MSO Workshop notes, January 21, 2016

1. **Welcome** – Amy Waltz, and the 4FRI Multi-party Monitoring Board
    a. This workshop is sponsored by the 4FRI MPMB.
    b. Workshop Need: (from the MSO Recovery Plan) *"Communication and collaboration among scientists, land managers, and interested publics should play a key role in shaping future research. Managers need to understand the methods, problems, and uncertainties involved with gaining reliable knowledge from ecological research. Scientists, on the other hand, must rely on managers to identify appropriate questions and political and legal constraints, to implement experimental treatments, and to develop appropriate implementation of knowledge derived from research results in an adaptive management context."*
    c. Workshop Goals:
        i. Information sharing among stakeholders, researchers, and managers
        ii. Learn about recent research findings from on-going and future long-term MSO projects
        iii. Learn about research and monitoring questions, appropriate scales and implications of results
        iv. Define and clarify terms, methods, challenges in MSO monitoring and research
    d. Links to docs – 2011 GTR.

2. **Mexican Spotted Owl Recovery Plan highlights** – Shaula Hedwall, USFWS MSO National Lead, Recovery Team Member, & Fish and Wildlife Biologist, & Bill Block, MSO Recovery Team leader, Rocky Mountain Research Station
    a. Background – MSO was listed in April 1993. The recovery plan was signed in 1995 and incorporated into Land and Resource Management Plans (LRMPs) in 1996. Revised in 2011. Even-aged management and lack of regulatory mechanisms were identified as the causes of listing, and other threats were identified during recovery planning, including forest management and high-severity fire. Appendix C is the "meat of the plan", and the most helpful for land managers. RMRS and FWS lead research efforts. Plan promotes a landscape scale approach.
    b. Differences between the 1995 and 2011 plan.
        i. Updated ESA five-factor threats analysis, more clear definition of an owl site (what a PAC is), descriptions of canyon cover types and riparian habitats
        ii. Revised recovery criteria to reflect changes in population and range wide habitat monitoring
        iii. Recovery units are now called ecological management units – EMUs. The updated plan does shift the boundaries of the EMU (compared to the 1995 plan). 4FRI is the Upper Gila Mountain EMU. Mixed Conifer and Pine Oak habitat is key.
    c. Recovery Plan
        i. Appendix B – review of the most current science and what we know. Of note - Slick rock canyon is an important habitat for the owl, not just forest.
        ii. Pages 249-250 – assumptions and guidelines. If you can only review two pages of the plan, these are the ones to read.
        iii. Appendix C- management recommendations have been updated, describes what activities are thought to have limited impacts in PACs, which activities may

have a bigger impact and/or need further analysis. Using the phrase "recovery habitat", instead of restricted habitat, to help convey that treatment in order to expand appropriate habitat/create habitat is needed and encouraged.

iv. Appendix C details:
    1. Key habitat components defined – also referred to desired conditions.
    2. 3 levels of management in the plan: for PACs (currently occupied), recovery habitat (for life history and expansion), and other forest and woodland types (which is 79% of the landscape, and doesn't have recommendations, and allows for restoration activity without owl overlap). Habitat areas are a small percentage, but are important.
    3. Area of ~600 acres around known owl sites should receive the most protection. Prescribed fire outside of the breeding season, may thin 20% of the PAC area within each EMU. 100 acre nest/roost core area should be designated within PAC.
    4. Desired conditions within PACs – canopy cover is a high predictor of owl occupancy at roost site. Not intended to guide the management of all recovery habitat – see Table C.3 for detail on minimum desired conditions for mixed conifer and pine-oak forest areas managed for recovery nesting/roosting habitat.
    5. Different types of monitoring. Range wide, management experiments, specific site or PAC monitoring
    6. Appendix E is not the protocol for monitoring, it is an approach using occupancy monitoring to evaluate owl population trends.

d. Questions
    i. 20% thinning – is there a time frame for accomplishing this? There is not a time frame. The plan is adaptive and we're learning as we go. Looking at the schedule, we're not close yet. The more experimenting we can do, the more habitat restoration, the closer that we'll get to recovery.
    ii. The barred owl is not currently a threat here.
    iii. 20% mechanical and burning – does the intensity matter? Yes. The FWS will work with managers to develop management experiments and desired conditions range wide
    iv. 25% of recovery habitat should be managed as mixed-conifer and 10% of pine—oak nest and roost replacement habitat. Effort to provide areas of expansions for the owl.

3. **Monitoring Trends in Site Occupancy by Mexican Spotted Owls in Arizona and New Mexico** – Karl Malcolm, USFS R3 Wildlife Ecologist, Wendy Lanier and Jennifer Blakesley, Bird Conservancy of the Rockies
    a. Region-wide MSO monitoring happening across Region 3 (11 national forests, which contain the bulk of US MSO habitat).
    b. Recovery criteria - need to be able to detect a 25% decline in occupancy rate over a 10-year period. Sample size of 200, but where to monitor? Used a geophysical model (Johnson 2003) – and ecological response units accounting for veg.
    c. Sites – 1 square kilometer, at least 50% USFS land, and certain criteria from the models. 17903 cells/potential sites. 2014 was the first field season. Ideally sampling would expand to non-USFS lands. Within each survey site are 5 call points, 15 minutes at each call site. Site complete once all sites are called, or when occupancy by a pair is verified.

d. Multistate robust design occupancy model
    i. Robust design – hierarchical nature, surveys nested within seasons – assumes occupancy does not change within a season
    ii. Assumption that the most occupied state in a season is the true occupancy state (occupancy does not change in a season).
e. Too soon to infer any population trends. Lower detection probability from single owls (less territorial, may be transient, could be spatially unavailable – larger home range). Unoccupied sites decreased, single owl occupancy increased slightly, pair occupancy increased most. Very few sites experienced reduction/local extinction. Single occupancy to pair was most probable. Most likely to detect a pair if there is a pair, pairs are territorial and most likely to call.
f. Questions
    i. Transition probability is the probability that a site had the same status in 2015 as it did in 2014. The likelihood a pair site was unoccupied or single occupancy the following year was so low, that there was 100% transition probability a pair site stayed a pair site (not detection probability).
    ii. Will sites change/move? No, sites are fixed.
    iii. When setting up the sites, were sites removed for access issues? Canyon sites? Many canyon sites. Some accessibility issues were in canyons, forests, and some border sites. Not just surveying "easy" sites. Crews packed in on horseback to access remote sites in the Gila Wilderness.
    iv. No surveying outside of USFS land yet, but hoping to include more areas in the future. Parks Service will be doing surveys.
    v. Time frame between surveys? Not strict, at least 3 weeks typically. Do all the sites once, then start over again. Calls are broadcasted using digital callers– always the same.
    vi. How will the data be used in delisting? This is ultimately up to the recovery team. Delisting is not just about occupancy, but also about habitat quality. And there's a 10 year data requirement. 2014 data isn't considered a baseline, but it will count as a data point.

4. **Evaluating recovery plan recommendations using recent data from the Sacramento Mountains, New Mexico** – Joe Ganey, Rocky Mountain Research Station ecologist
    a. Published and available: http://www.treesearch.fs.fed.us/
    b. 10 year study (2002-2011) of owl and prey demography and habitat use, high elevations mixed conifer forest (PSME, white fir), many owl PACs
    c. Tried to survey all territorial birds (captured and tag), 2004 to 2011, PACs as sampling units
    d. Evaluating PAC use – PACs are key to the recovery strategy but use of PACs hadn't been evaluated. Results - nest and roost locations are concentrated within PACs. PACs protect key habitat, and use persisted over time. Vacant PACs were colonized as the population grew.
    e. Recovery habitat – from recovery plan, is outside of PACs, provides replacement habitat for sites lost and new habitat for growing population.
        i. Recovery plan proposed 4 desired conditions for recovery habitat – stand scale approach (primarily because the USFS is the major land manager and they collect data at the stand level). All 4 conditions should be met simultaneously.

Attribute	Desired Condition
Total BA	≥145 ft2/ac
%BA12TO18	>30%
%BAGT18	>30%
Trees ≥18 in dbh	≥15 trees/ac

f. Research questions asked –
    i. Do nest sites feature higher levels of structural attributes than surround stands? Assumed yes in the recovery plan. Nest sites typically did have greater levels of attributes, but wasn't always statistically significant. Large tree component – nest sites have more large trees compared to surrounding area.
    ii. How many meet the desired conditions? Nest sites meet the desired conditions more than the nest vicinity plots. Not all DCs are good identifiers of nest sites or nest stands, and it's hard to get all 4 together.
    iii. Are these the most appropriate DCs for recovery habitat? What attributes best separate nest habitat from non-nest habitat? Used modeling. Canopy cover and % BA greater than 18 most important.
g. Conclusions – Desired conditions failed to identify nesting habitat >70% of the time, canopy cover isn't included and probably should be
h. Relevance to 4FRI? unsure, different landscape, much less mixed conifer in 4FRI
i. Questions
    i. Topography not included? Wasn't in DCs, could have added it like canopy cover, might be a useful predictor. The desired conditions had 2 objectives, identifying and managing stands. Topography or other physiographic covariates could aid in first objective, not in second.
    ii. How was canopy cover estimated? 18m radius plot. 3 transects, centered on the nest tree, 2m interval overhead estimated.
    iii. Overlap between other MSO research sites and FIA sites? Some BCR plots are out there, not sure where the FIA plots are (sparse).

5. **Revisiting the Rodeo-Chediski fire: Mexican spotted owl habitat occupancy in a burned landscape** – Mike Lommler, School of Forestry, NAU (NOTE: This presentation is not included in the accompanying presentation file. The data were too preliminary to share with a www audience).
    a. What is the effect of large severe wildfires on MSO? Limited research on fire with MSO (some with California SO and Northern SO). Owls have high territory fidelity, so we expect fire to have an impact on owls (due primarily to tree mortality).
    b. How did the Rodeo Chediski fire influence owl habitat selection? Rodeo Chediski fire happened in 2002, large and severe, nearly 190000 hectares. Study area – NW portion of the burned area (18,800 ha), Apache-Sitgreaves NF and Tonto NF, Mogollon rim. Primarily ponderosa pine, some mixed conifer, some pine-oak, most burned at high to moderate severity. 20 PACs in this area before the fire. 3 PACs eliminated, 1 added (administrative). Many PACs burned at high severity over a significant portion of their area.
    c. Methods: occupancy modeling. 1 square km grid, each cell with call points over 20 pre-fire PACs. Data collected in 2014 and 2015. Forest structure, topographical, fire severity, and forest type covariates.
    d. Results: detection increased from 2014 to 2015.
    e. Questions

i. Environmental variables taken from LANDFIRE – used cell descriptions. Analysis is early, will have DIC values in addition to AIC values.
ii. Was the second season longer than the first? Yes, but a small crew in early spring and weather issues, so it was roughly the same amount of time.
iii. 20 PACs before fire – how many were occupied after? Hard to say exactly, some occupancy was between PACs, best guess is 1/4th of old PACs were occupied, but we wouldn't expect the old areas to be occupied necessarily. What's more important is how the populations has responded. Not all of those 20 PACs were necessarily occupied before the fire.

6. **Characterizing and comparing tribal and non-tribal MSO habitat using remote sensing and stand exam results from tribally managed MSO breeding areas** – Serra Hoagland, Southern Research Station and NAU School of Forestry (NOTE: This presentation is not included in the accompanying presentation file. The sensitive nature of data from the Mescalero Apache Reservation lands precludes sharing with a www audience).
    a. Goals: Incorporate tribal information in assessing owl habitat, protect MSO habitat by examining effects of forest treatment
    b. Questions: are all sites different from surrounding areas? Are the reservation sites different from the USFS sites?
    c. Methods: Using phenoclasses – NDVI shows the "greenness" of an area. 100 phenoclasses – typify the mode of NDVI over time of one pixel. 2000 random points (filtered to habitat types relevant to owls)
    d. Owls are being selective of habitat based on phenoclass. Evergreen white fir is the highest selected. Difference on tribal lands? Yes. Might be that estimates of preferred owl breeding habitat are incomplete given that owl preference is different on the reservation than on NF. [Why the difference? Difference in mgmt.]
    e. Questions:
        i. Will your research/the monitoring continue? This year, yes, and the tribe is interested in continuing it as well.
        ii. Owl sites are different between USFS and tribal lands, is there an elevational difference? It might be an elevational gradient, the reservation is more of a dry mixed conifer condition, while the Lincoln NF is more of a wet system. There also may be a difference in fire history, that hasn't been examined at this point.
        iii. There is a continuum of PACs and owl occupancy across the reservation and the national forest. The tribe manages for sustainable yield, among other values and needs (environmental needs, economic/job needs, and social needs). The tribe does have an owl management plan.
7. **Multiscale habitat modeling for Mexican spotted owl and planned future simulation modeling of climate change and landscape restoration** – Sam Cushman
    a. Scale optimization – what kinds of approaches and scales have been used in MSO studies? Some single level, some multiple, some scale optimized and some not, very few multi-level and scale optimized.
    b. Used MSO survey data collected by the USFS between 1990 and 1993. Focused on nest and roost locations, not significantly different so they were combined. 4 topographic variables, five landscape composition variables, and 3 climate covariates. What are the optimal scale of analysis?
    c. Variable importance changes with scale. Multivariate models – best scale changes.

d. Owl nest/roost sites tend to be in cool & steep (topography), with high canopy cover and highly desirable vegetation
e. Next steps – continue to improve the model using canopy cover map from NAIP imagery, and extend modeling to NM for comparison with different topography.
f. Questions
    i. Climate explained little variation in the model, what does that mean for climate change? Study area was not very variable, climate areas not suitable for owls weren't examined.
    ii. Why look at monsoons instead of snow? Several precipitation/seasonal variables were examined, monsoons were retained because they were the only one with a relationship.

8. **Extending multiscale habitat modeling to Sacramento Mountains New Mexico, and overview of planned simulation modeling** – Ho Yi Wan
    a. Objectives: review current knowledge and gaps regarding emerging threats to MSO, examine modeling techniques that can predict MSO future under changing fire regime and climate. Main threats – habitat loss and fragmentation. Emerging threats – climate change and stand replacing fire.
    b. Literature search – 527 publications, 77 of those are about MSO (14%). Decrease in publication on MSO in the last decade. Overall, not a lot of existing knowledge. And a lot of complexity in the aspects of the MSO that we want to understand (like occupancy and population).
    c. Methods: Study area – Sacramento Ranger District, Lincoln NF. Used RM Lands (12 scenarios) and FRAGSTATS to develop a multi-scale habitat model. Multi-scale habitat model was then used with UNICOR and CDPOP.
        i. RM Lands –landscape disturbance succession simulator model – shows how the landscape will changes through time (including disturbance and succession). Can define scenarios with different treatment and climate conditions.
        ii. FRAGSTATS – spatial analytical software designed to quantify landscape metrics
        iii. UNICOR – species connectivity and corridor identification tool- can identify areas/paths that are most important to the species
        iv. CDPOP – used to predict genetic diversity, similar in that ability of the species to move around is related to the ability to breed with unrelated populations.
    d. Landscape disturbance-succession model (LDSM) – simulation of processes like succession on landscape patterns, which in turn influence disturbance processes. Major components: representation of landscape, disturbance simulator, succession simulator. Simulation predicts probability of disturbance at each time-step.
    e. Conclusions: Need more research, literature is lacking. Environmental factors influencing MSO are complex. Monitoring is most important! Tools are very helpful, but good data is needed for those tools.

9. **Forest Project research: 4FRI, FWPP** – Shaula Hedwall
    a. Monitoring treatment effects on MSO. High severity and landscape scale fire lead to large scale habitat loss. Strategies – fuel reduction reduces scale of impacts.
    b. PACs – designated for various reasons, and designated areas may or may not meet the habitat qualities/desired conditions for owls. What is functioning habitat?
    c. Status of knowledge – Owl was listed under ESA in 1993 and we still do not have good information on how thinning and prescribed burning impact owl habitat and owl

occupancy. Not enough to say what needs to be done. Recommendations are vague because we don't have the details.

d. So, where are our learning opportunities? Management experiments – examine impacts of treatments. Doesn't/can't occur in every PAC. Need a well-designed study.
    i. Do planned treatments affect short-term occupancy and reproductive success in treated versus reference PACs? Treatments/management experiments are set up for both 4FRI and FWPP. Pre-treatment data has been collected.
e. PAC criteria for monitoring – occupied, similar in habitat, similar in environmental condition, confounding factors not an issue, treatment planned for most of the PAC.
f. A lot of challenges – costly, collaborative planning can be slow and it is difficult to please all parties, constraints in planning and implementation

10. **Discussion and questions from the MPMB** – Amy Waltz
    a. What data or knowledge do we have to tell us about the historic population? The type specimen for the MSO was identified in 1936 on the Coconino National Forest. We don't have good info on the historical distribution. BCR work is the closest comprehensive population survey we have at this point. The recovery criteria based more on habitat and expectation for the functioning population. Delisted criteria – stable or increasing population is the goal, declining means we're doing something wrong. Some historical district survey information, but it does not inform population level estimates.
    b. What did we learned from Rocky Gutierrez's population study from the 1990s? This was done on the Coconino and Gila NFs. Pine-Oak owl population was stable (AZ), mixed conifer owl population was in decline (NM).
    c. FWPP – 2 to 3 years of post-treatment monitoring. It will give us short term occupancy data, but it would be nice to continue this monitoring, but that's funding dependent. Is there extrapolation from that work? Will help define what to keep in mind as we look at the larger landscape, but there may not be as many large projects to tack on to, like FWPP and 4FRI.
    d. How can we share information across research studies, where we fill in each other's gaps? Gaps for the fire weren't done intentionally (for the USFS/BCR survey), Mike's study fills in the gap but the data won't scale appropriately. But the USFS broad scale study will help smaller projects look at the broader trends.
    e. How can we better interface with the tribes as partners? The biggest component is building relationships and trust, and it depends highly on what the tribe's priorities are. FWS has fairly good relationships with several tribes, but there are limits to how they can see and use the data. This is a challenge not just for owl data, but for vegetation and other variables.
    f. Is anyone looking at owls in the Wallow Fire? Multiple PACs are being monitored, but only for the short-term and in response to site-specific projects.
    g. How relevant is other species information (like California spotted owl) to the MSO? CSO data doesn't look much at nest/roost data in burned areas (burned areas are used for forage). The conclusions in the literature are not that dissimilar than what we see with MSO, but it depends on how the data is interpreted and presented. Accurate summary is important.

h. Planning the adaptive management component of the 4FRI EIS with the owl management experiments is difficult.