concern or are beneficial to the MSO. Prescribed fire is one treatment that may not be a concern or may be viewed by the Plaintiff as beneficial. But, there has been a lack of interest in a blanket allowance for this activity to be

stipulated within or outside of MSO habitat without painstaking validation for each individual project. Other activities in areas with very limited impacts to MSO have also not been stipulated for exclusion. They include vegetation management to protect infrastructure, utilities, recreation sites, and provide commercial fuelwood for small businesses.

13. Pursuant to 28 U.S.C. §1746, I certify under penalty of perjury that the foregoing is true and correct.

Executed this 5th day of November 2019.

Ronald A. Maes
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USDA Forest Service
Southwestern Region
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MEXICAN SPOTTED OWL

Strix occidentalis lucida

Perk-Grindstone Hazardous Fuels Reduction Project Update

2009

LINCOLN NATIONAL FOREST
SMOKEY BEAR RANGER DISTRICT

Treatments within PACs in Fiscal Year 2009:

Contract acreage within MSO PACs awarded in 2009 totaled 404.22 acres. Each contract was awarded and designed to thin trees up to 9 inches in diameter utilizing mastication equipment. By the end of 2009, approximately 50 acres of the targeted acreage had not been masticated. This remaining acreage should be thinned in 2010, prior to March 1st restrictions. The treatment within the Brady PAC (Treatment contract #1), however, is completed. The remaining acreage is within the Flume and Perk PACs. **Table 1** describes the target acreage within each PAC and the actual acres treated as of 02/01/2010.

Table 1. Treated Acreage and Type of Treatment: Perk-Grindstone MSO PACs

PAC Name	Total Acreage in PAC	No treat/nest core acreage	Treated Acres Target FY-09	Actual Acres Treated to 1/25/10	Treatment Type
Brady	692	101	91.14	91.14	Mastication
Flume	623	138	170.37	150.37	Mastication
Perk	607	105	233.85	203.85	Mastication

Descriptions of Monitoring Sites and Narrative of Surveys, Perk/Grindstone WUI

Brady P.A.C. (T11S. R13E. SEC 7, 8, 17, 18). This area is located behind Brady Canyon road. The area is accessible by gaining permission and parking at Dr. Brown's house and walking back into the canyon. The area is also accessible from Trail 92 (Perk Ridge trail). The area is surrounded by residential areas, which make the canyon very noisy. The habitat within the canyon consists of smaller mixed conifer trees with larger trees in upper reaches of the canyon. This area required formal monitoring. An adult Mexican spotted owl of unknown sex was seen during one survey and never seen or heard from again. Many other species of owls were heard in the canyon. Great Horned Owl (*Bubo virginianus*) and Flammulated Owl (*Otus flammeolus*) were positively identified during surveys.

Flume P.A.C. (T11S. R13E. SEC 29, 30, 31) This survey area is located in Upper Canyon directly off of Flume Road. The proximity of this area to residential areas made surveys difficult due to barking dogs. The canyon consists mostly of mixed conifers with oak, maples, and box elder in the drainage. This area required formal monitoring. A nesting pair of Mexican spotted owls was found along with three fledglings, confirming reproduction. A potential nest tree was found near the area where the fledglings were found but was never confirmed.

Perk P.A.C.: (T11S. R13E. SEC 17, 18, 19, 20) This area is located north of the Upper Canyon area of Ruidoso and is accessible from Perk Canyon Road. The area is surrounded by private residences, making the canyon very noisy. The habitat within the canyon consists of smaller mixed conifer trees with few larger trees, as well as some areas of oak. This area required formal monitoring. A pair of Mexican spotted owls was found, but no nest was ever located. Owls seemed disinterested in mice and even dropped one after capturing it during "mousing" attempts. Reproduction status remains unknown.

Table 2. Survey Schedule, 2009 season

PAC	Survey Date	Survey Date	Survey Date	Survey Date	Survey Date	Survey Date	Total Observations
Brady	5/5/09 AM	5/19/09	5/27/09	6/11/09 VU	6/29/09	7/09/09	5
Flume	4/27/09 *VM 4/28	5/12/09	5/26/09 *VM/AF 5/27	6/29/09 *VF/VM 7/1			7
Perk	4/27/09 *VF 4/28	5/12/09	5/26/09 *VM/VF 5/27	6/16/09 *AM 6/17	6/29/09 *VM/VF 7/01	7/08/09	5

*Daytime follow-up (A-V: A= Audio, V= Visual; Sex: F= Female, M= Male, U= Unknown)

Table 3. Results of MSO Surveys and Reproduction

Survey Site	Occupancy	Reproduction	Number of Young
Brady	S	U	
Flume	O	C	3
Perk	O	U	

*Nonreproduction was confirmed by four mice being eaten by individuals for these areas.

Definitions and explanations for Reproductive and Historical Data Table 3.

O = These sites had a pair of birds confirmed in the core area.

S = Single owl inferred or confirmed.

U = These sites were monitored but were not visited four times or

did not have an adult bird eat four mice. Reproduction was unknown.

C = These sites had reproduction confirmed.

Methods

A team of certified Forest Service biological technicians conducted spotted owl surveys in prioritized areas where proposed action is being planned. The team uses a protocol derived from the Forest Service Manual 2676.2 Interim Directive No. 2 Exhibit I to survey for the Mexican spotted owl. That protocol was improved in 1998 by the U.S. Fish and Wildlife Service and various owl experts and is the current protocol used to survey owls. This protocol for informal monitoring calls for each area to be surveyed four times. Formal monitoring areas are surveyed 6 times. Formal monitoring was performed on owl PACs within the Perk-Grindstone WUIs. Owls have a confirmed presence when they are seen or heard in a survey area and are then fed mice in the hope that they will carry the mice back to their nest. Following the owls enables surveyors to find the nest and observe the young to confirm reproduction for that year. The adult owls are fed additional mice to determine the number of young. Owls observed eating four mice in a row without carrying them anywhere are determined to have no reproduction or nest for the year. Each designated area was surveyed a minimum of four times unless a nest was found or until

they were observed eating four mice. The various calling techniques used to induce a response from the owls to determine a presence were left to the discretion of the technician conducting the survey. Most calling techniques consist of a four-note hoot, a bark, a whistle, and/or numerous hoots known as an agitated call. Surveys generally followed the calling station method, which consists of call points spaced at approximately 0.25 miles apart where at least 15 minutes of calling would take place. (2003 Protocol, 1A) As protocol dictates, no survey area was surveyed within five days of the previous survey.

Areas identified as inventory areas were surveyed at night to try and determine presence of the owls. Night surveys usually started with crewmembers being on site at approximately 2000 hours. The field technicians would call along a calling route set up previously. If Mexican spotted owl presence was detected a morning follow up visit was then conducted in which "mousing" was used in order to establish nesting site and reproductive status.

Early morning surveys and monitoring surveys usually started with crewmembers being on site at approximately 0515 hours. As written in the 2003 protocol "the optimal dawn period is 0.5 hours before sunrise to 2 hours after sunrise and the optimal dusk period is 2 hours prior to sunset." These surveys were conducted in areas where previous owl presence was determined. The biological technicians would call a route determined by historical or habitat type data. Upon hearing a response the technicians were then required to search in that direction. When a visual of the owl or owls was established the crew would then place a mouse out to try and persuade the owl to take it and lead the crew to a nest site. During early morning surveys with no response from Mexican spotted owls, a search of the surrounding area was conducted as soon as daylight allowed. Such searches were conducted by moving slowly through an area of suitable habitat and examining all trees for roosting owls, owl pellets, or for white wash, thereby indicating past or present occupancy. These searches were to last a minimum of 4 person-hours.

Surveys were carried out in teams of two or three. All responses by other raptors and owls were recorded by surveyors as well as approximate temperature, wind speed, cloud cover and precipitation. If a great horned owl, *Bubo virginianus*, was heard calling during surveys, crew members were instructed to stop calling for at least one half hour or to move at least one quarter of a mile away from the great horned owl and only resume calling if the owl could no longer be heard. Most surveys were conducted at night to determine presence of owls where a follow up could be conducted if an owl was found. Table 1 shows the dates, times of day, and areas surveyed.

Table 3: Survey schedule, 2009 season

Aspen	5/6/09 AM 5/8	6/8/09 AM 6/9	7/1/09 AM 7/2	7/8/09 AM 7/10	
Big Bear	5/6/09	6/1/09 AM 6/2	6/16/09		
Bluefront	4/29/09 AM 4/30	5/20/09	6/9/09		
Brady	5/5/09	5/19/09	5/27/09	6/11/09	6/29/09 AM 6/30
Carlton	4/23/09	6/11/09			
Dark Betsy	4/24/09	5/27/09	6/10/09		
Dry	5/27/09	6/10/09			
Eagle Creek	6/1/09 AM 6/2	6/16/09	7/7/09 AM 7/9		
Flume	4/27/09 AM 4/28	5/12/09	5/26/09 AM 5/27	6/29/09 AM 7/1	
George Washington	4/28/09	5/13/09 AM 5/15	6/2/09	6/30/09	
Iron	4/24/09	5/13/09	6/2/09	6/9/09 AM 6/10	7/6/09
Littleton	4/24/09	5/18/09 AM 5/19	6/15/09 AM 6/16		
Little Bear	7/6/09				
Little Bonito	5/4/09 AM 5/6	5/20/09	6/15/09	6/30/09 AM 7/1	
Krause	5/11/09 AM 5/12	6/16/09	7/1/09	7/8/09	
Perk	4/27/09 AM 4/28	5/12/09	5/26/09 AM 5/27		
Schoolhouse	5/11/09 AM 5/12	6/8/09 AM 6/9	7/7/09 AM 7/9		
Upper G. Washington	4/28/09	5/20/09	6/11/09	6/30/09	
Walt Smith	4/29/09 AM 4/30	5/18/09	6/10/09	7/1/09 AM 7/2	7/8/09 AM 7/10

Results

A total of ninety six Mexican spotted owl surveys, including night and morning surveys, were conducted over the field season in nineteen separate survey areas, beginning April 24, 2009 and ending July 10, 2009. Targeted areas were surveyed at least four times, unless reproductive pairs were established in fewer visits. The areas that had reproductive success confirmed in less than four visits were: Dark Betsy P.A.C., Littleton P.A.C., Dry P.A.C., Big Bear P.A.C., Blue Front P.A.C., and Carlton P.A.C.. Little Bear P.A.C. was surveyed only one time and is therefore an incomplete survey, since no owl presence was found. Results of surveys, including numbers, reproduction status, and number of young observed is reported in Table 2. Other owls recorded during surveys are reported in Table 3. Table 4 shows historic reproduction data for the district and Table 5 is an overview of Mexican spotted owls found on the Smokey Bear Ranger district since 1989.

Definitions and explanations for Reproductive and Historical Data Tables 2, 3, 4, and 5

X = These sites were not known or monitored in the year indicated.

A = No birds were found at these sites.

O = These sites had a pair of birds confirmed in the core area.

P = Owl(s) present, but not confirmed.

S = Single owl inferred or confirmed.

U = These sites were monitored but were not visited four times or

did not have an adult bird eat four mice. Reproduction was unknown.

C = These sites had reproduction confirmed.

N = These sites were monitored with four visits or an adult took

four mice without going to nest, young, or another adult.

No reproduction was confirmed.

= This was the number of young counted during that year.

Table 4. Results of MSO Surveys and Reproduction

Survey Site	Occupancy	Reproduction	Number of Young
Aspen P.A.C.	O	U	
Eagle Creek P.A.C.	S	U	
Big Bear P.A.C	O	C	2
Bluefront P.A.C.	O	C	2
Brady P.A.C.	S	U	
Carlton P.A.C.	O	C	2
Dark Betsy P.A.C.	O	C	2
Dry P.A.C	O	C	3
Flume P.A.C.	O	C	3
George Washington P.A.C.	S	U	
Iron P.A.C.	O	U	
Krause P.A.C	A	U	
Little Bonito P.A.C.	O	C	1
Littleton P.A.C.	O	C	2
Little Bear P.A.C.	A	U	
Perk P.A.C.	O	U	
Schoolhouse P.A.C.	O	U	
Upper George Washington	A	U	
Walt Smith P.A.C.	O	U	

*Nonreproduction was confirmed by four mice being eaten by individuals for these areas.

Table 5: Other owls found at survey sites

Survey Site Name	BUVI	OTFL	GLGN	AEAC	OTKE	ASOT
Aspen P.A.C						
Eagle Creek P.A.C.						
Big Bear P.A.C.						
Bluefront P.A.C.						
Brady P.A.C.	X	X				
Carlton P.A.C.						
Dark Betsy P.A.C.						
Dry P.A.C.						
Flume P.A.C.						
George Washington P.A.C.		X				
Iron P.A.C.	X	X				
Krause P.A.C.		X				
Little Bonito P.A.C.			X			
Littleton P.A.C.						
Little Bear P.A.C.						
Perk P.A.C.						
Schoolhouse P.A.C.						
Upper George Washington		X				
Walt Smith P.A.C.		X				

Historical Data

Table 6: Reproduction records

Mexican Spotted Owl Reproduction within the Smokey Bear Ranger District					
Year	**Total Pairs**	**Reproducing Pairs**	**# Young Produced**	**Average Young Per Pair**	**# of Triplets**
1990	7	1	1	0.1	0
1991	3	1	1	0.3	0
1992	6	2	3	0.5	0
1993	8	1	2	0.2	0
1994	6	1	2	0.3	0
1995	0	0	0	0	0
1996	1	0	0	0	0
1997	4	3	4	1.0	0
1998	3	1	3	1.0	1
1999	2	2	3	1.5	0
2000	1	0	0	0	0
2001	1	0	0	0	0
2002	2	1	2	1.0	0
2003	3	2	4	1.3	0
2004	3	2	2	0.7	0
2005	3	1	2	0.7	0
2006	6	3	5	1.2	0
2007	7	3	5	0.71	0
2008	8	3	6	2	0
2009	13	8	17	2.125	2

Table 7. Historical Sightings for Smokey Bear Ranger District (information does not reflect areas not surveyed in a given year)

Survey Areas	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Argentina	O	S															O			
Aspen			O	O														O	O	O
Big Bear																		O	O	O
Bluefront	O	S	S	O	O			O	O				O					O	O	O
Brady							S					O	S*					S	O	S
Carlton	O	O	O	O	O		O	O	O	O		S	O	O	O	O	O	O	O	O
Carrizo						S	S	S	S	S			S*							
Dark Betsy					O			O	S								O	O	O	O
Dry								O												O
Eagle Creek	O	O	O	O	O									O	O				S	S
Flume																O	O	O	O	O
George Wash.			O	O	O												S			S
Gavilan		O	S	O*																
Iron	O		S	S	S				O	S										O
Krause	O	S	S	O	O			S		S		S								A
Kraut **											S									
Littleton	O		S	S							O	S							P	O
Little Bear		S	S	S	O															A
Little Bonito			O	O													O	O	S	O
Perk										S						S	O	S	O	O
Pine Springs																				
Schoolhouse				S							S			O	S					O

Walt Smith			O	S	S					O		S					O	S	S	O
Water **									S											

* These findings were not reported in annual reports prior to 2006, but have been obtained from reviewing older field data and reports.

** Areas that are not an established P.A.C.

Discussion

There were nineteen prioritized survey areas this season. Surveyors detected thirteen pairs of Mexican spotted owls, seventeen fledglings, and three single owls in the areas visited. Pairs were observed in Aspen P.A.C., Big Bear P.A.C., Bluefront P.A.C., Carlton P.A.C., Dark Betsy P.A.C., Dry P.A.C., Flume P.A.C., Iron P.A.C., Little Bonito P.A.C., Littleton P.A.C., Perk P.A.C., Schoolhouse P.A.C., and Walt Smith P.A.C. Nesting owl pairs in Dry P.A.C. and Flume P.A.C. were found to have three fledglings each. Nesting pairs with two fledglings were: Big Bear P.A.C., Bluefront P.A.C., Carlton P.A.C., Dark Betsy P.A.C. and Littleton P.A.C. The nesting pair in Little Bonito P.A.C. only produced one fledgling. Overall, there were more owl

pairs located, more fledglings found, and the highest young to nesting pair ratio to date. The number of sites surveyed this year was greater than any year to date, which could have something to do with more pairs and fledglings being found. Occupancy was confirmed in all the same P.A.C.s as 2008 with the exception of Brady P.A.C., where only a single owl was confirmed in 2009. This reinforces the fact that owls are continually nesting in similar locations year after year even if they are not reproducing that year. The population of Mexican spotted owls on the Smokey Bear District seems to not only be stable, but possibly expanding. Historical data is limited so conclusions as to why the owls' numbers are so great this year are difficult to say. The numbers over the past three years have stayed relatively stable. Hopefully, this data reveals the beginning of an upward trend of reproductive success leading to owl population expansion.

Perk-Grindstone WUI:

It is still too early to determine if any of the treatments within the Perk-Grindstone WUI has had an effect on owl reproduction. All three PACs had owl presences, however only the Flume PAC had reproductive success. The historical information for all three PACs is minimal. Better information on nest core areas are needed in both the Brady and Perk PACs before any conclusions can be made.


Andrew Passarelli

1. Management territory R03F08D01-19 (Brady) T11S. R13E. SEC 7,8,17,18 (last update 11/09)

This MSO site was first located in 1996. Since that time, the site was informally monitored in 1999 and from 2001 to 2007. The area was formally monitored in 2008-2009. See Table 1 for occupancy, reproductive success, and number of young. Data from this site is combined with data from Perk PAC through the 2005 season. In 2006, Perk was designated as a separate PAC, and subsequent data will be specified as such.

No research or special visitation has occurred within this site.

In 2004, a 603-acre management territory was established utilizing GIS technology and ground verification. The territory, which includes a 100-acre no-touch zone, was designated as Brady PAC. There was an estimated 60 acres of forage habitat and 543 acres of roost/nest habitat present using the existing (2004) vegetation data.

In 2006 new vegetative information was gathered. The updated stand information denoted that some vegetation had been mis-identified and that additional mixed conifer habitat was needed to benefit the pair. An addition of 89 acres was added to the PAC. The new PAC size is now 692 acres. Table 2 gives vegetation breakdown of both the 2004 data and the 2006 data, along with some activity data.

Activities occurring or have occurred in the PAC are: hunting, hiking, and bicycling (PAC is adjacent to private land). Additionally, the PAC is within approximately ¼ mile of the Mescalero Apache Indian Reservation. The Brady PAC is part of the Perk-Grindstone Wildland Urban Interface (WUI) project.

Table 1. Reproductive Status and Historical Data on the Brady Owl Site

Year	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Occupancy	X	X	X	X	X	X	X	S	X	X	S	X	O	S	A	A	A	A	S	O	S
Reproduction	X	X	X	X	X	X	X	U	X	X	U	X	U	U	U	U	U	U	U	U	U
# of Young	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 2. BRADY SITE #R03F08D01-19

Mexican Spotted Protected Activity Center (PAC)

Total acreage within the PAC is 603 (2004)

692 (2006)

Forest Type	Acres
Mixed Conifer	543 (2204), 591 (2006)
Ponderosa Pine	60 (2004), 59 (2006)
Ponderosa mixed with Pinyon/Juniper	0 (2004), 20 (2006)
Pinyon/Juniper	0 (2204), 21 (2006)
Grass land	0 (2204), 1 (2006)
Past Activity	Acres
Old Burn	0
Past Management	0
Open Road	0.0 miles
Motorized Trail	0.0 miles
Utility Lines	0.0 miles
Closed Roads or Trails	1.4 miles
Special Use within PAC or 1/4 of PAC	0
Uses including private land within 1/4 mile	1

2. Management territory R03F08D01-20 (Flume) T11S. R13E. SEC 29, 30, 31 (last update 2009)

This MSO site was first located in 2000. The site was informally monitored in 2000, 2001, and 2003 to 2007. The area was formally monitored in 2008 and 2009. See Table 1 for occupancy, reproductive success, and number of young. This PAC is adjacent to the Mescalero Apache Indian Reservation, where MSO use in the area is undocumented.

No research or special visitation has occurred within this site.

In 2005, a 603 acre management territory was established utilizing GIS technology and ground verification. The territory, which includes a 100 acre no-touch zone, was designated as Flume PAC. Table 2 gives vegetation breakdown and some activity data. There are an estimated 361 acres of forage habitat and 243 acres of roost/nest habitat.

Activities occurring or that has occurred in the PAC are: road maintenance, hunting, hiking, bicycling and PAC is adjacent to both Mescalero Apache Tribal lands and private land. The Flume PAC will be part of the Perk-Grindstone Wildland Urban Interface (WUI) project.

Table 1. Reproductive Status and Historical Data on the Flume Owl Site

Year	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Occupancy	X	X	X	X	X	X	X	X	X	X	X	A	A	X	A	A	O	O	O	O	O
Reproduction	X	X	X	X	X	X	X	X	X	X	X	U	U	X	U	U	C	N	U	C	C
# of Young	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2	0	X	2	3

Table 2 . FLUME SITE #R03F08D01-20

Mexican Spotted Protected Activity Center (PAC)

Total acres within the PAC is 604 **(623 in 2006)**

Forest Type	Acres
Mixed Conifer	302
Ponderosa Pine	302
Past Activity	Acres
Old Burn	0
Past Management	**0**
Open Road	0.97 miles
Motorized Trail	0.0 miles
Utility Lines	0.0 miles
Closed Roads or Trails	12 miles
Special Use within PAC or 1/4 of PAC	**0**
Uses including private land within 1/4 mile	1

3. Management territory R03F08D01-21 (Perk Canyon) T11S. R13E. SEC 17, 18, 19, 20 (last update 2006)

This MSO site was first located in 1996, and was historically incorporated in the Brady area for surveys. The site was separately designated Perk PAC in 2006. The site was informally monitored in 1998-1999 and 2004-2009. Additionally, the area was included in Brady monitoring in 2001 to 2003. See table 1 for occupancy, reproductive success, and number of young. This PAC is adjacent to the Mescalero Apache Indian Reservation, where MSO use in the area is undocumented. Older data for this canyon suggest the owls were possibly nesting on Reservation lands, while foraging on forest lands.

No research or special visitation has occurred within this site.

In 2004 a 600 acre management territory was established utilizing GIS technology and ground verification. The territory, which

includes a 100 acre no-touch zone, was designated as Perk PAC. Table 2 gives vegetation breakdown and some activity data. There are an estimated 248 acres of forage habitat and 352 acres of roost/nest habitat.

Activities occurring or that has occurred in the PAC are: hunting, hiking, bicycling and is adjacent to private land and Mescalero Apache Tribal lands. The Perk PAC will be part of the Perk-Grindstone Wildland Urban Interface (WUI) project.

Table 1. Reproductive Status and Historical Data on the Perk Owl Site

Year	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Occupancy	X	X	X	X	X	X	X	X	X	X	S	X	A	A	A	A	S	O	S	O	O
Reproduction	X	X	X	X	X	X	X	X	X	X	U	X	U	U	U	U	U	N	U	N	U
# of Young	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	0	X	0	X

Table 2 . PERK SITE #R03F08D01-21

Mexican Spotted Protected Activity Center (PAC)

Total acres within the PAC is 600 **(607 in 2006)**

Forest Type	Acres
Mixed Conifer	420
Ponderosa Pine	180
Past Activity	Acres
Old Burn	0
Past Management	0
Open Road	0.0 miles
Motorized Trail	0.0 miles
Utility Lines	0.0 miles
Closed Roads or Trails	1.5 miles
Special Use within PAC or 1/4 of PAC	**0**
Uses including private land within 1/4 mile	1

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513

In reply refer to:
AESO/SE
02EAAZ00-2013-F-0190

June 5, 2015

Mr. Scott Russell, Acting Forest Supervisor
Coconino National Forest
1824 South Thompson Street
Flagstaff, Arizona 86001-3600

RE: Biological Opinion – Flagstaff Watershed Protection Project

Dear Mr. Russell:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request and biological assessment (BA) were dated January 8, 2015, and received by us on January 12, 2015. This consultation concerns the potential effects of mechanical thinning and burning activities implemented as part of the Flagstaff Watershed Protection Project (FWPP) on the Flagstaff Ranger District, Coconino National Forest (NF) in Coconino County, Arizona. The Forest Service has determined that the proposed action may affect, and is likely to adversely affect, the threatened Mexican spotted owl (*Strix occidentalis lucida)* and its designated critical habitat.

You also requested that we provide our technical assistance with respect to compliance with the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) for bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*). Our documentation of the Forest Service's implementation of minimization measures to reduce the likelihood of take to eagles is included in Appendix C.

This biological opinion (BO) is based on information provided in the January 8, 2015, BA, the June 2014 Draft Environmental Impact Statement (DEIS), meetings, and other sources of information. Literature cited in this BO is not a complete bibliography of all literature available on the species of concern, forest management and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

Details of the consultation history are summarized in Table 1.

Table 1. Summary of Consultation History

Date	Event
November 2012 -Present	We have worked with the Forest Service on development of FWPP action and the monitoring plan for the Mexican spotted owl. During this time we participated in numerous meetings, field trips, and discussions regarding the project.
April 11, 2013	The Forest Service published a notice of intent to prepare an EIS for the FWPP in the Federal Register and proposed action for comment.
May 16, 2013	We provided comments on the FWPP proposed action.
June 24, 2104	We received your letter requesting comments on June 2014 DEIS.
August 18, 2014	We provided comments on the FWPP DEIS through the Office of the Secretary, U.S. Department of the Interior.
November 20, 2014	We attended a meeting regarding FWPP with Forest Service leadership and the City of Flagstaff.
November 25, 2014	The Forest Service provided a draft BA for review by the FWS.
December 18, 2014	The FWS provided comments to the Forest Service on the draft BA.
January 12, 2015	We received your January 8, 2014, request for formal consultation and the Final BA.
January 20, 2015	We issued a thirty-day letter initiating formal consultation.
June 1, 2015	We submitted a draft BO to the Forest Service for review.
June 2, 2015	We received your comments on the draft BO.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The complete description of the proposed action and effects analysis can be found in your January 2015, BA and other supporting information in the administrative record. These documents are included herein by reference.

During the November 2012 elections, residents of Flagstaff, Arizona approved a $10 million bond to support watershed and fire risk reduction work within key watersheds on the Coconino NF and State of Arizona lands. Identified on the ballot as the "Forest Health and Water Supply Protection Project," the planning effort on the National Forest segment is now known as the "Flagstaff Watershed Protection Project" (FWPP).

The primary purpose of FWPP is to reduce the risk of high severity wildfire and subsequent flooding in two key watersheds near Flagstaff, Arizona: the Dry Lake Hills (DLH) portion of the Rio de Flag Watershed located north of Flagstaff; and the Mormon Mountain (MM) portion of the Walnut Creek-Upper Lake Mary Watershed located south of Flagstaff (Appendix A, Figure 1). More specifically, there is a need to reduce the potential for crown fires, high intensity surface fires, and to reduce the likelihood of human-caused ignitions. Subsequently, FWPP is a fire risk reduction project with components of forest restoration. Both areas are located on the Flagstaff Ranger District of the Coconino NF. Figure 1 shows the project area locations relative to the watersheds in which they are located. The yellow (DLH) and orange (MM) areas depict the areas analyzed for treatment as part of the FWPP. The project will be implemented over approximately the next 10 years, depending upon funding and the ability to implement burning prescriptions successfully.

Fuels Reduction and Treatment Summary

The FWPP DEIS analyzed three potential action alternatives to meet the purpose and need of the project. The final proposed action, as described below, contains a blend of these alternatives. The project areas are unique in that they include very steep slopes and mixed conifer forest. Until recently, the Coconino NF has focused on more accessible terrain in the ponderosa pine forest and treatments to reduce fire risk on steep slopes and mixed conifer forests have not occurred, until now.

There are approximately 10,544 acres between the two project areas proposed for thinning and burning activities. Acres could be thinned by helicopter, cable logging, specialized steep-slope equipment, traditional ground-based methods, and hand thinning. Prescribed burning will be included across all treated areas (approximately 8,668 acres). Within the project area, there are also some areas that will not receive any thinning or burning. Table 2 provides a summary of the treated acres and different harvesting methods to be used across the project area.

Table 2. Summary of treated acres and harvesting methods in FWPP.

Area	Treated Acres	Helicopter Acres	Cable Logging Acres	Specialized Machinery Acres	Ground Based Acres	Hand Thinning Acres	Burn Only Acres	No Treatment	Total Acres
DLH	5,692	566	414[1]	250	3,497	498	468	1,876	7,569
MM	2,975	0	0	73	2,320	180	402	0	2,975
Total	**8,668**	**556**	**414**	**323**	**5,817**	**678**	**870**	**1,876**	**10,544**

[1]Of the 414 acres, 114 acres will be harvested via skyline and 300 acres via excaline.

Helicopter logging will be utilized for removing cut trees on approximately 556 acres within the DLH project area. This includes steep slopes within Mexican spotted owl protected activity centers (PACs) and those areas visible from the City of Flagstaff. No helicopter logging will occur on MM.

Cable logging will be utilized to remove cut trees on approximately 414 acres within the DLH, the majority of which would be by excaline (300 acres) and the rest will be skyline (114 acres). Excaline corridors will be shorter (typically less than 300 feet [ft] in length) than skyline corridors, and a machine known as a jammer could also be used, which would remove the need

for cable corridors. No cable logging will occur on MM. Descriptions of the harvesting methods are provided in Chapter 2 of the DEIS (pgs. 46-56).

Approximately 323 acres will be harvested using specialized steep-slope equipment; approximately 250 acres within the DLH and 73 acres on MM. Hand thinning will occur on a total of 678 acres, and an additional 270 acres of steep sloped areas are deferred from treatment for a total of 1,875 acres of deferral.

The treatment descriptions and objectives for FWPP are:

- **Ponderosa pine fuels reduction**: This treatment type includes areas outside of Mexican spotted owl PACs and northern goshawk post-fledgling family areas (PFAs) and nest cores. Mechanical treatments are designed to develop uneven-aged structure and a mosaic of openings and tree groups of varying sizes. Openings would occupy approximately 20 percent of the treatment area. Tree groups would vary in shape, size, density, and number (generally from 0.05 – 0.7 acre in size with residual group basal areas of 20-80 square feet [ft^2] per acre and 2-40 trees per group). This treatment type will occur on 1,865 acres in the DLH and 766 acres on MM.

- **Ponderosa pine fuels reduction – hand thinning**: This treatment includes steep areas that have low tree density and/or are dominated by smaller diameter trees where the purpose and need can be met through hand felling treatments. Where practical and feasible, treatments would be designed to develop uneven-aged structure and a mosaic of tree groups of varying sizes similar to the treatment described above. This treatment type will occur on 81 acres in the DLH.

- **Mixed conifer fuels reduction (Mexican spotted owl recovery habitat)**: These treatments areas include dry mixed conifer areas outside of Mexican spotted owl PACs, replacement nest/roost habitat, and northern goshawk PFAs and nest cores, but include MSO recovery habitat. Mechanical treatment would be designed to develop uneven-aged structure and a mosaic of openings and tree groups of varying sizes. Trees above 24 inches diameter-at-breast height (dbh) would not be cut. Openings would occupy about 10 to 20 percent of the treatment area. Tree groups would vary in shape, size, density, and number (generally less than one acre in size with residual group basal areas of 30-90 ft^2 per acre and 2-50 trees per group). This treatment type will occur on 1,141 acres in the DLH.

- **Mexican spotted owl PAC fuels reduction (wet mixed conifer)**: Mechanical treatment within the wet mixed conifer vegetation type would create small openings within aspen stands to promote regeneration. Dead and down material would be piled for burning to reduce the heavy fuel loading and allow for lower-intensity prescribed burning. Piles would be placed in openings to the extent possible to reduce fire damage to large trees. This treatment type will occur on 180 acres on MM.

- **Mexican spotted owl PAC fuels reduction**: Mechanical treatment would create a diversity of patch sizes with minimum patch size of 2.5 acres, provide for 10 percent openings across treatment areas from 0.1 – 2.5 acres in size, and maintain a minimum of

40 percent canopy cover in pine/pine-oak and 60 percent in mixed conifer. Post-treatment, trees greater than 16 inches dbh would contribute at least 50 percent of the stand basal area per Recovery Plan Desired Conditions (USFWS 2012a). Trees above 18 inches dbh would not be cut unless necessary for cable corridor locations. This treatment type will occur on 1,195 acres in the DLH and 1,592 acres on MM.

- **Mexican spotted owl PAC fuels reduction – hand thinning**: This treatment includes steep areas that have low density and are dominated by smaller trees or are located in areas not conducive to steep slope equipment or helicopter or cable yarding operations. Treatments where feasible would treat stands similar to the PAC treatment described above. Otherwise treatments would be thin from below to reduce density and fuel ladders. This treatment type will occur on 202 acres in the DLH.

- **Mexican spotted owl nest habitat fuels reduction – hand thinning**: Hand thinning up to 5 inches dbh would occur within 80 percent of the Schultz Creek PAC nest core in coordination with the FWS (122 acres, DLH). Approximately 20 percent of the nest core would be deferred from treatment in order to maintain denser patches for habitat. Residual basal area would be a minimum of 110 ft^2, and treatment would maintain a minimum of 60 percent canopy cover in mixed conifer. This nest core would also receive prescribed burning.

- **Mexican spotted owl nest fuels reduction – burn only**: In all nest cores (other than the Schultz Creek nest core, as described above), treatment would consist of low-intensity burning only. Dead and down material in nest cores would be piled by hand and burned. This treatment will occur on 261 acres in the DLH and 402 acres on MM.

- **Mexican spotted owl recovery nest/roost habitat – hand thinning**: Hand thinning up to 9 inches dbh would occur on 72 acres in DLH under this treatment, and dead trees less than 12 inches dbh and down material would be cut and piled by hand for prescribed burning.

- **Mexican spotted owl recovery nest/roost habitat – burn only**: Thirty-seven acres of recovery nest/roost replacement habitat in the DLH would be prescribed burned only (no hand thinning). Snag retention guidelines identified in the Forest Plan would be followed. Treatments would be designed to move the stands towards minimum desired conditions. As such, treatments would result in: a residual basal area of 110 ft^2 in ponderosa pine and 120 ft^2 in mixed conifer; canopy cover of 40 percent in pine/pine-oak and 60 percent in mixed conifer; 12 trees per acre greater than 18 inches dbh; trees from 12-18 inches dbh would comprise over 30 percent of the stands BA; and, trees greater than 18 inches dbh would comprise an additional 30 percent of BA.

- **Mexican spotted owl recovery nest/roost habitat – mechanical thinning**: Mechanical treatment would remove ponderosa pine in a variety of size classes; however, no trees greater than 18 inches dbh would be cut. Treatments would be designed to maintain a minimum residual basal area of 110 ft^2; canopy cover of 40 percent with 12 trees per acre greater than 18 inches dbh; trees from 12-18 inches dbh would comprise over 30 percent of stands BA; and, trees greater than 18 inches dbh would comprise an additional

30percent of BA. No Gambel oak would be cut. This treatment type will occur on 22 acres on MM.

- **Northern goshawk PFA fuels reduction**: This uneven-aged mechanical treatment would develop uneven-aged structure and a mosaic of tree groups of varying sizes. Openings would occupy 20 percent of the treatment area. Tree groups would vary in shape, size, density, and number: generally from 0.05 – 0.7 acre in size with residual group basal areas of up to 30-90 ft^2 per acre and 2-40 trees per group. This treatment type will occur on 359 acres in the DLH.

- **Northern goshawk nest fuels reduction**: Mechanical treatment designed to develop northern goshawk nest stand conditions consisting of a contiguous over-story of large trees. This treatment type will occur on 100 acres in the DLH.

- **Aspen treatment**: A variety of different treatments would be used to promote and protect aspen health and regeneration, including the removal of post-settlement conifers within 100 ft of aspen clones, prescribed fire, ripping, planting, fencing and/or cutting of aspen to stimulate root suckering. This treatment type will occur on 22 acres in the DLH.

- **Grassland restoration**: Mechanical treatment to remove encroaching post-settlement conifers and restore the pre-settlement tree density and patterns. This treatment type will occur on 60 acres in the DLH.

- **Burn only**: Burn only treatment would remove excessive fuel loading in areas that were previously burned by the Radio Fire. This treatment type will occur on 171 acres in the DLH.

- **Electronic site – structure protection**: These sites are occupied by telecommunication facilities and would be treated to provide a sufficient defensible space around these structures from a wildland fire. Individual trees that are determined to contribute to wildfire risk or pose a hazard to the electronic sites would be removed. The remainder of the sites would receive a thin from below to approximately 20 – 40 ft^2 basal area with the purpose of raising the crown base height and leaving the largest and most fire resistant trees. This treatment will occur on 6 acres in the DLH and 12 acres on MM.

- **No treatment (no new analysis)**: These acres include non-treatable areas, including rock faces and boulder fields, and the Orion Timber Sale (approximately 837 acres). Although the Orion Timber Sale is within the project boundary, the treatments for that area were analyzed and authorized under the Jack Smith Schultz Fuels Reduction and Forest Health Restoration Project Decision Notice/Finding of No Significant Impact (2008). No additional treatments within the Orion Timber Sale area are proposed under FWPP. This area includes 1,876 acres within the DLH.

Tables 3 and 4 (below) summarize the harvesting methods for the different treatment types in each of the project areas (DLH and MM).

Table 3. The number of acres by harvesting methods for each treatment type in the Dry Lake Hills (DLH) Project Area.

Treatment Type	Ground-based	Hand cut/pile	Helicopter	Cable logging	Burn only	Steep slope Machinery	Total Acres
PIPO[1] Fuels Reduction	1,1613			242		10	**1,865**
PIPO Fuels Reduction – Hand Thin		81					**81**
MC[2] Fuels Reduction	626		299	126		90	**1,141**
PAC Fuels Reduction	793		267			135	**1,195**
PAC Fuels Reduction – Hand Thin		202					**202**
MSO[3] Nest Fuels Reduction		122			261		**383**
MSO Recovery Nest/Roost		72			37		**109**
PFA Fuels Reduction	299			45		15	**359**
Goshawk Nest Fuels Reduction	100						**100**
Aspen		22					**22**
Grassland	60						**60**
Burn Only					171		**171**
Electronic Site	6						**6**
No Analysis							**1,876**
Total	**3,497**	**499**	**566**	**413**	**469**	**250**	**7,570**

[1] PIPO = Ponderosa pine
[2] MC = Mixed conifer
[3] MSO = Mexican spotted owl

Table 4. The number of acres by harvesting methods for each treatment type on Mormon Mountain (MM) Project Area.

Treatment Type	Ground-based	Hand cut/pile	Burn Only	Steep slope Machinery	Total Acres
PIPO Fuels Reduction	766				**766**
MSO PAC Fuels Reduction	1,519			73	**1,592**
MSO PAC Fuels Reduction – Wet MC		180			**180**
MSO Nest Fuels Reduction			402		**402**
MSO Recovery Nest/Roost	22				**22**
Electronic Site	12				**12**
Total	**2,321**	**180**	**402**	**73**	**2,975**

Required Transportation System

Truck volume will increase throughout the FWPP treatment period as a result of the thinning operations. Within the DLH and MM areas, approximately 14,000 total truck trips are expected to result from activities authorized by this decision, which equals roughly 2,800 truck trips per year over a five year period.

Within the DLH and MM project areas, the Forest Service has identified system haul roads within and outside the project areas, temporary roads on existing road prisms, temporary roads that need to be rehabilitated for use, relocated system roads to be used as haul roads, and system roads to be decommissioned. The miles of road for each category are summarized in Table 5.

Table 5. Miles of road, by type, within the Dry Lake Hills (DLH) and Mormon Mountain (MM) Project Areas.

Road Type	DLH Miles	MM Miles	Total Miles
System haul roads within the project area	18.07	16.46	34.53
System haul roads outside the project area	14.33	18.13	32.46
New temporary haul roads constructed	11.67	0.0	11.67
Temporary roads on existing road prisms	2.75	2.52	5.27
Temporary road rehabilitated	14.43	2.52	16.96
Relocated system road used as haul road	1.57	0.53	2.10
System road decommissioned	4.19	0.19	4.38

Adaptive Harvesting Matrix

The FWPP proposed to use several specialized harvesting systems in order to accomplish the proposed treatments. To address concerns with the potential of finding a contractor for these specialized harvesting systems, the Forest Service has included an Adaptive Harvesting Matrix, which would allow the latitude to substitute harvesting methods that result in less impact to meet

the approved forest management goals identified for the treatment area. For example, the analysis of effects in the DEIS show that helicopter logging can result in less impact to owls overall than cable logging, but is often more expensive. If, during project implementation, it is found to be more advantageous to treat an area of forest with helicopter logging or hand thinning that is identified in the decision to be treated with cable logging, this would be acceptable and within the scope and range of environmental effects considered in the environmental analysis and is part of the proposed action. This adaptive approach provides flexibility to substitute a less invasive treatment type rather than deferral from treatment in the event a qualified contractor cannot be acquired or other problems are identified. Decisions to modify treatment types shall follow a hierarchy of impacts, moving from the harvesting method with the most impacts to resources to those with less (see Table 6). Additional analysis or a revision to the decision would not be required as the fallback harvesting method would have less impact than the original harvesting method, and all the harvesting methods were included in the analysis performed for the FWPP DEIS. The decision does not authorize a change from a secondary harvesting method to one with more impacts (e.g., from helicopter logging to cable logging). The Forest Service will coordinate with FWS as they proceed with implementation and will document (in a letter to FWS) what the ultimate harvesting method used in the different Mexican spotted owl habitats identified for treatment.

Table 6. Adaptive Harvesting Matrix.

Planned Harvesting Method	Secondary Harvesting Method	Third Harvesting Method
Cable Logging	Helicopter Logging	Hand Thinning
Helicopter Logging	Hand Thinning	
Specialized Steep-Slope Machinery	Hand Thinning	

Mexican spotted owl Monitoring Plan

The Mexican spotted owl monitoring plan is designed to evaluate the effects of prescribed fire and mechanical thinning on short-term owl occupancy and reproduction, and key habitat components (as described in the Mexican spotted owl Recovery Plan, Table C.2). This monitoring plan would provide valuable information on the effects of these proposed activities on Mexican spotted owls and their habitat. For FWPP this is of particular interest because fuels reduction treatments within mixed conifer vegetation types or within nest cores have not previously occurred on the Flagstaff Ranger District. The Mexican spotted owl Revised Recovery Plan (USFWS 2012a) (Recovery Plan) states that if thinning and burning are to occur in PACs, monitoring of treatment effect on owls should be conducted. In order to meet this need, the FWS worked with the Forest Service to develop a monitoring plan for this project that would assist in determining the effects of thinning and burning on Mexican spotted owls and their habitat (Appendix B). The monitoring plan includes the details for sample selection, treatment specifics, measurement protocols including timing, and planned analyses. The monitoring plan was developed with FWS in order to meet the Recovery Plan guidelines for conducting fuels treatments in PACs. The proposed monitoring plan would pair treated and untreated (or reference) PACs within DLH and MM portions of the project and compare occupancy rates, reproduction rates, and vegetation (habitat) changes. Reference PACs match the environmental conditions in PACs where treatments are proposed, as closely as possible.

In addition, the Forest Service and FWS worked with Dr. David Huffman of the Ecological Restoration Institute (ERI) of Northern Arizona University to design and implement the vegetation monitoring component of the project and to analyze treatment effects on habitat components, such as tree species composition and structure.

Campfire Restriction Order

The proposed action would also include establishing a permanent campfire restriction order in the DLH portion of the project area to limit the potential for human-caused wildfire. The current temporary campfire restriction order has been in effect since June 2011 (reissued June 2013 for two years), and prohibits building, maintaining, attending, or using a fire, campfire, or stove fire (36 CFR § 261.52(a)). The proposed action would extend this order permanently in the project area.

Forest Plan Amendments

The Forest Service BA states that the proposed action is being conducted under the original Land and Resource Management Plans (LRMP) for the Coconino NF (1987), including the 1996 Region-wide Amendment. The 1996 Forest Plan Amendment incorporated specific language from the 1995 Mexican spotted owl Recovery Plan (USFWS 1995) into standards and guidelines. In 2012, the FWS issued the Revised Recovery Plan for the Mexican Spotted Owl (USFWS 2012a), which includes the best available science and management recommendations concerning the owl, and under which we recommend actions are planned. The Forest Service is in the process of revising the Coconino NF LMRP with the Record of Decision (ROD) for the revised plan anticipated for release in 2016. The Forest Service has proposed two amendments to the Coconino 1987 LRMP that include changes to standards and guidelines for the Mexican spotted owl that would allow the project to be more consistent with the revised Recovery Plan (USFWS 2012a). These amendments now only apply to the 1987 Coconino NF LRMP:

- Amendment 1: The purpose of this amendment would be to facilitate treatment in high-priority locations such as Mexican spotted owl occupied habitat to prevent high-severity wildfire from removing nest/roost habitat. This is based on language in the Mexican Spotted Owl Recovery Plan (USFWS 2012a), which states, "[wildfires] result in the most significant alteration of owl habitat and hence, have the greatest potential for loss of habitat" (USFWS 2012a). The current Forest Plan adopted language from the previous Recovery Plan (USFWS 1995). For this project, the Forest Plan amendment utilizes some of the more updated management direction in the revised recovery plan where it is different than what is currently included in the Forest Plan. More information about this amendment can be found in the DEIS.

- Amendment 2: The current Forest Plan restricts the use of mechanical equipment to slopes less than 40 percent. Amendment 2 removes the restrictive language related to 40 percent slopes and also the language identifying slopes above 40 percent as inoperable in order to allow mechanical harvesting on slopes greater than 40 percent within the project area.

Conservation Measures

The FWPP BA includes a long list of conservation measures that are all incorporated herein by reference. However, we are only listing below those that directly apply to minimizing effects to the Mexican spotted owl.

- The FWPP project boundary lies within the project boundary for the Four Forests Restoration Initiative (4FRI) as well as other forest thinning and burning projects. Flagstaff Ranger District staff would ensure that all proposed treatments are coordinated to ensure that there are not multiple entries into sensitive habitats (such as Mexican spotted owl PACs) that are split between different project boundaries. In doing so, habitat and noise disturbance to owls in these areas would be minimized.

- The Forest Service will work with the FWS to monitor effects to Mexican spotted owls from the proposed action and report the findings. In addition, in order to meet the requirements of the 2012 LRMP BO, implementation monitoring would include information such as when or if the project was implemented, whether the project was implemented as analyzed (including conservation measures and best management practices), breeding season(s) over which the project occurred, relevant spotted owl survey information, and any other pertinent information about the project's effects on the species. However, treatment activities within PACs would be evaluated through implementation of the FWPP monitoring plan designed by the FWS and Forest Service.

- Treatments would be designed so that thinning activities within each PAC would be completed in one to two breeding seasons. Treatments within PACs may occur during the breeding season for no more than two years; if implementation is not completed at the end of two years, timing restrictions would apply (March 1 – August 31). The Thicket northern goshawk PFA on MM would be treated with the same parameters in conjunction with the PACs it overlaps.

- Activities would not occur within Mexican spotted owl nest cores during the breeding season (March 1 – August 31).

- Initial entry burning and pile burning would primarily occur in PACs during the fall/winter to minimize impacts from smoke on Mexican spotted owls. However, maintenance burning within PACs but outside of nest cores could occur during the breeding season.

- Prescribed fire would be allowed to enter owl nest cores only if it is expected to burn with low fire severity and intensity. Fire lines, check-lines, backfiring, and similar fire management tactics would be used to reduce fire effects and to maintain key habitat elements (e.g. hardwoods, large downed logs, snags, and large trees).

- In Mexican spotted owl recovery habitat, manage for large Gambel oaks (>10 inches diameter-at-root collar [drc]) by removing conifers up to 18 inches dbh that do not meet the "old tree" definition within 30 ft of oak 10 inches drc or larger. Gambel oak would only be cut as necessary to facilitate logging operations (skid trail and landings).

- Coordinate burning spatially and temporally to limit smoke impacts to nesting owls (March 1 to August 31).

- No cable or helicopter logging would occur within Mexican spotted owl nest cores.

- No cable logging would occur within PACs. An implementation guide would be developed in coordination with FWS and Arizona Game and Fish Department (AGFD) to minimize the impacts of helicopter operations (i.e., helicopter landing locations, flight patterns) on nesting birds (Mexican spotted owl, peregrines, eagles, northern goshawks, etc.).

- In areas where large snags are cut for safety purposes, fallen trees would be left on site as needed for wildlife habitat while still lowering overall fuel loadings to meet desired conditions.

- Emphasize retaining old, pre-settlement trees where possible, particularly within Mexican spotted owl recovery nest/roost replacement habitat. Old trees, as defined by Thomson (1940) for ponderosa pine, and mixed conifer species with fire scars would not be targeted for cutting. However, exceptions may be necessary. An example of this would be removing an old tree to address human health and safety concerns and Occupational and Safety Administration (OSHA) regulations where treatments are occurring if these trees are considered to be dangerous. Other examples could include cutting an old tree to accommodate the turning radius of a logging truck, rather than relocating an entire road, or if the tree(s) are located within a cable yarding corridor or temporary road location.

- Treatments within both dry and wet mixed conifer vegetation types would be site-specific in nature and vary according to the diversity of tree species compositions and locations.

- In wet mixed conifer forest types, piles would be placed in openings to the extent possible to reduce fire damage to large trees.

- Biologists would identify patches of snags up to 10 acres in size in advance of treatment unit layout in cable and helicopter logging areas. This would allow for the protection of patches of snags at the ecosystem management area level that could serve as a reserve area for areas/acres where we are unable to maintain snags during operations. Patch locations would be identified with consideration for red squirrel caches.

- Where helicopter logging is used, the Forest Service will consider using patch cuts in order to break up fuels. This would allow for the maintenance of snags outside the patches, but would allow for greater removal of trees (live and dead) and operational safety within the patches.

- Protect snags and logs wherever possible through site prep, implementation planning, and ignition techniques to retain within the project area an average of approximately ≥ 2 snags per acre >18 inches dbh and $\geq$30 ft in height and $\geq$3 logs with > 12 inches mid-

point diameter and ≥ 8 ft in length in ponderosa pine; and ≥ 3 snags per acre >18 inches dbh and ≥30 ft in height and ≥5 logs with >12 inches mid-point diameter and ≥ 8 ft in length in mixed conifer and spruce-fir.

- Within the project area, retain an average of approximately ≥ 2 trees per acre ≥18 inches dbh with dead tops, cavities, and lightning strikes wherever possible to provide for replacement snags and cavity nesting/foraging habitat.

- Create snags in key areas identified by biologists (i.e., PACs, recovery nest/roost habitat) where monitoring determines a deficit. Trees would be chosen on a case-by-case basis in order to ensure successful recruitment as snags. Created snags, or a subset of, would be monitored over time to determine if the action was successful (i.e., trees decayed but remained standing, etc.).

- The Forest Service, in coordination with the FWS, shall develop contingency plans in the event of new PACs being established or PAC boundary modifications due to owl movement or habitat changes. Flexibility shall be built into the project (including task orders) so that as owls move or new sites are located, project activities can be modified to accommodate these situations. Minor modifications will be coordinated with FWS.

- The Forest Service shall ensure that all contractors associated with thinning and burning activities, transportation of equipment and forest products, research, or restoration activities are briefed on the Mexican spotted owl, know to report sightings and to whom, avoid harassment of the owl, and are informed as to who to contact and what to do if a Mexican spotted owl is incidentally injured, killed, or found injured or dead on the Coconino NF. If an owl fatality is discovered, the FWS Mexican spotted owl lead will be contacted as soon as possible.

- The Forest Service shall meet annually with the FWS to discuss the upcoming year's thinning and burning plans in Mexican spotted owl habitat and review the past year's thinning and burning activities in owl habitats.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components in our evaluation for each species: (1) the *Status of the Species*, which evaluates the species' range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and, (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this BO places an emphasis on consideration of the range-wide survival and recovery needs of the species and the role of the action area in the survival and recovery of the species as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

In accordance with policy and regulation, the adverse modification analysis in this BO relies on four components: 1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for the species in terms of primary constituent elements (PCEs), the factors responsible for that condition, and the intended recovery function of the critical habitat overall; 2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; 3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how they will influence the recovery role of affected critical habitat units (CHUs); and, 4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how they will influence the recovery role of affected CHUs.

For purposes of the adverse modification determination, the effects of the proposed Federal action on each species' critical habitat are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the species.

STATUS OF THE SPECIES AND CRITICAL HABITAT

In 1993, the FWS listed the Mexican spotted owl (hereafter, referred to as Mexican spotted owl, spotted owl, and owl) as threatened under the Act. The FWS appointed the Mexican spotted owl Recovery Team in 1993 (USFWS 1993), which produced the Recovery Plan for the Mexican spotted owl in 1995 (USFWS 1995). The FWS released the final Mexican spotted owl Recovery Plan, First Revision (Recovery Plan) in December 2012 (USFWS 2012a). Critical habitat was designated for the spotted owl in 2004 (USFWS 2004).

A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican spotted owl is found in the Final Rule listing the owl as a threatened species (USFWS 1993), the original Recovery Plan (USFWS 1995), and in the revised Recovery Plan (USFWS 2012a). The information provided in those documents is included herein by reference.

The spotted owl occurs in forested mountains and canyonlands throughout the southwestern United States and Mexico (Gutiérrez et al. 1995). It ranges from Utah, Colorado, Arizona, New Mexico, and the western portions of Texas south into several States of Mexico. Although the owl's entire range covers a broad area of the southwestern United States and Mexico, it does not occur uniformly throughout its range. Instead, the Mexican spotted owl occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Known owl locations indicate that the species has an affinity for older, uneven-aged forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico.

In addition to this natural variability in habitat influencing owl distribution, human activities also vary across the owl's range. The combination of natural habitat variability, human influences on owls, international boundaries, and logistics of implementation of the Recovery Plan necessitates subdivision of the owl's range into smaller management areas. The 1995 Recovery Plan subdivided the owl's range into 11 "Recovery Units" (RUs): six in the United States and five in Mexico. In the revision of the Recovery Plan, we renamed RUs as "Ecological Management Units" (EMUs) to be in accord with current FWS guidelines. We divide the Mexican spotted owl's range within the United States into five EMUs: Colorado Plateau (CP), Southern Rocky Mountains (SRM), Upper Gila Mountains (UGM), Basin and Range-West (BRW), and Basin and Range-East (BRE) (Appendix A, Figure 2). Within Mexico, the Revised Recovery Plan delineated five EMUs: Sierra Madre Occidental Norte, Sierra Madre Occidental Sur, Sierra Madre Oriental Norte, Sierra Madre Oriental Sur, and Eje Neovolcanico.

Mexican spotted owl surveys since the 1995 Recovery Plan have increased our knowledge of owl distribution, but not necessarily of owl abundance. Population estimates, based upon owl surveys, recorded 758 owl sites from 1990 to 1993, and 1,222 owl sites from 1990 to 2004 in the United States. The Recovery Plan (USFWS 2012a) lists 1,324 known owl sites in the United States. An owl site is an area used by a single or a pair of adult or subadult owls for nesting, roosting, or foraging. The increase in number of known owl sites is mainly a product of new owl surveys being completed within previously unsurveyed areas (e.g., several National Parks within southern Utah, Grand Canyon National Park in Arizona, Guadalupe National Park in West Texas, Guadalupe Mountains in southeastern New Mexico and West Texas, Dinosaur National Monument in Colorado, Cibola NF in New Mexico, and Gila NF in New Mexico). Thus, an increase in abundance in the species range-wide cannot be inferred from these data (USFWS 2012a). However, we do assume that an increase in the number of areas considered to be occupied is a positive indicator regarding owl abundance.

We are currently working with the Southwestern Region of the Forest Service to conduct a pilot study for the population monitoring recommended in the Revised Recovery Plan (USFWS 2012a). The effort to conduct this work occurred during the 2014 breeding season and has continued into the 2015 breeding season, but only on National Forest System (NFS) lands. The Recovery Team, Forest Service, and the Rocky Mountain Bird Observatory (RMBO, contractor) are continuing to collect data and develop a strategy for incorporating additional lands (e.g., National Park Service, Bureau of Land Management, Department of Defense) into the monitoring. Currently, based on the work conducted by the Forest Service and RMBO, we have a process for conducting rangewide population monitoring, but we need to further develop the potential strategy for collecting rangewide habitat monitoring data.

Two primary reasons were cited for the original listing of the Mexican spotted owl in 1993: (1) the historical alteration of its habitat as the result of timber-management practices; and, (2) the threat of these practices continuing. The danger of stand-replacing fire was also cited as a looming threat at that time. Since publication of the original Recovery Plan (USFWS 1995), we have acquired new information on the biology, threats, and habitat needs of the Mexican spotted owl. Threats to its population in the U.S. (but likely not in Mexico) have transitioned from commercial-based timber harvest to the risk of stand-replacing wildland fire (USFWS 2012a). Recent forest management has moved away from a commodity focus and now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which have potential to benefit the spotted owl. However, as stated in the revised Recovery Plan (USFWS 2012), there is much uncertainty regarding thinning and burning treatment effects and the risks to owl habitat with or without forest treatment as well. Therefore, efforts to reduce fire risk to owls should be designed and implemented to evaluate the effects of treatments on owls and retention of or movement towards desired conditions.

Southwestern forests have experienced larger and more severe wildland fires from 1995 to the present, than prior to 1995. Climate variability combined with unhealthy forest conditions may also synergistically result in increased negative effects to habitat from fire. The intensification of natural drought cycles and the ensuing stress placed upon overstocked forested habitats could result in even larger and more severe fires in owl habitat. Several fatality factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites.

Historical and current anthropogenic uses of Mexican spotted owl habitat include both domestic and wild ungulate grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and development. These activities have the potential to reduce the quality of owl nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout the range of the owl and is thought to have a negative effect on the availability of grass cover for prey species. Recreation impacts are increasing throughout the Southwest, especially in meadow and riparian areas. There is anecdotal information and research that indicates that owls in heavily used recreation areas are much more erratic in their movement patterns and behavior. Fuels reduction treatments, though critical to reducing the risk of severe wildland fire, can have short-term adverse effects to owls through habitat modification and disturbance. As the human population grows in the southwestern United States, small communities within and adjacent to wildlands are being developed. This trend may have detrimental effects to spotted owls by further fragmenting habitat and increasing disturbance during the breeding season.

Several fatality factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites. For example, West Nile Virus also has the potential to adversely impact the Mexican spotted owl. The virus has been documented in Arizona, New Mexico, and Colorado, and preliminary information suggests that owls may be highly vulnerable to this disease (Courtney et al. 2004). Unfortunately, due to the secretive nature of spotted owls and the lack of intensive monitoring of banded birds, we will most likely not know when owls contract the disease or the extent of its impact to the owl range-wide.

Currently, high-severity, stand-replacing fires are influencing ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Uncharacteristic wildland fire is probably the greatest threat to the Mexican spotted owl within the action area. As throughout the West, fire severity and size have been increasing within this geographic area. Landscape level wildland fires, such as the Rodeo-Chediski Fire (2002), the Wallow Fire (2011), and the Whitewater-Baldy Complex (2012) have resulted in the loss of tens of thousands of acres of occupied and potential nest/roost habitat across significant portions of the Mexican spotted owl's range. Although owls will forage in burned areas,

Finally, global climate variability may also be a threat to the owl. Changing climate conditions may interact with fire, management actions, and other factors discussed above, to increase impacts to owl habitat. Studies have shown that since 1950, the snowmelt season in some watersheds of the western U.S. has advanced by about 10 days (Dettinger and Cayan 1995, Dettinger and Diaz 2000, Stewart et al. 2004). Such changes in the timing and amount of snowmelt are thought to be signals of climate-related change in high elevations (Smith et al. 2000, Reiners et al. 2003). The impact of climate change is the intensification of natural drought cycles and the ensuing stress placed upon high-elevation montane habitats (IPCC 2007, Cook et al. 2004, Breshears et al. 2005, Mueller et al. 2005). The increased stress put on these habitats is likely to result in long-term changes to vegetation, and to invertebrate and vertebrate populations within coniferous forests and canyon habitats that affect ecosystem function and processes.

Critical habitat

The FWS designated critical habitat for the Mexican spotted owl in 2004 on approximately 8.6 million acres (3.5 million hectares) of Federal lands in Arizona, Colorado, New Mexico, and Utah (USFWS 2004). Within the designated boundaries, critical habitat includes only those areas defined as protected habitats (defined as PACs and unoccupied slopes >40 percent in the mixed conifer and pine-oak forest types that have not had timber harvest in the last 20 years) and restricted (now called "recovery") habitats (unoccupied owl foraging, dispersal, and future nest/roost habitat) as defined in the 1995 Recovery Plan (USFWS 1995). The PCEs for Mexican spotted owl critical habitat were determined from studies of their habitat requirements and information provided in the Recovery Plan (USFWS 1995). Since owl habitat can include both canyon and forested areas, PCEs were identified in both areas. The PCEs identified for the owl within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the owl's habitat needs for nesting, roosting, foraging, and dispersing are:

- A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with dbh (4.5 ft above ground) of 12 inches or more;
- A shade canopy created by the tree branches covering 40 percent or more of the ground;
- Large, dead trees (snags) with a dbh of at least 12 inches.
- High volumes of fallen trees and other woody debris;
- A wide range of tree and plant species, including hardwoods; and,
- Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

The PCEs listed above usually are present with increasing forest age, but their occurrence may vary by location, past forest management practices or natural disturbance events, forest-type productivity, and plant succession. These PCEs may also be observed in younger stands, especially when the stands contain remnant large trees or patches of large trees. Certain forest management practices may also enhance tree growth and mature stand characteristics where the older, larger trees are allowed to persist.

Steep-walled rocky canyonlands occur typically within the Colorado Plateau EMU, but also occur in other EMUs. Canyon habitat is used by owls for nesting, roosting, and foraging, and includes landscapes dominated by vertical-walled rocky cliffs within complex watersheds, including many tributary side canyons. These areas typically include parallel-walled canyons up to 1.2 miles (2 kilometers) in width (from rim to rim), with canyon reaches often 1.2 miles (2 kilometers) or greater, and with cool north-facing aspects. The PCEs related to canyon habitat include one or more of the following:

- Presence of water (often providing cooler and often higher humidity than the surrounding areas);
- Clumps or stringers of mixed-conifer, pine-oak, piñon-juniper, and/or riparian vegetation;
- Canyon walls containing crevices, ledges, or caves; and,
- High percent of ground litter and woody debris.

Overall, the status of the owl and its designated critical habitat has not changed significantly range-wide in the U.S. (which includes Utah, Colorado, Arizona, New Mexico, and extreme southwestern Texas); based upon the information we have, since issuance of the 2012 LRMP BO for the Coconino NF (USFWS 2012b). What we mean by this is that the distribution of owls continues to cover the same area, and critical habitat is continuing to provide for the life history needs of the Mexican spotted owl throughout all of the EMUs located in the U.S. We do not have detailed information regarding the status of the Mexican spotted owl in Mexico, so we cannot make inferences regarding its overall status.

However, this is not to say that significant changes have not occurred within the owl's U.S. range. Wildland fire has resulted in the greatest loss of PACs and critical habitat relative to other actions (e.g., such as forest management, livestock grazing, recreation, etc.) throughout the U.S. range of the Mexican spotted owl. These wildland fire impacts have mainly impacted Mexican spotted owls within the UGM EMU (e.g., Slide and Schultz Fires on the Coconino NF, Rodeo-Chediski and Wallow Fires on the Apache-Sitgreaves NF and Whitewater-Baldy Complex on the Gila NF) and BRW EMU (e.g., Horseshoe 2 Fire on the Coronado NF); but other EMUs have been impacted as well (SRM EMU, the Santa Fe NF by the Las Conchas Fire, CP EMU by the Warm Fire). However, we do not know the extent of the effects of these wildland fires on actual owl numbers.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental

baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation. The environmental baseline descriptions provided below are a summary of the available information. A complete description of the environmental baseline for each species can be found in the administrative record for this consultation.

The project area is dominated by ponderosa pine and mixed conifer forest communities. Inclusions of aspen, meadows, ephemeral drainages, and springs also occur across the analysis area. Southwestern ponderosa pine and dry mixed conifer forest are fire-adapted ecosystems with relatively frequent fire return intervals dominated by low severity surface fire. The project area also includes wet (mesic) mixed conifer forest which is likely less adapted to frequent fire.

Description of the action area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR section 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment. The action area for this BO is defined as the DLH and MM areas proposed for mechanical thinning, prescribed burning, and other treatments (collectively the "treatment area") and anywhere outside of this treatment footprint that other project-related effects could spread (such as smoke effects, as analyzed in the BA).

A. Status of the species and critical habitat within the action area

The FWP analysis area lies entirely within the UGM EMU. Within the overall project area, there are ten PACs totaling 3,954 acres, but not all of each PAC lies completely within the project area. Approximately 20 percent of the total PAC acreage (~784 acres) within FWPP consists of nest cores. PAC and nest core acres within the project areas are listed in Table 7. Additional PACs, not listed in Table 7, that are located within 0.5 mile of the project include: Archie's (#030405034), Red Raspberry (#030405003), Dairy Spring (#030405007), and Aspen Spring (#030402035).

Table 7. Summary of acreages of PACs and core areas in the Dry Lake Hills (DLH) and Mormon Mountain (MM) project areas.

Project Area	PAC	PAC Acres	Core Area Acres
DLH	**Schultz Creek** (#030402006)	659	122
	Mount Elden (#030402002)	630	102
	Orion Spring (#030402035)	328	150
	Weatherford 2 (#030402039)	163	8
MM	**De Toro's** (#030405033)	663	185
	Lockwood (#030405041)	149	0
	Moore Well-Rock Dike (#030405011)	21	7
	Mormon Mountain (#030405051)	148	0

MM	**Mormon Mountain North** (#030405008)	611	109
	Weimer Springs (#030405032)	582	101
	Total Acres	**3,954**	**784**

All MSO habitats within the project area and a 0.5 mile buffer were surveyed in 2013 and 2014. In addition, seven PACs that may be used as reference PACs for the effects monitoring (see Appendix B), were also surveyed. Surveys were conducted according to FWS protocol (USFWS 2012a). All owl responses were associated with existing PACs. This survey data is summarized in Table 8.

Table 8. Survey results for PACs within and adjacent to the FWPP project area.

PAC	2013 Survey Results	2014 Survey Results
DeToros	Female – Non-nesting	No Information
Lockwood	Pair Occupancy – Nesting unk.	Pair Occupancy – Nesting unk.
Moore Well-Rock Dike*	Pair Occupancy – Nesting unk.	Pair – Two Young Fledged
Mormon Mountain	Absent	No Information
Mormon Mountain North	Absent	No Information
Weimer Springs	Pair Occupancy – Nesting unk.	No Information
Schultz Creek	Pair Occupancy – Nesting unk.	Pair Occupancy – Nesting unk.
Mount Elden	Pair Occupancy – Non-nesting	Pair Occupancy – Nesting unk.
Orion Spring	Pair Occupancy – Nesting unk.	Pair Occupancy – Nesting unk.
Weatherford 2	Pair – Two Young Fledged	Pair Occupancy – Nesting unk.
Aspen Spring	Pair – Two Young Fledged	Pair Occupancy – Nesting unk.
Snowbowl*	Pair Occupancy – Non-nesting	Pair Occupancy – Nesting unk.
Little Spring*	Pair – Two Young Fledged	Pair – Two Young Fledged
Red Raspberry*	Absent	No Information
Mayflower Tank*	Pair Occupancy - # Fledged unk.	Pair – Two Young Fledged
Dairy Springs*	Pair Occupancy – Non-nesting	Male
East Bear Jaw*	Absent	Absent
Archies	No Information	No Information

*Reference PACs, not located within FWPP Project Area

There are 2,975 acres of recovery (suitable but unoccupied) habitat within FWPP. The acreages are detailed in Table 9. Recovery habitat is characterized by basal area and percent of basal area of trees 12-18 inches dbh and trees per acre greater than 18 inches dbh as well as the amount of course woody debris and snags greater than 18 inches dbh. Based upon information in the Silviculture Specialist's Report, recovery habitat exceeds basal area minimums with adequate number of large trees with the exception of recovery nest roost replacement habitat in mixed conifer in the DLH area, which is lacking in large trees > 18 inches dbh.

The Recovery Plan (USFWS 2012a, Table C.3) calls for managing 25 percent of mixed conifer recovery habitat and 10 percent of pine oak recovery habitat as nest/roost replacement habitat across the landscape. Within this 25 percent, the Recovery Team used Forest Service stand data to develop goal parameters of minimum basal area of 120 ft^2/ac with at least 12 trees per acre greater than 18 inches dbh in mixed conifer, and a minimum basal area of 110 ft^2 with at least 12

trees per acre greater than 18 inches dbh in pine oak. For the pine -oak, nest/roost stands were identified in previous decisions or as part of the 4FRI. For the mixed conifer, nest/roost stands have been identified through previous decisions and as part of a Forest Service District-wide Assessment done in cooperation with the FWS. Approximately 131 acres of recovery nest/roost replacement habitat occur within the project. Active Crown Fire Potential within recovery nest/roost replacement habitat is 28 percent in DLH and 95 percent in MM project area.

Based upon analyses completed by the Forest Service, current conditions are inhibiting the recruitment of old-growth trees, thereby not favoring the creation of large snags in stands and accumulation of large down logs on the forest floor over time. Current data for many of these areas indicates that there is an excess supply of coarse woody debris due to the exclusion of frequent, low-severity fire, which can increase the likelihood of high-severity fire within owl recovery habitat. In addition, the high number of smaller diameter (<12 inches dbh) trees per acre is preventing the development of a structurally and biologically diverse assemblage of tree and understory species. Lack of stand diversity excludes conditions that support a wide variety of prey species for spotted owls.

Table 9. Acreages of Mexican spotted owl recovery habitat, including nest/roost replacement habitat within the FWPP area.

Owl Habitat Category	Project Area	Recovery Habitat	Recovery nest/roost Habitat	Total Acres Recovery Habitat
Mixed conifer Recovery Habitat Outside of PACs	DLH Acres	1,800	109	1,909
	MM Acres	0	0	0
	Total Acres	1,800	109	1,909
Pine-Oak Recovery Habitat Outside of PACs	DLH Acres	277	0	277
	MM Acres	767	22	789
	Total Acres	1,044	22	1,066
	Total Acres	**2,844**	**131**	**2,975**

One of the primary threats to Mexican spotted owls is the potential loss of habitat from high-severity fire effects. Crown fire potential was analyzed for the DLH and MM using data generated from modeling performed using FlamMap 5.0 (see pages 23-24 in the BA). Modeling results indicated that approximately 65 percent of the PAC habitat in the DLH and 66 percent in the MM project area was rated as having an active crown fire potential, indicating that wildfire activity would result in more severe fire effects to the habitat than would occur if the area were operating under a natural fire regime. Approximately 54 percent of the mixed conifer and 49 percent of the ponderosa-pine oak recovery habitat in the DLH project area and 81 percent of the ponderosa pine-oak recovery habitat in the MM project area were rated as having an active crown fire potential.

Critical Habitat

The FWPP project area is located within Mexican spotted owl critical habitat unit (CHU) UGM 14. This CHU encompasses approximately 55,533 total acres, but not all of this area is considered to be critical habitat. Only Federal lands that meet the definition of protected or

recovery habitat within the CHU are considered to be critical habitat, unless otherwise exempted. Within the FWPP project area, there are approximately 6,929 acres of protected (3,954 acres) and recovery (2,975 acres) habitat that are critical habitat. Table 10 describes the acres of critical habitat within the DLH and MM project areas and for the entire FWPP area. These acres completely overlap with the PAC and recovery habitat acres described above.

Table 10. Designated critical habitat acres within FWPP.

Owl Habitat Category	Dry Lake Hills Project Area	Mormon Mountain Project Area	Total Acres
PAC	1,780	2,174	3,954
Recovery (Pine-Oak)	277	789	1,066
Recovery (Mixed conifer)	1,909	0	1,909
Total Acres	3,966	2,963	6,929

B. Factors affecting the species and critical habitat within the action area

The action area consists primarily of National Forest System (NFS) lands, and there are few State, tribal, or private actions impacting the Mexican spotted owl or its critical habitat. Key factors that have affected the owl within the action area are vegetation removal activities associated with fuels reduction and forest restoration projects, fire and fuels management, maintenance of vegetation along utility corridors, lands projects involving infrastructure repair/maintenance, recreation, and wildfire. The projects have all included conservation measures to minimize effects to the owl and its habitat.

The FWPP project area is of high scenic, cultural, wildlife, and recreational value. Public use of the project area is very heavy, with many heavily-used trails (for both motorized and non-motorized use), camping areas, and rock climbing areas. The area also has religious significance to several Native American tribes in the region.

There is overlap between the 4FRI DEIS and FWPP DEIS analysis area. Those areas that were initially analyzed by the 4FRI DEIS were included in this planning effort to address additional treatment options (such as treatments on steep slopes), but not carried forward into the 4FRI FEIS, the Record of Decision, or included in the 4FRI biological opinion (#22140-2011-F-0145). The Mount Elden/Dry Lake Hills (MEDL) Recreation Planning Project is also underway and overlaps a majority of the project area within the DLH. While the purposes of the MEDL and FWPP projects differ, consistency between the proposed actions will be maintained as each project moves through the analysis process to ensure there are no conflicts between proposals. Both the 4FRI project and the MEDL projects have or will receive separate section 7 consultation under the Act.

Of the 10,545 acres within the DLH and MM project areas, approximately 1,872 acres within the general project boundary are already covered under two previous NEPA decisions: Jack Smith/Schultz (2009) and Eastside (2007) Fuels Reduction and Forest Health Restoration Projects. The treatable areas covered under those decisions are either currently being implemented or will be implemented in the near future. For example, the Orion Task Order (from the Jack Smith/Schultz Decision, 2009) is within the project boundary in the DLH area and

is anticipated to be treated through the 4FRI contractor. Some areas within the Jack Smith/Schultz project area were either determined to be untreatable by ground-based equipment or were designated as No Treatment during that planning effort due to steep slopes and accessibility issues; those areas were reanalyzed in the FWPP DEIS.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Effects of the action on the Mexican spotted owl and its habitat

The following is a discussion of the potential effects from activities associated with FWPP on the Mexican spotted owl. Below we summarize the potential effects of thinning and prescribed burning, transportation, and disturbance (noise, smoke) on owls and their habitat.

Thinning and Prescribed Burning

Thinning and burning treatments were designed to move toward desired conditions as identified in the Recovery Plan (USFWS 2012a). Treatments follow the Recovery Plan (USFWS 2012a) in protected and recovery habitats with three exceptions: 1) trees greater than 24 inches dbh would be cut for cable corridors in recovery habitat; 2) work would need to be completed in PACs but outside of nest cores during the breeding season to reduce the duration of disturbance from implementation; and 3) hand thinning of trees less than 5 inches dbh in 80 percent of the Schultz Creek nest core and prescribed burning in the following nest cores within the project boundary outside of the Mexican spotted owl breeding season would be allowed: De Toro's, Lockwood, Moore Well-Rock Dike, Mormon Mountain, Mormon Mountain North, Weimer Springs, Schultz Creek, Mount Elden, Orion Spring, and Weatherford 2.

Table 11 summarizes the acres of each treatment type in PAC and recovery habitat. Table 12 summarizes the acres of proposed harvest methods by PAC and recovery habitat. All of the 3,954 acres of protected (PAC) habitat within the FWPP project area are proposed to be treated, including 122 acres of the Schultz Creek PAC nest core (thin up to 5 inches dbh, hand pile and burn down and dead wood). The remaining 663 acres of nest cores would be burn only. In recovery habitat, 2,698 acres would be treated with mixed conifer and ponderosa pine fuels reduction treatments. Of these recovery habitat acres, 131 acres are identified as recovery nest/roost replacement habitat and would be treated to improve their ability to provide nest/roost habitat. Ninety-four acres of recovery nest/roost replacement habitat would be hand thinned (uneven-aged prescription) and broadcast burned. The remaining 138 acres of recovery habitat and 37 acres of recovery nest/roost replacement habitat would be burned with no thinning.

Table 11. Acres of proposed treatment type in Mexican spotted owl habitat.

Treatment	PAC Acres	Recovery Habitat Acres
Mixed Conifer Fuels Reduction	0	1,141
Mixed Conifer Fuels Reduction Burn Only	0	138
Ponderosa Pine Fuels Reduction Hand Thinning	0	14
Ponderosa Pine Fuels Reduction	0	1,265
PAC Fuels Reduction (wet mixed conifer)	180	0
PAC Fuels Reduction	2,787	0
PAC Fuels Reduction- Hand Thinning	202	0
PAC Core Area Fuels Reduction-Burn Only	663	0
PAC Core Area Fuels Reduction- Hand Thinning	122	0
Recovery Nest/Roost Hand Thin	0	72
Recovery Nest/Roost Mechanical Thin	0	22
Recovery Nest/Roost Burn Only	0	37
Totals	3,954	2,689

Table 12. Acres of proposed harvest method by PAC and recovery habitat.

PAC/Habitat Category	Burn Only	Excaline[1]	Ground Based	Hand Thin	Helicopter	Skyline[1]	Steep Slope	Total
DeToros PAC	185*	0	330	120	0	0	28	663
Lockwood PAC	0	0	137	0	0	0	12	149
Moore Well-Rock Dike PAC	7*	0	14	0	0	0	0	21
Mormon Mountain PAC	0	0	122	26	0	0	0	148
Mormon Mountain North PAC	110*	0	434	34	0	0	32	611
Weimer Springs PAC	101*	0	481	0	0	0	0	582
Schultz Creek PAC	0	0	312	110 122*	83	0	32	659
Mount Elden PAC	102*	0	256	92	127	0	53	630
Orion Spring PAC	150*	0	128	0	0	0	49	328
Weatherford2 PAC	8*	0	98	0	57	0	0	163
Total Acres in PAC	**663**	**0**	**2,313**	**504**	**267**	**0**	**206**	**3,954**
Recovery Habitat	138	12	1890	14	299	114	90	2557

PAC/Habitat Category	Burn Only	Excaline[1]	Ground Based	Hand Thin	Helicopter	Skyline[1]	Steep Slope	Total
Recovery Nest/Roost	37	0	22	72	0	0	0	131
Total Acres in Recovery	**175**	**12**	**1,913**	**86**	**299**	**114**	**90**	**2,689**
Overall Total	**838**	**12**	**4,227**	**590**	**566**	**114**	**296**	**6,643**

[1] Acres treated by Skyline/Excaline harvest method include cable corridors
* Nest/roost core area acres

Thinning and/or prescribed burning activities in PAC and recovery habitat may indirectly affect Mexican spotted owls by affecting the habitat structure including snags, downed logs, woody debris, multi-storied canopies, and dense canopy cover. Under the proposed action, all treatments in PAC and recovery habitats would be designed to move toward the desired conditions as identified in the Recovery Plan (USFWS 2012a). The Forest Service conducted models that show that the treatments would move toward development of desired conditions both immediately after treatment and continuing over the next 20 to 40 years. Treatments would be designed to maintain large snags and large logs and develop trees into the larger size classes. Snags would not be targeted for removal except where necessary for cable corridor locations and safety requirements in areas where trees would be felled by hand and removed by cable or helicopter. Trees greater than 18 inches dbh would not be cut in PAC or recovery nest/roost habitat, and trees greater than 24 inches dbh would not be cut in recovery habitat except where necessary for cable corridor locations.

Skyline logging uses a system of cables to drag whole logs from the cutting unit to a roadside landing. It is used on sites that are too steep for ground based operations. Roughly parallel "corridors" for the skyline are placed every 100 to 140 ft. These corridors are approximately 12 ft wide and all trees must be removed from the corridor to facilitate safe removal of the logs. Much of the area to be logged this way contains large (greater than 24 inches dbh) pre-settlement trees and snags. The Forest Service has estimated that approximately 88 acres (3 percent) of recovery habitat in the project area would be denuded by the cable/skyline logging. None of these 88 acres is located in recovery nest/roost replacement habitat. The Recovery Plan (USFWS 2012a) recommends retaining trees greater than 24 inches dbh in recovery habitat. The Forest Plan amendment that would allow for this would allow for the removal of approximately 108 trees greater than 24 inches dbh in the DLH. No cable corridors are proposed in PAC habitat in DLH or on MM, or in recovery habitat on MM.

In addition, cable and helicopter logging requires that all hazard trees be removed from the entire area that would be cable or helicopter logged to provide for safety of personnel on the ground outside of protected (closed cab) machinery. Conversely, discussions with a logging company helicopter pilot during a FWPP site visit indicated few snags would need to be removed with the exception of areas around log landings (email from Robert Rich 11/12/2014). To minimize the removal of snags, the Forest Service has agreed to identify patches of snags and live trees up to 10 acres in size that will not be treated in areas proposed for cable and helicopter logging to allow for retention of snags in these areas. Not taking into account the retention of snags within these patches, there could be approximately 267 acres (7 percent of the protected habitat within the project) in protected habitat and 425 acres of recovery habitat acres (14 percent of the

recovery habitat within the project) where all snags could be removed in order to provide for worker safety. Despite the removal of these snags, Forest Service modeling indicates that mixed conifer protected and recovery habitats would continue to meet LRMP desired conditions for snag numbers. There would be no change to snag densities from cable and helicopter logging in ponderosa pine-Gambel oak recovery habitat as these activities are not proposed within this habitat.

Under the proposed action, the removal of snags and trees greater than 24 inches dbh would occur. Again, Forest Service modeling indicates that following treatment there will still be enough large trees to meet the LRMP desired conditions. Conservation Measures such as retaining snag patches, large trees with dead tops, cavities, and lighting strikes wherever possible will protect existing snags and provide for replacement snags. Monitoring would allow for the creation of additional snags in those areas determined to be deficient.

A benefit of cable and helicopter logging would be the reduction in ground disturbance from heavy machinery on steep slopes, which would minimize soil compaction, rutting, and/or exposure of bare mineral soil. The protection of soil on these steep slopes should allow for quicker herbaceous recovery post-logging.

Prescribed fire, the deliberate application of fire to reduce forest fuels and reestablish fire as a process, as stated above, is also part of the proposed action. Effects from prescribed burning in PAC and recovery habitats are difficult to quantify due to the uncertainty inherent in prescribed fire. Design features are in place to minimize the loss or modification of large trees, snags, and logs during all prescribed burning treatments. In the process of applying fire deliberately to this landscape, past experience and research have shown that large logs, snags, large trees, and Gambel oaks – all key habitat components of Mexican spotted owl habitat - may be lost or damaged during these activities (Horton and Mannan 1988).

Randall-Parker and Miller (2002) monitored the effects of prescribed fire in ponderosa pine forest on snags, down logs, Gambel oaks, and old ponderosa pine trees at five sites on two national forests (Coconino and Kaibab) and a national monument (Walnut Canyon). All burns were conducted in the fall. At all sites except one, some snags were lined (i.e., duff and debris raked away from the base of the dead tree). Results included the following:

- Twenty-one percent of all snags monitored were consumed by fire or converted to logs, and the range of loss across sites was 12 to 38 percent. Nine snags were also created by fire: six of these were old-growth trees that were converted from live to dead trees and two were Gambel oaks.
- Fifty-three percent of all logs monitored were consumed by fire (lost). Log loss did not differ by species.
- Six percent of the 282 Gambel oaks greater than ten inches dbh were lost, and loss ranged from zero to nine percent across the five sites.
- Old growth tree loss across the sites ranged from zero to six percent.

Another study conducted as part of the Birds and Burns Network (Saab et al. 2006) also evaluated the magnitude of change in the quantities of downed wood, snags, and trees within one year after prescribed burn treatments in the Southwest. Study areas were located in ponderosa pine forests in six treatment units located on the Apache-Sitgreaves, Coconino, Kaibab, and Gila NFs. Although few of the results were statistically significant at $p \leq 0.05$, results included the following:

- Nearly half of large downed wood (≥9 inch large end diameter) was consumed by prescribed fire. The authors surmised that drought conditions, followed by low wood moistures prior to fire treatments, may have contributed to the large loss of downed wood.
- Overall tree densities were also significantly reduced after fire treatments. However, the greatest reduction in tree densities was in the smallest size classes (<3 inches dbh and ≥3 to <9 inches dbh), with little change in larger (≥9 inches dbh) tree densities. Small diameter trees tend to function as ladder fuels in dense stands and can carry flames into the crowns of mature trees; therefore, the removal of these smaller trees is likely to reduce the likelihood of stand-replacing fire, which is one goal of the proposed action. Large tree (≥9 inches dbh) densities changed relatively little.
- Smaller snag (<9 inches dbh) densities increased 30 to 60 percent. With time, these dead trees could contribute to increased risk of spot fires.

In summary, thinning and prescribed burning is expected to reduce the risk of wildfire by reducing accumulations of fuels, but it will also modify and/or result in the loss of the key habitat components that comprise Mexican spotted owl habitat, both in PAC and recovery habitat. Design features/conservation measures will be implemented in an attempt to minimize these losses, but it is difficult to reduce and protect fuels on the same piece of ground. We do think that fire staff involved in implementing FWPP have gained experience over the years and will use best management practices to ensure that low severity fire effects are achieved. In addition, burning also increases vegetative diversity, which may result in a more diverse and productive prey base. However, based upon the number of acres proposed for burning in areas with fairly high levels of coarse woody debris, we think that there is a likelihood that key habitat components will be unintentionally lost to fire and that this could result in short-term adverse effects to Mexican spotted owls.

Transportation and Roads

Maintaining, using, and constructing a transportation system to move people, equipment, and forest products on and off the Coconino NF in order to implement FWPP will result in effects to owls. Effects from road maintenance and construction, high volumes of traffic, and decommissioning can result in minor impacts to habitat (widening, tree removal, fill and grading), noise disturbance to owls in the presence of large amounts of traffic, and possible death from collisions of owls and vehicles. Some temporary road construction and maintenance may occur during the Mexican spotted owl breeding season within PACs. However, no roads, including temporary roads, will be built in nest cores or in recovery nest/roost replacement habitat.

Our assessment of potential disturbance to Mexican spotted owls and their habitat from road-related activities goes beyond the level of occupied habitat or total owl habitat. The risk of collisions extends well-beyond where owls nest and roost, and also includes all areas where they could be foraging, seasonally migrating, or dispersing through. Most logging traffic associated with FWPP would occur during day time hours when owls are not as mobile; however there could be occasions when trucks are operating at times when owls may be foraging in the area during the late afternoon or early morning. As a general rule, logging trucks usually begin their trip out to the harvest site pre-dawn and run until dark, particularly during summer months. In the winter, we would also expect that trucks would run when temperatures are coldest and road surfaces are frozen, which is typically in the pre-dawn and dusk hours. Mexican spotted owls are vulnerable to collisions with trucks because they are active in the late afternoon (two hours or so pre-sunset) to early morning (two hours or so post-sunrise) when they are actively foraging and defending their territories. Overall, we do not have information regarding how frequently owl-vehicle collisions might occur. However, there is potential risk from implementation of this project due to the level of truck traffic that will occur in Mexican spotted owl habitat.

Main haul routes have been identified and include Forest Roads (FR) 420, 556, and 557 for DLH and FR 132, 132A and 648 for MM. FR 420, 132, 132A and 648 pass within 0.25-mile of Mexican spotted owl nest/roost locations, increasing the potential for vehicle-related disturbance to nesting owls and collisions. Hauling within the DLH may occur within 0.25 mile of the Schultz Creek nest or roost locations during the breeding season. Schultz Creek road could be used to haul approximately 5,200 truckloads within 0.25 mile of the known roost location. Hauling of logs from MM may occur within 0.25 mile of Weimer Spring, DeToros, Archies, Mormon Mountain, and Moore-Well Rock Dike nest/roost locations during the breeding season. For Schultz, Archies, Mormon Mountain and Moore Well-Rock Dike PACs, the haul routes skirt the 0.25 mile buffer of known nests and roosts. But for Weimer Springs and DeToros PACs, the 132A haul route cuts through the buffers, increasing the potential for disturbance. There would be an estimated 4,700 truckloads that could haul on these routes. This disturbance would occur consistently (greater than twice per hour) for an extended period of time (greater than an hour) and could influence reproductive success if owls are nesting.

The proposed action would mechanically treat 4,727 acres in the DLH and 2,393 acres on MM, which roughly correlates to a maximum of 9,000 and 4,700 truckloads respectively of logs that would potentially be hauled adjacent to these PACs. Based on a normal operating season of April 15 to November 30 (150-210 days) and assuming mechanical treatments accomplish eight acres per day, helicopter logging 10 acres per day, and skyline and excaline yarding accomplish two acres per day, it could potentially take from 3.8 to 5.3 years (breeding seasons) to complete implementation in the DLH and 1.5 to 2.1 years (breeding seasons) to complete implementation on MM.

While no temporary roads would be constructed within any owl nest cores, there would be approximately 4.8 miles of temporary roads constructed within PAC habitat and another 1.0 miles of road reconstruction. No temporary roads would be constructed in recovery nest/roost replacement habitat, but there would be approximately 6.1 miles of temporary road construction within recovery habitat and another 0.9 miles of road reconstruction in order to accomplish thinning treatments. All temporary roads would be rehabilitated after harvesting has been completed.

Disturbance

Implementation of FWPP is expected to result in disturbance effects during the breeding season. Conservation measures would minimize this disturbance by eliminating activities in nest cores during the breeding season where owls are documented to nest and roost. The intention of allowing activities during the breeding season within PACs would be to reduce the number of years (breeding seasons) Mexican spotted owls would be affected by project disturbances while allowing completion of the project to take place as quickly as possible. Activities that could result in disturbance to nesting, roosting, and foraging Mexican spotted owls could be caused by thinning and burning, helicopter flights, road construction and maintenance, hauling harvested forest materials, and road rehabilitation.

There are a growing number of studies attempting to describe and quantify the impacts of non-lethal disturbance on the behavior and reproduction of wildlife, and Mexican spotted owls in particular. Delaney et al. (1997) reviewed literature on the response of owls and other birds to noise and concluded the following: 1) raptors are more susceptible to disturbance-caused nest abandonment early in the nesting season; 2) birds generally flush in response to disturbance when distances to the source are less than approximately 200 ft and when sound levels are in excess of 95 dBA; and 3) the tendency to flush from a nest declines with experience or habituation to the noise, although the startle response cannot be completely eliminated by habituation. Delaney et al. (1999) found that ground-based disturbances elicited a greater flush response than aerial disturbances. Delaney and Grubb (2004) determined that spotted owls are capable of hearing sounds from road maintenance equipment to a distance of at least 0.25 mile. Our guidance is to limit potentially disturbing activities to areas ≥0.25 mile from Mexican spotted owl nest sites during the breeding season (March 1 - August 31). This corresponds well with the Delaney et al.'s (1999) 0.25 mile threshold for alert responses to helicopter flights. In addition, Delaney et al. (1999) found that Mexican spotted owls did not flee from helicopters when caring for young at the nest, but fled readily during the post-fledgling period. This may be a result of optimal fleeing decisions that balance the cost-benefit of fleeing. Frid and Dill (2002) hypothesize that this may be explained using predator risk-disturbance theory and perhaps the cost of an adult spotted owl fleeing during the nestling period may be higher than during the post-fledgling period.

There is a potential for owls to relocate because of noise disturbance during treatment activities. No mechanical treatments would occur within the Schultz Creek nest core during the breeding season (unless non-nesting is determined), but treatments will occur in the remaining PAC acres during the breeding season. Treatments within individual PACs would be limited to no more than two breeding seasons, which is expected to reduce the duration of potential disturbance to breeding owls.

The use of helicopter logging would require landings where trees are processed at the landing area. As stated above, Delaney (1999) indicates that a 344 ft buffer zone for helicopter overflights would minimize impacts of these overflights on Mexican spotted owls. Since no helicopters would be used to harvest trees in the MM project area, there would be no potential for noise disturbance from helicopters to owls in MM. However, all four PACs in the DLH area (Schultz Creek, Mount Elden, Orion Spring, and Weatherford 2) and within helicopter flight paths could be impacted. Estimated production rate for helicopter logging is about 10 acres per

day. Implementation of all proposed helicopter logging treatments within PAC and recovery habitats in the DLH would likely exceed 56 days in duration. However, a conservation measure to limit thinning and logging in each PAC to no more than two breeding seasons would limit the duration any one PAC would be impacted by helicopters. An implementation plan would be designed to ensure helicopter operations (i.e., helicopter landing locations, flight patterns) would minimize impacts to owls, especially during the breeding season.

Smoke from broadcast and pile-burning could also temporarily disturb Mexican spotted owls. Pile burning occurs during the winter and is not expected to result in disturbance to nesting owls. Broadcast (prescribed) burning would be managed to minimize the accumulation of smoke in PACs during the breeding season (see Conservation Measures). Short-term impacts from smoke would be reduced by coordination and timing and type of burning with wind direction, topography, time of year, and distance to PACs. Initial entry burning would not occur in nest cores during the breeding season, and burning would be restricted during the breeding season in areas that may create smoke impacts to occupied PACs. Prevailing southwest winds and the topography of the area typically act to lift smoke, carrying it away from ignitions sites. PACs on DLH and MM are on raised topographic features (mountains) and are not expected to have smoke settle in them long enough to cause discernable effects to owls because of air movement in these landscape-scaled features.

Summary

The FWPP has done an excellent job of including measures to protect the Mexican spotted owl and its habitat by deferring management activities in core areas during the breeding season, planning for low severity fire effects in PACs, and attempting to minimize breeding season disturbance to Mexican spotted owls from proposed activities.

Even with these efforts, however, the FWPP has the potential to negatively affect the owl and its habitat when implemented. There is likely to be short-term disturbance to breeding owls as thinning activities would occur during the breeding season (even with the substantial efforts included to minimize these effects), some loss of key habitat components (large trees, snags, and logs), and some degree of potential for direct fatality from vehicular collisions due to the significant increase in logging truck traffic. Implementation of the project should result in benefits to the owl through habitat enhancement and fire risk reduction. The jointly developed monitoring plan will assist in tracking the effects of the action to owls and their habitat. Because there currently is uncertainty regarding treatment effects and risks to owl habitat with or without forest treatment until rigorous monitoring results from projects such as FWPP have been compiled and analyzed, we will continue to struggle with how to conduct thinning and burning activities in occupied and suitable owl habitat. Therefore, the FWPP gives us a unique opportunity to learn about treatment effects to the Mexican spotted owl and its habitat, as recommended in the Recovery Plan (USFWS 2012a).

Effects of the action on Mexican spotted owl critical habitat

In our analysis of the effects of the action on critical habitat, we consider whether or not a proposed action will result in the destruction or adverse modification of critical habitat. In doing so, we must determine if the proposed action will result in effects that appreciably diminish the

value of critical habitat for the recovery of a listed species. To determine this, we analyze whether the proposed action will adversely modify any of the PCEs that were the basis for determining the habitat to be critical. To determine if an action results in adverse modification of critical habitat, we must also evaluate the current condition of all designated CHUs, and the PCEs of those units, to determine the overall ability of all designated critical habitat to support recovery. Further, the functional role of each of the CHUs in recovery must also be considered because, collectively, they represent the best available scientific information as to the recovery needs of the species.

Below, we describe the PCEs related to forest structure and maintenance of adequate prey species and the effects from implementation of FWPP. The PCEs for steep-walled rocky canyonlands are not analyzed in this BO because this habitat does not occur within the action area.

All critical habitat acres (6,929 acres) within the FWPP treatment area are proposed for either thinning and/or prescribed burning.

Primary Constituent Elements related to forest structure:

PCE: A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 percent to 45 percent of which are large trees with dbh of 12 inches or more.

Effect: Actions implemented under the proposed project are expected to retain the range of tree species (i.e., conifers and hardwoods associated with Mexican spotted owl habitat) and would not reduce the range of tree sizes needed to create the diverse forest and multi-layered forest canopy preferred by owls. In addition, these actions are designed to grow larger trees by reducing competition among trees for nutrients, sunlight, and moisture. Some loss of trees of all types and dbh size classes would occur during mechanical thinning and prescribed fire activities. However, actions implemented under the FWPP are expected to maintain a range of tree species and sizes needed to maintain this PCE in PACs and recovery habitat across the treatment area because the Forest Service is implementing the Recovery Plan (USFWS 2012a) guidelines that strive to retain large trees, canopy cover appropriate for owl habitat, and a diverse range of tree species (such as Gambel oak in pine-oak forests). There will be a complete loss of trees (including snags and large trees) on 88 acres in recovery habitat due to cable corridors. This correlates to approximately 108 live trees ≥24 inches dbh; however, because these effects will be small in extent and intensity, the function and conservation role of this PCE would not be compromised by the proposed action. These treatments that will reduce key habitat components in the short-term are also designed to develop an uneven aged structure and to increase the number of large trees in critical habitat over time. This will result in long-term benefits to this PCE and owl habitat.

PCE: A shade canopy created by the tree branches covering 40 percent or more of the ground.

Effect: We expect that tree shade canopy would be reduced following thinning and burning treatments implemented. Canopy cover would be eliminated on 88 acres where cable corridors are needed in recovery habitat. However, we do not expect canopy cover in Mexican spotted

owl forested habitat to be reduced below 40 percent because the Forest Service would retain multi-layered canopies where they occur in protected and recovery habitat and patches of regeneration would be interspersed throughout the thinning treatment areas, which, over time would contribute to development of multi-layered canopy structure. We would expect that some reduction in existing canopy cover (5 to 10 percent) may actually aid in increasing understory herbaceous vegetation and forb production, which could benefit Mexican spotted owl prey species. Because recovery habitat would retain canopy closure of 40 percent or more with a goal of developing larger trees, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE: Large, dead trees (snags) with a dbh of at least 12 inches.

Effect: There would be a loss of snags within areas logged by helicopter and cable logging. Additionally, large snags could be both created and lost following proposed prescribed burning (Horton and Mannan 1988, Randall-Parker and Miller 2002). Snags would be created as large and small trees are killed through prescribed burning. This may benefit Mexican spotted owls, particularly their prey species as most snags created through the prescribed fire are likely to be ≤9 inches dbh (Saab et al. 2006). Snags used by Mexican spotted owls for nesting are typically very old, large dbh, highly decayed snags with cavities. Snags with these characteristics tend to be limited in ponderosa pine and mixed conifer forests in northern Arizona (Ganey and Vojta 2004). In individual burning projects, the Forest Service would attempt to minimize loss of these large snags through conservation measures (such as lining or using lighting techniques to avoid snags). The Forest Service has also agreed to identify patches of snags up to 10 acres in size in advance of treatment unit layout in cable and helicopter logging areas. This would allow for the protection of patches of snags when snags must be removed to protect workers in other treatment areas. Conservation measures/design features will be implemented to protect the largest and oldest snags. Therefore, although we anticipate there would be a measurable loss of snags due to implementation of the FWPP, efforts to protect this rare resource would be made to minimize this loss, and the function and conservation role of this PCE would not be compromised by the proposed action.

Primary Constituent Elements related to maintenance of adequate prey species:

PCE: High volumes of fallen trees and other woody debris.

Effect: Fallen trees and woody debris would likely be reduced by the proposed burning treatments (broadcast, piling, and maintenance burning) as reduction of coarse woody debris is a component of the proposed action. Research and monitoring indicates that prescribed burning could reduce logs by as much as 30 to 50 percent (Randall-Parker and Miller 2002, Saab et al. 2006). The loss of larger logs could result in short-term adverse effects to this primary constituent element and could result in localized impacts to prey species habitat. Loss of large logs will be minimized through site preparation, implementation planning, and ignition techniques. However, across the treatment area, it is likely that prescribed burning would also create fallen trees and woody debris as trees are killed post-burn and fall and in areas where large snags are cut for safety purposes. In addition, current data for many of these areas indicates that there is an excess supply of coarse woody debris due to the exclusion of frequent, low-severity fire, which can increase the likelihood of high-severity fire within recovery habitat. Therefore,

some removal of woody debris would result in an overall benefit to the function and conservation role of this PCE, though short-term adverse effects would likely occur within some areas.

PCE: A wide range of tree and plant species, including hardwoods.

Effect: We expect this PCE would be positively affected by the actions taken under the FWPP. Plant species richness would increase following thinning and/or burning treatments that result in small, localized canopy gaps. The FWPP includes conservation measures that focus on retaining Gambel oaks and other hardwood and coniferous species but some level of short-term loss could occur during logging operations, prescribed fires, or road construction/maintenance. However, current levels of Gambel oak are estimated to be above historical levels, and the function and conservation role of this PCE would not be compromised by the proposed action.

In addition, although aspen is not a cover type known to be used by Mexican spotted owls, it occurs in inclusions within PAC and recovery habitat. Twenty-two acres of aspen treatment are proposed within critical habitat. These treatments will enhance Mexican spotted owl prey species habitat, albeit in a relatively small area, within the CHU.

PCE: Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

Effect: Short-term decreases in plant cover would result from prescribed burning. We expect long-term increases in residual plant cover because fire treatments would provide conditions suitable for increased herbaceous plant growth by removing a thick layer of dead plant debris within treated areas. The mosaic effect created by burned and unburned areas and by opening up small patches of forest within protected habitat is also expected to increase herbaceous plant species diversity (Jameson 1967, Moore et al. 1999, Springer et al. 2001) and, in turn, assist in the production and maintenance of the Mexican spotted owl prey base. The combination of low-intensity prescribed burns and thinning during restoration projects would most likely result in only short-term effects to the Mexican spotted owls with regard to modifying prey habitat within treatment areas. In frequent-fire landscapes, herbaceous understory response and plant regeneration tends to be positive following tree removal and prescribed fire (Springer et al. 2001). There is the potential for wild and domestic ungulates to have adverse effects on the production of plant cover post-burning if ungulates were allowed to graze burned areas too soon following fire. However, the Coconino LRMP includes desired conditions and guidelines to maintain healthy levels of forage and for managing livestock following prescribed fire. Therefore, the function and conservation role of this PCE across the FWPP area would not be compromised by the proposed action.

Effects of the action on the role of critical habitat in recovery

Adverse effects and associated incidental take from the FWPP are not expected to negatively affect Mexican spotted owl recovery or further diminish the conservation contribution of critical habitat to the recovery of the Mexican spotted owl. The FWPP includes objectives and species protection measures in accordance with the Recovery Plan (USFWS 2012a). These actions were identified by the Recovery Team as being necessary to conserve and recover the Mexican spotted

owl, and the FWPP will implement these actions in designated critical habitat. Designated critical habitat includes all PACs and recovery habitat (unoccupied suitable spotted owl habitat) within the project area. These actions include the following:

- The Forest Service within the project area has and continues to designate 600 acres surrounding known Mexican spotted owl nesting and roosting sites. PACs are established around owl sites and are intended to protect and maintain occupied nest/roost habitat. Nesting and roosting habitat is rare across the range of the Mexican spotted owl, and by identifying these areas, which are also critical habitat, for increased protection, the Forest Service is aiding in recovery.

- The FWPP has identified and is managing mixed conifer and ponderosa pine-oak forests that have potential for becoming Mexican spotted owl recovery nest/roost replacement habitat, or are currently providing habitat for foraging, dispersal, or wintering habitats. Nesting and roosting habitat is a limiting factor for the owl throughout its range. By managing critical habitat for future nest/roost replacement habitat, the Forest Service is aiding in recovery.

- The FWPP's intent is to integrate the best available recovery habitat management objectives where possible into the proposed fuels reduction treatments with the overall goal to protect owl PACs from high-severity wildland fire and to conduct actions to improve forest sustainability (e.g., thinning and prescribed burning). This management will ensure that Mexican spotted owl habitat continues to exist on the forest and that critical habitat will continue to retain its function for conservation and recovery of the owl. In addition, the FWPP includes a monitoring plan that will aid us in learning how to conduct thinning and burning activities in PACs.

Over the long-term, these actions should increase the sustainability and resiliency of Mexican spotted owl habitat (particularly through fuels management and forest restoration actions). Therefore, implementation of the FWPP is not expected to further diminish the conservation contribution of critical habitat to the recovery of the Mexican spotted owl.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Climate change, in combination with drought cycles, is likely to exacerbate existing threats to all these species' habitats in the southwestern U.S., now and into the foreseeable future. Increased and prolonged drought associated with changing climatic patterns will adversely affect streams and riparian habitat by reducing water availability and altering food availability and predation rates. The continued warming and drying of forested habitats will likely alter vegetation structure and composition and reduce the amount and quality of nesting and roosting habitat for Mexican spotted owls in the action area. However, implementation of forest restoration and

fuels reduction projects such as FWPP should help to mitigate some of the long-term effects of climate change on Mexican spotted owl habitat.

The main non-Federal activities that may impact the Mexican spotted owl habitat are loss of habitat through development of private inholdings for home sites and related disturbance at these properties. Within these private lands, there is the potential for activities that create disturbance or removal of Mexican spotted owl habitat components on private lands, such as roads, grazing, mining, recreation activities, and fuel treatments. Mexican spotted owl critical habitat has not been designated on non-Federal lands; there are no anticipated cumulative effects to Mexican spotted owl critical habitat from non-Federal actions. The Navajo Nation owns a 140-acre parcel in the middle of the DHL project area. The parcel borders the Mount Elden PAC. The tribe has partnered with the City of Flagstaff to complete vegetation treatments on about 105 acres within this parcel. Thirty-five acres of hand thinning was completed in the fall of 2014 with piles planned to be burned in 2016. The remaining 70 acres is planned for mechanical treatments in coordination with actions on Forest Service managed-lands. There are no plans for development of the parcel.

CONCLUSION

This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the Act to complete the following analysis with respect to critical habitat.[1]

Mexican spotted owl and critical habitat

After reviewing the current status of the Mexican spotted owl and its critical habitat, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the FWPP will not jeopardize the continued existence of the Mexican spotted owl, and will not destroy or adversely modify its designated critical habitat. We base our conclusion on the following:

1. The FWPP will strive to implement the Recovery Plan (USFWS 2012a) and manage for Mexican spotted owl recovery on the Coconino NF.

2. Desired conditions and guidelines in the FWPP recognize the need to reduce the potential for landscape level, stand-replacing fire in ponderosa pine- oak and mixed conifer forests that the Mexican spotted owl occupies. These efforts to improve forest condition and sustainability should reduce the risk of high severity fire and subsequently, reduce the loss of owl habitat, particularly nest/roost habitat.

3. Based on the discussion provided in the Effects to Mexican Spotted Owl Critical Habitat section above, CHU UGM 14, which will be affected by treatments conducted under

[1] See December 27, 2004, memo from Acting Director Fish and Wildlife Service. This analysis is also consistent with our proposed definition of "destruction or adverse modification of critical habitat" published in the *Federal Register* on May 12, 2014 (79 FR 27060).

FWPP, will continue to serve the function and conservation role of critical habitat for the Mexican spotted owl.

The conclusions of this BO are based on full implementation of the project as summarized in the "Description of the Proposed Action" section of this document, including the standards and guidelines that apply to the action and serve as conservation measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Mexican spotted owl

For the purpose of evaluating incidental take of Mexican spotted owls from the action under consultation, incidental take can be anticipated as either the direct fatality of individual birds or the alteration of habitat that affects behavior (e.g., breeding or foraging) of birds only temporarily, or to such a degree that the birds are considered lost as viable members of the population and thus "taken." Birds experiencing only temporary or short-term effects may fail to breed, fail to successfully rear young, or raise less fit young; longer-term disturbance may result in owls deserting the area because of chronic disturbance or because habitat no longer meets the owl's needs.

We anticipate that the proposed action is reasonably certain to result in incidental take of Mexican spotted owls. However, it is difficult to quantify the number of individual owls potentially taken because: (1) dead or impaired individuals are difficult to find and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species could change over time through immigration, emigration, and loss or creation of habitat; and (3) the species is secretive and we rarely have information regarding the number of owls occupying a PAC and/or their reproductive status. For these reasons, we will attribute incidental take at the PAC level. This fits well with our current section 7 consultation policy, which provides for incidental take if an activity compromises the integrity of an occupied PAC to an extent that we are reasonably certain that incidental take occurred (USFWS 1996). Actions outside PACs will generally not result in incidental take because we are not reasonably certain that Mexican spotted

owls are nesting and roosting in areas outside of PACs. We may modify this determination in cases when areas that may support spotted owls have not been adequately surveyed and we are reasonably certain spotted owls are present.

Amount of Take

Based upon analyses of the effects of Forest Service projects within previous forest restoration BOs, we anticipate the majority of incidental take for actions implemented under the FWPP proposed action will be in the form of short-term harassment. Owls experiencing short-term harassment may fail to successfully rear young in one or more breeding seasons, but will not likely desert the area because of a short-term disturbance (Delaney et al. 1999); harassment is measured as owls taken associated with a specific number of PACs. Incidental take in the form of harm is also anticipated, albeit at a lesser amount than take from harassment and is measured as the number of owls taken. For this project harm would be the direct fatality of individual birds.

There are at least 10 PACs that could be affected by FWPP. All PACs have acreage that will be thinned and prescribe burned.

Using available information as summarized within this document, we have identified conditions of incidental take for the Mexican spotted owl associated with implementation of the FWPP. Based upon the potential for incidental take to occur as part of implementation of the project, we anticipate the following incidental take for the proposed action, which is in addition to previously authorized incidental take resulting from ongoing projects or projects that have yet to be implemented:

- We anticipate the take of one pair of Mexican spotted owls and/or associated eggs/juveniles in the form of harassment in up to six PACs per year due to a single (one breeding season) or short-term (one to three breeding seasons) disturbance (non-habitat altering action that disrupts or is likely to disrupt owl behavior within the PACs) or habitat alteration (e.g., short-term loss of key habitat components) associated with implementation of the proposed action. We do not expect that each year owls associated with six PACs may be taken as a result of short-term disturbance and/or habitat alteration; however, we think the potential is there in any given year. The disturbance and short-term habitat modification generated by activities associated with FWPP is likely to interrupt, impede, or disrupt normal behavior patterns to the point that breeding and feeding activities are impacted over the course of one to three breeding seasons. Incidental take is exceeded if owls associated within an individual PAC are harassed over the course of more than three breeding seasons or if owls associated with more than six PACs are harassed in one year as a result of this project. Under the 2012 LRMP BO we anticipated harassment of Mexican spotted owls associated with up to nine PACs per year (5 percent) of the 186 PACs on the NF due to a single or short-term disturbance. The only other incidental take we have anticipated under the LRMP BO is for the 4FRI Project (up to four PACs per year due to a single or short-term disturbance). Although cumulatively this allows for incidental take of up to 10 PACs per year, based upon the project implementation schedules, incidental take will not exceed nine PACs per year while the 2012 LRMP BO is in effect.

- In addition, we anticipate the incidental take of two Mexican spotted owls in the form of harm and/or direct fatality due to vehicular collision on average once every five years, for a ten-year period. Following the discovery of two fatalities, we will re-assess the project with the Forest Service and determine how to reduce fatalities. This incidental take is within the number of owls anticipated to be incidentally taken (harmed) under the 2012 BO for the Coconino NF LRMP.

EFFECT OF THE TAKE

In this BO, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the Mexican spotted owl. We have based this determination on the number of PACs with anticipated take from mechanical thinning and burning projects to be implemented under FWPP that could have short-term adverse effects, but long-term benefits to the Mexican spotted owl, and direct fatality that could occur from vehicular collisions.

No reasonable and prudent measures are included in this incidental take statement as the Forest Service has worked with us to incorporate the measures needed to minimize incidental take into the proposed action, including monitoring and reporting.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 4901 Paseo del Norte NE, Suite D, Albuquerque, NM 87113; 505-248-7889) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care and in handling dead specimens to preserve the biological material in the best possible state.

Certain project activities may also affect species protected under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. sec. 703-712) and/or bald and golden eagles protected under the Bald and Golden Eagle Protection Act (Eagle Act). The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when authorized by the FWS. The Eagle Act prohibits anyone, without a FWS permit, from taking (including disturbing) eagles, and including their parts, nests, or eggs. If you think migratory birds will be affected by this project, we recommend seeking our Technical Assistance to identify available conservation measures that you may be able to incorporate into your project. Please see Appendix C for our technical assistance to avoid take of bald or golden eagles.

For more information regarding the MBTA and Eagle Act, please visit the following websites. More information on the MBTA and available permits can be retrieved from http://www.fws.gov/migratorybirds and http://www.fws.gov/migratorybirds/mbpermits.html. For information on protections for bald eagles, please refer to the FWS's National Bald Eagle Management Guidelines (72 FR 31156) and regulatory definition of the term "disturb" (72 FR

31132) published in the Federal Register on June 5, 2007 (http://www.fws.gov/southwest/es/arizona/BaldEagle.htm), as well at the Conservation Assessment and Strategy for the Bald Eagle in Arizona (SWBEMC.org).

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that the Forest Service work with us to conduct Mexican spotted owl surveys over the next several years to attempt to determine how owls modify their territories in response to wildland fires on the Coconino NFs. This information will aid us in understanding the short- and long-term impacts of fire on the owl and its subsequent effect on the status of the species in the UGM EMU. Surveys should be coordinated with the FWS prior to implementation of any project.

2. We recommend that the Forest Service continue to work with us to design forest restoration treatments across the Coconino NF that protect existing nest/roost habitat from high-severity, stand-replacing fire, and enhance existing or potential habitat to aid in sustaining Mexican spotted owl habitat across the landscape. PACs can be afforded substantial protection from wildland fire by emphasizing fuels reduction and forest restoration in surrounding areas outside of PACs and nest/roost habitat.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in your request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required when discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to continue to coordinate with the Bureau of Indian Affairs in the implementation of this consultation and, by copy of this biological opinion, are notifying affected Tribes of its completion. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department.

We appreciate the Forest Service's efforts to identify and minimize effects to listed species from this project. For further information please contact Shaula Hedwall (928-556-2118) or Brenda Smith (928-556-2157). Please refer to the consultation number, 02EAAZ00-2013-F-0190, in future correspondence concerning this project.

Sincerely,

Brenda N Smith

for Steven L. Spangle
Field Supervisor

cc (electronic):
District Ranger, Flagstaff Ranger District, Coconino National Forest, Flagstaff, AZ
District Ranger, Mogollon Rim Ranger District, Coconino National Forest, Blue Ridge, AZ
Forest Biologist, Coconino National Forest, Flagstaff, AZ
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Flagstaff, AZ
Linda Otero, Director, Aha Makav Cultural Society Fort Mojave Indian Tribe, Mohave Valley, AZ
Rex Tilousi, Chairperson, Havasupai Tribe, Peach Springs, AZ
Leigh J. Kuwanwisiwma, Director, Hopi Cultural Preservation Office, Kykotsmovi, AZ
Loretta Jackson-Kelly, Director, Cultural Resources Department, Hualapai Tribe, Peach Springs, AZ
Alan Downer, Director, Historic Preservation Department, Navajo Nation, Window Rock, AZ
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Vincent Randall, Director, Apache Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Gertrude Smith, Director, Yavapai Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Linda Ogo, Director, Cultural Research Program, Yavapai-Prescott Indian Tribe, Prescott, AZ
Kurt Dongoske, Director, Zuni Heritage and Historic Preservation Office, Zuni, NM
Environmental Specialist, Environmental Services, Western Regional Office, Bureau of Indian Affairs, Phoenix, AZ

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APPENDIX A – FIGURES

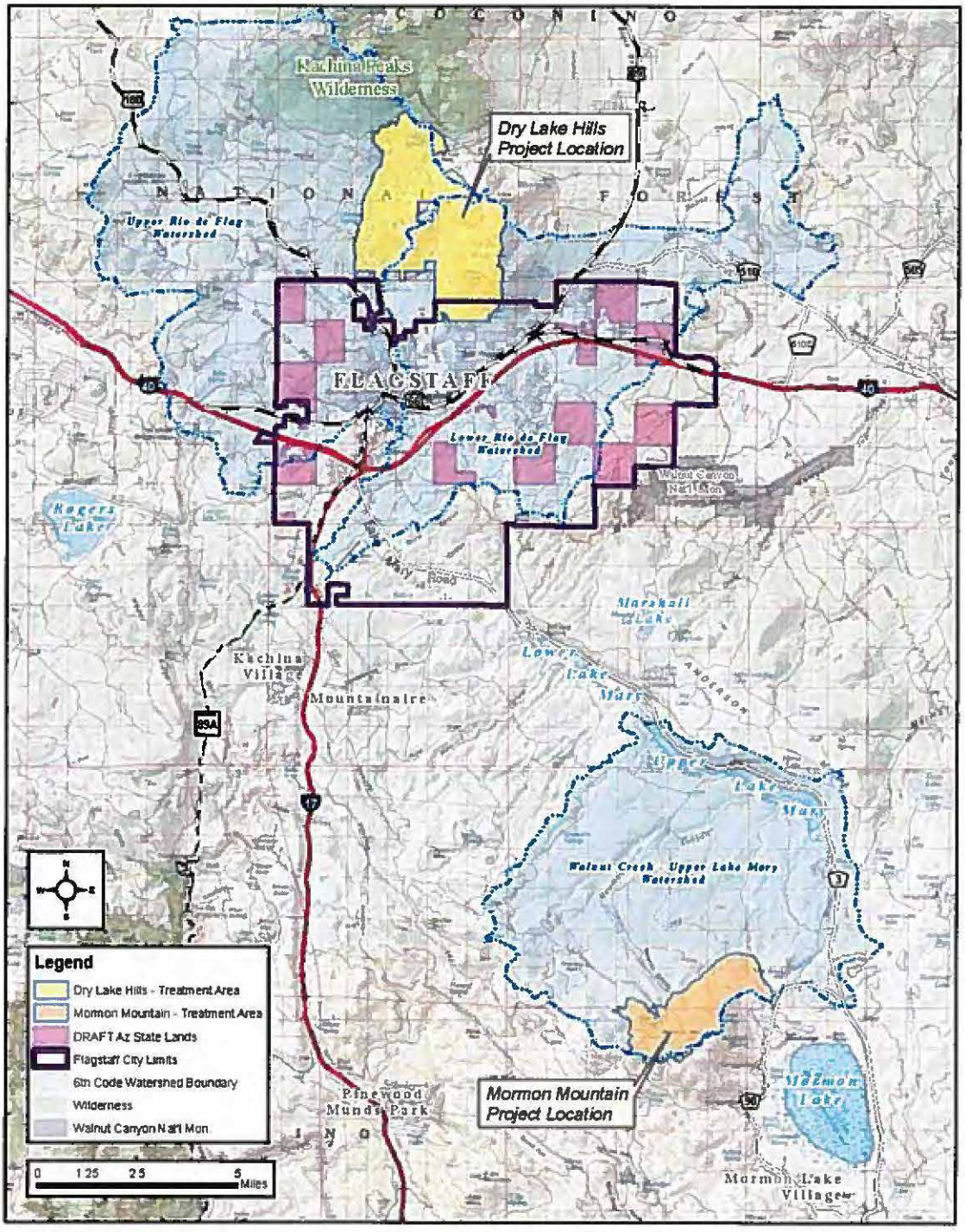

Figure 1. Vicinity map of the Flagstaff Watershed Protection Project.

Figure 2. Ecological Management Units for the Mexican spotted owl in the southwestern United States.

APPENDIX B - MEXICAN SPOTTED OWL MONITORING

As part of the Flagstaff Watershed Protection Project (FWPP), fuels reduction and prescribed burning activities will occur within Mexican spotted owl protected activity centers (PACs). Protected activity centers are occupied habitat. The effects of these treatments to owls and nesting/roosting habitat are not fully known. The Mexican spotted owl Recovery Team thinks that PACs can be afforded substantial protection by emphasizing fuels reduction and forest restoration in surrounding areas outside of PACs and nest/roost habitat; however it is recognized that in some cases protection of nest/roost habitat and human communities requires these actions to occur within PACs. The Mexican spotted owl Recovery Plan, First Revision (USFWS 2012a) provides guidance for these treatments and emphasizes the need for monitoring and feedback loops to allow management to be adaptive. Well-designed monitoring will provide valuable information on the effects of these activities on the owls and their habitat. Therefore, the Forest Service has been working with the U.S. Fish and Wildlife Service (FWS) to propose a monitoring plan that should help us begin to understand the effects of thinning and burning on Mexican spotted owls and their habitat.

The proposed monitoring plan would pair treated and untreated (reference) PACs within the Dry Lake Hills (n=3) and Mormon Mountain (n=3) portions of the project and compare occupancy rates, reproduction rates, and habitat changes.

Guiding Question:

- Do planned treatments (e.g., thinning, prescribed fire) affect occupancy and reproductive rates in treated versus untreated (reference) PACs?

Identified Response Variables:

- Owl occupancy rate (corrected for detection probability; the percent of PACs occupied before and after treatments).

- Owl reproductive output (the number of fledglings observed per adequately checked pair before and after treatments).

- Habitat change (the immediate effect of a treatment type on key variables selected from Table C.1 [USDI 2012, pp 276-277] showing description of desired conditions [DCs]) in forest and woodland cover types typically used by Mexican spotted owls for nesting and roosting. Analysis would incorporate what is retained as well as extent of change.

Planned Treatments:

- Treatments will likely be variable in spatial extent and intensity (intensity measured by degree of change in key habitat variables related to DCs [see Table C.1, USFWS 2012a]).

General Study Design Approach:

- For each treatment area (DLH and MM), monitoring will contrast a set of reference PACs (with no planned treatments) to a set of treatment PACs. Reference PACs match the environmental conditions in PACs where treatments are proposed, as closely as possible. Below is a list of the currently identified reference PACs; however, these are subject to change if owls cannot be located in the identified reference PACs.
    - For the DLH project area, treatments are proposed for the entire PAC in three PACs: Mt. Elden (040202), Schultz Creek (040206), and Orion Spring (040207). Additionally, treatments are proposed in a portion (163 acres) of the Weatherford 2 PAC. Three reference PACs are: Snowbowl (040205), Little Spring (040227), and East Bear Jaw (040233).
    - For the Mormon Lake project area, treatments are proposed for the entire PAC in three PACs: Mormon Mountain North (040508), Weimer Springs (040532), and DeToros (040533). Additionally, portions of Mormon Mountain (040551), Lockwood (040541), Moore Well-Rock Dike (040511) overlap with the project area (149, 148, and 20 acres respectively). Treatment PACs will be those with the entire PAC treated. Since the proposed areas for treatment are predominately mixed conifer, controls need to be similar. Potential reference PACs are Red Raspberry (040503), Dairy Springs (040507), Moore Well-Rock Dike (040511) which overlap with the project area. However, treatments would need to occur later in time.
    - Final determination of MM reference PACs will occur prior to installation of sampling plots and based on current monitoring data. Changes would be developed with FWS and modified as appropriate.
- Establish and install long-term forest monitoring plots in treated PACs in the FWPP area and untreated PACs outside of FWPP.
    - There are four treatment types proposed in PACs: Burn Only, PAC Fuels Reduction Mixed Conifer, PAC Fuels Reduction Hand Thinning and Nest Fuels Reduction. Sampling will be stratified by treatment type with long-term fixed plots randomly located within treatment types.
    - Long-term fixed plots will be randomly located in reference PACs where treatments are not proposed.
- Measure habitat change to calibrate treatments effects using the following desired condition variables (Table C.1):
    - Methods Outline (all sites):
        1. Establish and install long-term forest monitoring plots in treated PACs in the FWPP area and untreated PACs outside of FWPP:
            a. Sampling stratified by treatment type (~ 1 plot per 22 ac [9 ha]).

b. Long-term, fixed plots randomly located within treatment types within PACs.
c. Nested circular plot sampling; trees and shrubs:
    i. Standing dead trees (snags) = 0.20-ac (8712 ft^2) (0.08 ha).
    ii. Live trees ≥ 4.5 ft height = 0.10-ac (4356 ft^2) (0.04 ha).
    iii. Shrubs and trees < 4.5 ft height = 0.025=ac (1076 ft^2) (0.01 ha).
d. Fuels/coarse wood transects (x 2):
    i. 50 ft length:
        1. Moisture-lag classes (<0.25 in; .25-1.0 in; 1.0-3.0 in. +3 in. (sound/rotten).
        2. Diameter/length/location all +3 in. CWD.
e. Canopy cover:
    i. 50-ft line intercept (x 2).

- Sample response variables for owls each year, using a design that allows estimation of effects to occupancy, detection probability, and reproductive output.
    - Monitor treatment and reference PACs using the Mexican Spotted Owl Survey Protocol U.S. Fish and Wildlife Service, 2012.
- Sample timing:
    - PAC monitoring will be completed one year pre-treatment, during treatment year, and one, three, and five years post-treatment.
    - Vegetation sampling will be completed prior to treatments (as close as possible prior to implementation), one and five years post-treatment.

Analytic Approach:

- Simple treatment effect stratified by treatment type and geographic area/cover type.

Quality Control / Assurance:

- Vegetation monitoring has already begun in the DLH portion of the project, and information/lessons learned will be used to inform the monitoring for MM. Any changes will be developed with FWS and modified as appropriate.

APPENDIX C – TECHNICAL ASSISTANCE

This appendix contains recommendations to the Forest Service to reduce the likelihood of take of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) from implementation of the FWPP.

The final rule to remove the bald eagle from the Federal List of Threatened and Endangered Species was published in the Federal Register on July 9, 2007, and took effect on August 8, 2007. However, bald and golden eagles continue to be protected by the Bald and Golden Eagle Protection Act (Eagle Act). The Eagle Act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking eagles, including their parts, nests, or eggs. "Take" is defined under the Eagle Act as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" eagles. Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based upon the best scientific information available: (1) injury to an eagle; (2) a decrease in an eagle's productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or, (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior (USDI 2007).

FWS and the Forest Service jointly developed the following conservation measures to minimize impacts to bald and golden eagles in the project area. These measures are consistent with the strategies identified in the Conservation Assessment and Strategy for the Bald Eagle in Arizona (Driscoll et al 2006). We agree that implementation of the following measures will reduce the likelihood of take.

Bald eagles

- No cable or helicopter logging would occur in the MM project area where bald eagle potential habitat is known to occur, therefore, there would be no potential for noise disturbance.
- Prescribed burning will be coordinated spatially and temporally to limit smoke impacts to bald eagle breeding areas during the breeding season (if occupied). Prescribed burning in the MM project area of FWPP would only occur if ventilation is favorable and would be coordinated with the District Biologist and FWS.
- No aircraft used for logging would operate within 1,000 ft. of a nest during breeding season.
- Treatments would utilize ground-based harvesting across the majority of the project area. This would reduce the number of large trees and snags cut within potential bald eagle nesting/roosting habitat in the MM area. Since no helicopters would be used to harvest trees in the MM area, there would be no potential for noise disturbance from helicopters to bald eagles.

Golden eagles

- Known nest trees and nest sites, if occupied, will be protected from disturbance.
- There would be no direct effects to nesting golden eagles as the nearest nesting golden eagle is over one-half mile from the project, and noise generated from these activities is not expected to be audible at the nearest nest site. The nearest nest location occurs on a

cliff face on a raised topographic feature, and it is not expected that smoke would settle around the nest long enough to cause discernible effects to golden eagles because of the air movement away from this landscape scale feature.

- Spring or summer burning in the MM project area would be coordinated with the District Biologist and FWS personnel if either of the two golden eagle nests becomes occupied. Typically nesting can be confirmed by May and nests would be monitored prior to prescribe burning.
- Helicopter paths would be reviewed to exclude flights over occupied nest locations during the golden eagle breeding season

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jganey@fs.fed.us

Date: 14 June 2011

Don DeLorenzo
Director, Wildlife, Fish, and Rare Plants
Southwestern Region, US Forest Service
Albuquerque, NM

Dear Don:

I am writing you as my primary contact in coordinating activities between Rocky Mountain Research Station (RMRS) and the Southwestern Region (SW Region) relative to the study of Mexican spotted owls in the Sacramento Mountains, Lincoln National Forest (LNF). My purpose is to update you and other interested parties as to future options and limitations for RMRS.

As you know, RMRS, SW Region, and LNF have cooperated on studies of Mexican spotted owls in the Sacramento Mountains for approximately 20 years. Many of the results from these studies have been published, and both published and unpublished data have been shared with the forest and have provided empirical bases for recommendations in the Mexican spotted owl recovery plan.

As you also know, RMRS, SW Region, and LNF have cooperated on the current study for 10 years. SW Region provided the bulk of the funding, and committed to a 10-yr funding period ending this year. RMRS, in cooperation with LNF, has proposed extending the study and adding increased emphasis on implementing forest treatments in owl territories and monitoring the effects of those treatments on demographic parameters such as territory occupancy, survival, and reproduction. This proposal is very consistent with the direction forthcoming in the draft revision of the Mexican spotted owl recovery plan. Essentially, the revision provides opportunities to mechanically treat fuels within PACs, provided outcomes of the treatments are assessed through monitoring. To my knowledge, the Sacramento Mountains may be the only place in the southwest with rigorous pre-treatment data on owl demography, and consequently provide a great opportunity to move forward more quickly.

However, conducting this study requires continued funding, and discussions on that topic between LNF and SW Region are still ongoing. Pending the outcome of those discussions, RMRS is keeping options open by continuing all lines of data collection.

We cannot do this indefinitely, however, for several reasons. Should the SW Region decide to continue funding the study, RMRS will need lead time to process necessary administrative actions related to extending temporary appointments for crew leaders and renewing the lease on our Cloudcroft office. These (and other) actions require assistance from other shops within the Forest Service, and we need to provide them sufficient time to accomplish those actions.

Conversely, should the SW Region decide not to extend the study, RMRS will need time to close operations. All dedicated funding for the study currently expires as of 30 Sep 2011. Should that continue to be the case, we need to wrap up all field operations, pull all equipment from the field, organize all equipment and transport it to Flagstaff, terminate all study employees, and vacate our Cloudcroft office by that date. Again, accomplishing this body of work will require a block of time.

Consequently, we need to know whether or not the study is continuing, and need to know that in time to accomplish all required work. Given the extent of work involved in either extending or closing down the study, I estimate that we need an answer to this question by 15 July 2011. If we have no assurance of continued funding by that date, we will have no choice but to proceed with shutting down operations in Cloudcroft.

Please understand that I don't present this date as an ultimatum. I just want to ensure that you and other interested parties fully understand the limitations we're working under. We are very appreciative of the support we have received from both SW Region and LNF, understand that budgets are extremely tight these days, and will respect your decision no matter which way it goes.

I also understand that Regional budget commitments are made by committee. Again, I am writing you as our primary contact, understanding that you do not make funding decisions unilaterally. I also thank you personally for your support over the years. Please feel free to share this information with any interested parties, and feel free to contact me should you have any questions.

Sincerely,
/s/ Joseph L. Ganey
Research Wildlife Biologist

cc: Robert Trujillo, James Duran, Jack Williams, Mickey Mauter, Gary Ziehe, Rhonda Stewart, and Andrew Sanchez Meador, LNF
Bill Block, RMRS

Defendants' Exhibit E

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ARIZONA

WildEarth Guardians, Plaintiff, v. U.S. Fish and Wildlife Service, *et al.*, Defendants.	)	No. CV-13-00151-RCC

DECLARATION OF SHAULA J. HEDWALL

I, Shaula J. Hedwall, Senior Fish and Wildlife Service Biologist, U.S. Fish and Wildlife Service, Arizona Ecological Services Office, Southwest Region, declare as follows:

1. As a Fish and Wildlife Biologist in the Arizona Ecological Services Field Office, Southwest Region of the U.S. Fish and Wildlife Service ("FWS" or "Service"), I primarily work with fish and wildlife species listed under the Endangered Species Act of 1973 (16 U.S.C. §1531-1544), as amended (ESA). I am the FWS species lead for the Mexican spotted owl and am a member of the Mexican Spotted Owl Recovery Team. I hold a Bachelor of Science degree in Natural Resource Sciences, Wildlife Ecology and Fisheries Science from Washington State University (1993), and a Master of Science degree in Forestry with a Wildlife Ecology emphasis from Northern Arizona University (2000). I have spent almost 20 years working for FWS on ESA issues, including listing and recovery activities pursuant to section 4, recovery activities

pursuant to section 6, section 7(a)(2) interagency consultations, and incidental take permitting pursuant to section 10.

2. I played a significant role in writing the 2012 Biological Opinions (BiOps) for the continued implementation of the Land and Resource Management Plans for the 11 National Forests in Region 3 of the U.S. Forest Service (USFS).

3. I am familiar with the litigation involving the 11 BiOps. I am also aware of recent court orders modifying and clarifying the recent decision in this matter that enjoined forest management activities in six national forests in USFS Region 3. Those national forests are the Carson, Cibola, Gila, Lincoln, Santa Fe, and Tonto National Forests. I will be drafting modifications to those BiOps pursuant to this Court's recent order. I have reviewed the Defendant's Motion to Alter the Court's Decision and to Clarify or Modify the Court's Injunction and the plaintiff's Opposition to the Defendant's Rule 59 Motion, including the Declaration from Derek E. Lee.

4. The jeopardy analysis for Biological Opinions ("BiOps") under Endangered Species Act ("ESA") §7(a)(2) consultation must evaluate whether an action "reduce[s] appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, *or distribution* (emphasis added). "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, *or distribution* (emphasis added) of that species (50 CFR 402.02).

5. Our (FWS) jeopardy analysis relies on four components:

(1) Status of the Species: Section where we evaluate the range-wide condition of the listed species, the factors responsible for that condition, and the species' survival and recovery needs.

(2) Environmental Baseline: Section where we evaluate the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species.

(3) Effects of the Action (including any conservation measures): Section where we evaluate the direct and indirect effects of the proposed federal action and the effects of any interrelated or interdependent activities on the species.

(4) Cumulative Effects: Section where we evaluate the effects of future, non-federal activities in the action area on the species.

Therefore, the lack of range-wide population trend or habitat trend monitoring in connection with forest management activities is unlikely to result in jeopardy to the Mexican spotted owl because rangewide monitoring of the species and its habitat is not requirement of a jeopardy analysis. In addition, National Forest System (NFS) lands managed by the USFS are a subset of the range of the Mexican spotted owl (AR USFS 009564 SUP1); therefore, information regarding the owl on NFS lands would not be enough data for us to recommend delisting, per the recovery criteria, which apply rangewide (AR USFS 009624 SUP1). Range-wide monitoring is essential to determining whether delisting the owl is warranted (AR USFS 009624 SUP1). However, range-wide monitoring is not essential to ensuring an agency action is not impeding the survival and recovery of a listed species because we are able to use either reproduction, numbers, or distribution to make our jeopardy determination. The FWS jeopardy analysis in the 2012 LRMP

BiOps shows that the distribution of the Mexican spotted owl has not decreased with the implementation of the LRMPs since 1996 (additional surveys actually show an increased distribution). Therefore, this information indicates that the continued implementation of the southwestern region LRMPs has not decreased the distribution of the Mexican spotted owl.

6. The purposes of the ESA are to provide a means whereby the ecosystems upon which threatened and endangered species depend may be conserved and to provide a program for the conservation of such threatened and endangered species. Recovery plans describe the process by which we can reverse the decline of a threatened or endangered species and neutralize threats to its survival so that we can assure its long-term survival. Section 4(f)(1)(B) of the ESA specifies the contents of a recovery plan. Sections of the Mexican spotted owl Revised Recovery Plan meeting these requirements are (AR USFS 009556 SUP1):

> 1) A description of such site-specific management actions as may be necessary to achieve the Plan's goal for the conservation and survival of the species (Appendix C, AR USFS 009804 SUP1);
>
> 2) Objective, measurable criteria that, when met, would result in a determination that the species be removed from the list (Part III, AR USFS 009623 SUP1); and,
>
> 3) Estimates of the time required and the cost to carry out those measures needed to achieve the Plan's goal and intermediate steps toward that goal (Part V.1, AR USFS 009638 SUP1).

Recovery plans are neither self-implementing nor legally binding. Rather, approved recovery plans effectively constitute a FWS guidance document on that listed species or group of species, thereby serving as a logical path from what we know about the species' biology, life history, and

threats to a recovery strategy and program (AR USFS 009556 SUP1). The 2012 Recovery Plan (Part IV Recovery Program, AR USFS 009629 SUP1) lists the descriptions of actions recommended to achieve recovery as specified in the 2012 Recovery Plan. The first six actions are:

1) Establish or amend, as appropriate, land-management-planning documents to adopt the Recovery Plan recommendations as agency policy.

2) Survey planned project areas for Mexican spotted owl presence before conducting activities that may affect the Mexican spotted owl, following the Survey Protocol (Appendix D).

3) Maintain or enhance existing nesting/roosting habitat for Mexican spotted owls.

4) Manage for nesting/roosting habitat on the landscape.

5) Manage for foraging and dispersal habitat.

6) Manage specific threats as described in Appendix C – Threat-specific management recommendations (AR USFS 009629 SUP1).

The LRMPs and the 2012 BiOps include management direction to implement recovery actions 1-6.

7. In the Recovery Plan, we prioritized Recovery Actions using the following Priority Number:

1) Actions necessary to prevent extinction or irreversible decline.

2) Actions necessary to prevent extinction or a significant decline in population or habitat, or other effect short of extinction.

3) All other actions necessary to provide for full recovery.

The only priority one recovery action (action necessary to prevent extinction or irreversible decline) is recovery action 3, Maintain/enhance nesting/roosting habitat (AR USFS 009638 SUP1). This recovery action includes establishing protected activity centers (PACs), conducting treatments to reduce fire risk, and treating up to 20% high-risk fire areas. The USFS LRMPs include the establishment of PACs and conducting thinning and burning treatments to reduce fire risk in order to prevent the extinction or irreversible decline of the Mexican spotted owl. Therefore, the USFS is not only implementing the top seven recovery actions since they are also conducting region-wide population monitoring, but most importantly, the USFS is addressing the number one priority recovery action needed to prevent extinction or irreversible decline.

8. Recovery action 7, which is "Monitor owl population as described in Part V.B and Appendix E – Monitoring" is a priority 2 recovery action, and the other five recovery actions listed above are a mix of priority 2 and 3 recovery actions (AR USFS 009638 SUP1). Therefore, the Recovery Plan clearly indicates that the highest priority recovery action is to designate PACs and conduct treatments to reduce fire risk, both of which are reasons for the FWS finding that the continued implementation of the LRMPs would not jeopardize the survival and recovery of the species.

9. Derek E. Lee is correct that three points can indicate a trend; however, the goal of the Mexican spotted owl population monitoring is to measure the owl's population trend while minimizing our Type 2 error potential (ECF No. 104-1 ¶¶ 7-10). Three years of monitoring may show a trend for those three years, but we would likely have little confidence in that trend because of the low statistical power. *Id*. The "power" of any test of statistical significance is the

probability it will reject a false null hypothesis (power is inversely related to the probability of making a Type II error). Since the Mexican spotted owl is a threatened species, we want to be sure the trend we see is real and not, for example, a short-term increase based on environmental effects (*e.g.*, increased prey availability, weather conditions), versus an actual long-term decline. Short time series (*e.g.*, 3 years), particularly for long-lived species such as adult spotted owls, are likely "under-powered" and potentially misleading - meaning that they may not indicate the actual trend of the population. Regardless of the methodology used to measure the population trend (*i.e.*, demography or occupancy monitoring), it is essential that we do not conclude the owl population is stable or increasing when it is really declining (or in other words commit a Type II error). If we made this error, then the persistence of the owl population could be in jeopardy because we would not take measures to correct the decline because we assumed it was stable or increasing based on a short time series. Therefore, it is critical that we set a low Type II error rate so we do not infer an erroneous population trend (AR R000099). By increasing the number of years that we conduct this monitoring, we can better avoid this situation. This is why the Recovery Team was not certain that 10-15 years (10 years plus 5 years of delisting monitoring) would provide enough data to correctly assess the population trend in 1995 (AR R000100) and why the Recovery Team set a minimum of 10 years of range-wide population monitoring to meet the revised 2012 delisting criteria (AR USFS 009624 SUP1).

10. The 2012 Recovery Plan defined adaptive management as a deliberate and iterative process to optimize management strategies. The process entails formation of a management model, management implementation, monitoring and interpretation of system responses, and

ultimately refinement of the management model given lessons learned (AR USFS 009934 SUP1). The Recovery Team stated:

> "Following our General Management Recommendations, we recommend that vegetation manipulations be designed within an adaptive management framework. Rigorous monitoring systems will provide information that managers can use to adjust or modify objectives and activities. Long-term monitoring of owl site occupancy, extinction, and recolonization rates using appropriate designs will be imperative in light of climate change and evaluating efficacy of management objectives."

11. The 2012 Recovery Plan did not link the range-wide population monitoring to the owl monitoring recommended for management experiments to quantify the effects of thinning and burning treatments on the owl and its habitat. As the 2012 Recovery Plan states "The management recommendations in this plan are believed to be necessary and advisable to achieve this goal, but the best scientific information derived from research, management experiments, and monitoring conducted at the appropriate scale and intensity should be used to test this assumption." The simple reason the range-wide monitoring does not address the issue of effects of thinning and burning treatments on owl occupancy, reproduction, and habitat is because this range-wide occupancy monitoring and the forest treatments occur at different scales. We can measure owl site occupancy and specific vegetation changes that may affect owl occupancy by monitoring individual owls within PACs and changes in their habitat where these treatments occur (AR USFS 009837 SUP1). In the Recovery Plan, the Recovery Team provided general guidance for monitoring forest and fire management treatments (small-scaled question driven monitoring), which includes monitoring PACs (the scale at which the treatment occurs), not

using the range-wide monitoring (large scale) to assess the effects of forest and fire management (USFS 009837 SUP1).

12. Pursuant to 28 U.S.C. §1746, I certify under penalty of perjury that the foregoing is true and correct.

Executed this 5th day of November 2019.

Shaula Hedwall

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Defendants' Exhibit F

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF ARIZONA

WildEarth Guardians, Plaintiff, v. United Fish and Wildlife Service, et. al., Defendants.	)	No. CV-13-00151-RCC

DECLARATION OF CALVIN N. JOYNER

1. I am currently employed by the United States Department of Agriculture, Forest Service, as Regional Forester for the Southwestern Region ("Region"). I have held this position since 2013. In this capacity I serve as the responsible official for Regional decisions for land management actions on the eleven forests in the Region. This includes responsibility for authorizing the Region's ongoing occupancy monitoring program for Mexican Spotted Owls ("MSO").

2. The Region is committed to providing information to the FWS regarding the population trend for the MSO as outlined in the 2012 MSO Recovery Plan. The U.S. Forest Service ("USFS") has entered into an Agreement with the Bird Conservancy of the Rockies (formerly the Rocky Mountain Bird Observatory) and is gathering site occupancy data on

National Forest System ("NFS") lands across the Region. The site occupancy monitoring began in 2014 and is ongoing and is expected to continue until at least 2023.

3. This year, 2019, marks the sixth consecutive year the Bird Conservancy of the Rockies ("BCR") has completed region-wide breeding season occupancy monitoring for MSO on behalf of the Region. This work is supported by a recently renewed challenge cost share agreement, through which the Region invests approximately $270,000 annually in addition to time and expertise from our Regional ecologist, forest- and district-level biologists who help coordinate the program. The Region recently committed an additional $270,000 to support the 2020 field season, bringing the total R3 USFS investment in the program to date to ~$1.9 million.

4. The robust survey methodology being implemented is the product of close collaboration among the Region, BCR, Rocky Mountain Research Station (RMRS), FWS, and the MSO Recovery Team, is compliant with the requirement of our Forest Plans, and is based directly on the recommendations of the 2012 Recovery Plan for the MSO, First Revision. One square kilometer survey sites randomly distributed throughout suitable MSO habitat (n=289) were surveyed during the initial 2014 field season (149 surveyed twice, 140 surveyed once). In each of the subsequent years approximately 200 sites were surveyed once to twice each year during the MSO breeding season.

5. The multi-year program was designed to provide a reliable metric of the long-term trend in MSO abundance on National Forest System lands in Arizona and New Mexico, and to help inform future FWS' listing decisions for the MSO under the Endangered Species Act. The

2012 MSO Recovery Plan, First Revision, identifies the following recovery criteria for consideration in delisting:

- Owl occupancy rates must show a stable or increasing trend after 10 years of monitoring.
- Indicators of habitat conditions (key habitat variables) are stable or improving for 10 years in roosting and nesting habitat.

6. It is premature to draw conclusions about trends in abundance prior to the completion of the 10-year monitoring program, but probabilities of sites being occupied by MSO increased from 2014 to 2016 and decreased from 2016 to 2018. Year-to-year variation may be linked to differences in precipitation (with wetter years possibly driving up MSO prey availability, thereby fostering greater reproductive output by MSO).

7. The Region, FWS, and RMRS are exploring the potential to collaborate with the Forest Inventory and Analysis (FIA) Program to develop a strategy for making determinations on the second criterion that are concurrent with the MSO trend information.

8. The Region plans to continue conducting annual site occupancy monitoring through at least 2023 (estimated additional cost ~$810k), which will produce the ten years of data to produce a trend consistent with the requirement in our Forest Plans, and will contribute to the information the FWS needs for delisting the species.

9. I, Cal Joyner, declare my intent to continue funding the site occupancy monitoring through 2023. This includes my intent to commit funds for monitoring in 2021 as well as committing to develop a new agreement (the current agreement expires in April 2022) with the BCR to complete annual site occupancy monitoring through 2023.

10. Pursuant to 28 U.S.C. §1746, I certify under penalty of perjury that the foregoing is true and correct.

Executed this 5 day of November 2019.

Calvin N. Joyner
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