Blue Mountains Forest Partners Field Trip
Canyon Creek Post-Fire Research: Salvage & Woodpecker Nesting

Malheur National Forest, **12 August 2019**
Notes by Trent Seager (SNW)

Participants:
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10 KEY POINTS and TAKE-AWAYS:

1. Select post-fire harvest can occur while accounting for Lewis's and White-headed Woodpeckers, but not for Black-backed Woodpeckers (based on the data so far).
2. This is the best timber sale we've had in years (green or black).
3. The mosaic of treated and untreated within units, plus leave areas (e.g., riparian), likely allowed woodpecker species to nest in treatment types not prescribed for them.
4. Woodpeckers are selecting nest sites on different scales: fire perimeter, stand level, and individual tree.
5. The prescriptions and harvest were done to rigorous standards (individual tree mark) for research but could consider Designation by Prescription (DxP; FS designates the basal area, then logging contractor chooses the trees to cut based on designated basal area) or other options (e.g., DxP by dbh instead of basal area) for future treatments.
6. This research could inform future NEPA to be ready for the next fire.
7. Post-fire salvage should be addressed as part of the Forest Plan.
8. We need to look at the MIS woodpecker species at three different scales: (1) Forest-level viability, (2) fire boundary, and (3) treatment units.
9. Multiple other FS Regions are already using this data; the MNF and Region 6 should be teeing up to use it.
10. FIRE-BIRD (GIS Habitat Suitability Models) has the data in it and is accessible.

INTRODUCTION:

Dr. Vicki Saab and Jon Dudley, both from the USDA Rocky Mountain Research Station (RMRS), welcomed everyone at the MNF SO for a tour of year 4 of the woodpecker research in a post-fire environment where area salvage and roadside salvage has occurred in the Canyon Creek Fire (see previous notes for further information). Today's tour will include 6 different stops to review woodpecker response to prescriptions (see attachments). Lori Stokes and the MNF will be sharing what the treatment was for each treatment.

Reason for the project: in the 1990s, there was an increase in fire size and severity. Proposed salvage was litigated and stopped for 15-20 years. When Canyon Creek Fire happened, BMFP wanted to know if it was possible to have post-fire tree harvest (salvage) for economic gain while minimizing impact on wildlife habitat in the post-fire environment. The RMRS chose three woodpecker species (black-backed, white-headed, Lewis's) to represent the range of habitat conditions for wildlife in post-fire environment.

Vicki and Jon had studied fire and woodpeckers since the 1990s. They used the information from previous research (in Idaho, Oregon, and other western states) to create the prescriptions for the post-fire treatments. They used woodpecker habitat suitability tool to map habitat for the 3 different woodpecker species, including the size, density, and placement of snags (see previous field trips and handouts for detailed information). Used the woodpecker habitat tool to design the study. The tool is based on remotely sensed data, post-fire data, and GIS layers, including:

- burn severity
- topography
- aspect
- pre-fire forest conditions and data
- post-fire forest conditions and data

The research used fire-level data to develop prescriptions for woodpeckers. The treatments included 3 different salvage harvest levels (designed with cost in mind for economic gain) plus woodpecker habitat suitability over a broad spatial scale (landscape, 314 ha [776 ac]) and at a smaller spatial scale (immediate area around nest site (1 ha [2.47 ac]). The predictions were based on past woodpecker studies.

Spatial Scale and Analysis

The data analysis will be on different spatial scales. The treatments are not uniform, so there is a mosaic with each treatment. Within each study unit there are units of salvage, roadside salvage, skips. This creates variability within each study site.

Woodpecker surveys

Surveys were conducted by transects. Once woodpeckers were detected, they were observed to find the nest. Nest data included: nesting, occupancy, productivity (eggs, hatching, fledging) for all 3 species of woodpeckers in all units and study areas

including control areas (no treatment areas). Surveys for Lewis's woodpeckers are by visual observation only, because they rarely respond to playback calls of woodpeckers. For the other 2 species, the field crews used playbacks (recorded calls of the same species for conspecific response). The study was designed in a way that maintained habitat for the 3 different woodpecker species (and the variability of habitat they represent) while also allowing economic gain from logging.

Unique Opportunity
Vicki noted that they were fortunate that the Malheur NF and BMFP were so supportive of this research, as that was critical to make it happen.

Final Year of Study
This is the 4th and final year of data collection. Based on research in Idaho, Oregon, and Washington, after 4-5 years post-fire, there's a shift in snag fall, shrubs, insects, and thus ecological change that modifies the food web and habitat.

The general expected response of the woodpecker species, based on studies in other states and other landscapes, is:

- Black-backed woodpeckers peak 3-4 years post-fire then decline, following the peak and decline of wood-boring beetles, their main prey items.
- Lewis's woodpeckers increase up to 12 years post-fire, following the increase in shrub development and associated flying arthropods, their main prey items.
- White-headed woodpeckers are usually stable across all years

STOP #1: LOWER FAWN – INTERMEDIATE TREATMENT

Retention:

- 4 snags >21" dbh per acre
- 6 snags 15-20" dbh per acre
- 8 snags 12-14" dbh per acre

On map (see below), the treatment is in blue; roadside salvage is in yellow. 831-acre unit. The goal was 40% tree removal (with a range of: 31-50%) treatment in each study area.

Design: trees clumped based on previous studies and on ICO (individual, clumps, openings; from Churchill et al. 2017, PNW-GTR-956). Used data from previous research.

43% had tree removal.

Vicki and Jon share with the group about the salvage cut and retention (orange tree mark shown in photo). In this leave clump, a black-backed woodpecker nested. OPB Oregon Field Guide crew filmed the field trip. Photo: Trent Seager

In this area, there were black-backed woodpeckers nesting in a clump (see photo) and Lewis's woodpeckers nesting in an opening. Clumps varied by site. Large clumps (up to 16 trees) were hardest to create, so those were designed first in the treatment.

Question: So black-backed woodpeckers nest in small trees only?

> **Vicki**: woodpeckers typically use trees with large diameters >9"–30"+ dbh. Among woodpecker species, black-backed woodpeckers nest in relatively small diameter trees. Average nest tree diameter is 15" dbh (range 7"–39") for 164 nests monitored on the Canyon Creek Complex.
>
> **Jon**: correlation between food availability and tree diameter. Bark beetles prefer large diameter trees. Black-backed woodpeckers nest in relatively small diameter trees but typically forage in relatively large diameter trees (>20" dbh). Important to note that the marking of trees (treatment) produced habitat that the BBWO used for both nesting and foraging.

Q: Do you monitor beetle populations?

> **A:** No

Q for Iron Triangle: did this pencil out and pay for itself?

> **A**: Yes, it had multiple size classes. Level 3 is much more economical, but the whole sale (entire treatment areas/study areas) paid for itself.

In fact, this is the best sale we've had in years. The logging was easy; lots of stems per acre; timber close to roads. Logging was more expensive, but it still paid for itself.

Q: How are these treatments different from traditional salvage?

A: this is clumpy

A: traditional salvage hits much harder. Only 1.9 snags/acre required by the Malheur Forest Plan, but the MNF was leaving 3-4/acre. Still this has many more.

FS: yes, this is more clumpy than past salvage

Q: What is the window for getting economic value out of salvage trees post-fire?

A: Ideally, less than 1 year; 12-18 months at most before blue stain starts to happen.

Large ponderosa pine snag left in open with clumps of trees in the background. The study marked all trees for scientific rigor. If successful, the marking can be used as a guide so future prescriptions can be DxP or other options. Photo: Trent Seager

Note: all treatment acres with harvest were in General Forest acres (as designated by the Forest Plan). These acres burned and will be lost for timber value for decades. This was the only opportunity to get value on those General Forest acres.

20 million board feet sold directly to the local mill. This saturated the market. More could have been taken, but it would have to be hauled a long distance, which decreases the value, plus we were out of time. Any more harvest would have put us into the blue stain and lost the value of the log (plus haul distance costs).

Q: Does harvesting in clumps like this move the stand toward HRV?

James: This giant high-severity patch is anomalous; it may take 100s of years before this part of the forest returns to HRV. This used to burn every 8-10 years in low severity.

Vicki: There is other research showing that forests like this burned in mixed severity with larger patches of stand replacing fire.

James: Those are inaccurate, not only my research but Hagmann and Merschel's work in central Oregon have shown that. In my work with BMFP and OSU, I have put in a lot of research plots across this forest, and they all show 8-10 years for Fire Return Interval (FRI) and low severity.

Q: How do you know when you can't measure trees that are gone and burned up?

James: The age range of the trees that remain and/or are present today vary, showing trees from 300 years to 70 years old. If it was stand replacing, the trees would all be the same age.

Mallory and RMRs team: Lewis's nested here and were successful. They did well in all treatment units, even in controls. In previous studies conducted in Idaho, Lewis's were more successful in first 5 years after wildfire, followed by a decline in their nest success during 6-12 years postfire (Saab et al. 2011). Nest failures were attributed to predation during the later postfire years, when predators likely recolonized the burned forests.

Q: What kind of predators?

A: black bears, tree squirrels, chipmunks, other small mammals, ravens, hawks, and snakes.

Back to the fire debate:

Vicki: Large fires were on the landscape.

James: Not like this fire.

Vicki: There were mixed severity fires in mixed conifer forests. Many wildlife species use recently burned forests after stand-replacement events, evidence that burned forests of this severity existed in the past and are used by native wildlife.

James: We reconstruct the Fire Return Intervals through tree scars. We don't see structure that would tell us there was stand replacing fires at this scale.

Trent: You could both be right, but in different context. Hessburg's research shows that there is cross-talk between forest types, so a dry mixed conifer in a neighborhood of dry pine will share the Fire Return Intervals of the dry pine. James' research is right here on the Malheur NF and shows that the Dry Mixed Conifer and Moist Mixed Conifer had similar Fire Return Intervals and burnt at low severity. That makes sense given the neighborhoods of forest types where they are found.

Jon: The point really is that wildfire is here. On this fire, our research is focused on "Can we manage it for economics and wildlife?"

Pam: We can agree that these effects happened because we have not had low severity fire when we should (because of fire suppression). We are arguing details, but we are close to agreement.

Q: How far will black-backed woodpeckers travel to nest in a new fire?

Vicki: Evidence from Canada suggests that black-backs will move 50km (30 miles) to a recent burn, so these are likely local woodpeckers.

Q: What are the secondary cavity nesters we would expect?

A: Mountain bluebirds, western bluebirds, American kestrels, swallows, wrens, starlings, tree swallows, mountain chickadee, and many others. Those vary based on the primary excavators and settings (e.g., density of trees, shrubs, food webs).

STOP #2: ALDER GULCH – LEVEL 3

Riparian area wasn't logged, and Lewis's woodpeckers nested there. Would not have expected them to be in this treatment, but since there was a leave area (riparian required buffer), the Lewis's apparently found suitable patches and nested in them.

White-headed woodpeckers are using this.

To survey for shrub response, the field crew uses point-intersect. This helps assess food availability indirectly by estimating shrubs. Shrubs provide substrate for arthropods (e.g., flying insects) consumed by Lewis's Woodpeckers, and for small mammals that depredate on woodpecker nests.

Q: Would the riparian areas have a different food web?

A: We aren't looking at that; the study isn't set up to measure that, but insects are typically more abundant in riparian habitats than surrounding uplands

Roadside salvage in the foreground; prescription cut on the right-hand side in the background; riparian leave area on the left-hand side (dense area with green understory). Photo: Trent Seager

STOP #3: CONTROL (NO TREATMENT)

Here we captured the nest density information because there are too many to monitor for nest success.

Black-backed woodpecker nest numbers were highest 1-year post-fire then declined in subsequent years. We weren't expecting that. In all other studies, they nesting numbers increased for the first 3-4 years, followed by a decline.

On the other control (N side of the first), black-backed woodpeckers did increase every year. Won't know until the study is done, but we suspect there is reduced foraging habitat in the treatment units. Even in the control units, roadside salvage could have decreased foraging opportunities.

Q: Are the woodpeckers migratory or are they staying here all year?

A:

- Lewis's are migratory; they winter in oak woodlands or on the coast.
- White-headed and black-backed have local movements and are considered residents.
- Hairy woodpeckers are residents, and some individual Northern Flickers are resident while others migratory.
- Sapsuckers are migratory.

Q: What are the American kestrels eating out here? Small mammals? Does that represent a response in understory vegetation?

A: They are eating insects primarily, but the field crew did see them traveling further to bring back small mammals.

Lewis's woodpeckers

- These woodpeckers are unique in that they are aerial insectivores.
- They need forest (tree-less) openings because they have greater foraging and aerial capture.
- They nest in large diameter trees.
- They are weak excavators; find cavities or damaged areas of the trees and enlarge them.
- They will usurp cavities from other species.
- They will also reuse cavities
- Black-backed woodpeckers typically do not re-use cavities; they create new ones nearly every year.
- White-headed woodpeckers re-use nest holes.
- Northern flicker is a weak excavator.

Lewis's re-use of trees may be connected to them selecting large diameter trees (18-20" dbh) because those trees persist.

All woodpeckers select specific sites in trees that have some decay or defect in the tree or area of tree.

Post-fire tree selection across time

- In general, ponderosa pine is favored by many woodpecker species because of deep sapwood and softer wood.
- However, in many post-fire environments, black-backed woodpeckers start nesting in Douglas-fir and lodgepole pine trees because they decay more quickly after fire, then shift to ponderosa pine once it begins to decay around 3 years after fire.
- RMRS found this on the Fremont-Winema NF in the Toolbox Fire.
- Ponderosa pine decays later, and as such, are used later by woodpeckers.
- Tree fall is also species specific
- Doug-fir stand for 6-8 years, then the trees begin to fall with rootwad.
- Ponderosa pine often breaks off from the main tree trunk.

Woodpeckers are selecting habitat at different spatial scales:
(1) Fire; (2) Stand; and (3) Tree (e.g., size, level of decay)

STOP #4: WHITE-HEADED WOODPECKER – LEVEL 3

Whited-headed Woodpeckers (WHWO) nest in large pine trees/snags in openings and forage in clumps of smaller trees. Openings were created by treatment and intended for use by Lewis's and WHWO. The riparian area has dense snags was used by black-backed woodpeckers.

Vicki Saab (center) explains to the group white-headed woodpecker (WHWO) habitat and the prescriptions used for this unit. WHWO nested in a ponderosa snag right outside the photo (to the left). Note the green trees, which WHWO prefer for foraging while nesting in large ponderosa snags or damaged trees. Photo: Trent Seager.

Patch size matters. In this case, the treatment was for WHWO, but all 3 species nested in this unit. The Lewis's nested in one of the openings – solo snags. The black-backed woodpeckers nested in the dense area left as part of riparian buffer. Unfortunately, that nest tree broke and fell.

Photo A): woodpecker use of ponderosa pine snag near logging deck. Photo B): FS and BMFP members gather in riparian area that was left untreated within Level 3 and black-backed woodpeckers used it.

STOP #5: BLACK-BACKED WOODPECKER – CONTROL

RMRS collected data pre-roadside salvage and pre-treatment. For this unit, they found:

- 2016 – 9 pairs
- 2017 – 6 pairs
- 2018 – 3 pairs
- 2019 – 2 pairs

Once treatment happened on the roadside, the number of nesting pairs decreased. 19% of the unit was treated with roadside. It should have been 0% for a true control.

Q: Could treatment be more effective for a mosaic of habitat types if there weren't roadside salvage?

A: We don't have a replicates of this, so it is challenging to incorporate into the data to answer the question.

Q: What density did you expect for BBWO here?

A: Habitat Suitability Model predicted for each unit in the study area. We'd have to look at that to get the answer.

Vicki and Jon share their findings in the control area. No roadside salvage along this main road but there was salvage along a distant closed road, which encouraged lots of dialogue and questions. Photo: Trent Seager

Q: Can the FS answer why we did roadside salvage on a dead-end road? Was there an issue of human safety on that road?

A: It is an open road.

A: No, it isn't.

FS: We did roadside salvage on closed roads. It could be because of fire, recreation, or future management. We'd have to look at the records.

Comment: If we are doing to do this, we need to know why we are doing this.

STOP #6: LEWIS'S WOODPECKER – LEVEL 1

It looks sparse to the human eye, but it is important to remember that it was cut to what the research showed was good for Lewis's woodpeckers – and it is working. The Lewis's woodpeckers are here and using it.

Photo showing roadside salvage in the foreground; treatment Level 1 in the background for Lewis's woodpeckers. It may look sparse to some people, but the Lewis's woodpeckers are using it. Photo: Trent Seager

DISUCCSION of the FINDINGS and REVIEW at our Final Stop:

We'll have a lot more answers coming. There will be a Final Progress Report coming soon. After that, there will be publications on parts of the research. The final analysis will be 2 years out.

Q: Can we say anything now based on what you have found so far?

> **Vicki**: Yes, we can say, "select harvest can accommodate nesting by Lewis's and White-headed Woodpeckers during the first 4 years after wildfire; Black-backed Woodpeckers are nesting in select harvest units but, unexpectedly, their numbers appear to decline each year."

Q: What other data do we have for the post-fire environment?

> **James**: My monitoring of Forest-Veg-Fuels has plots in the Canyon Creek Fire.
>
> **Vicki**: We ran the Habitat Suitability Model for the entire fire to derive a map of species distributions for all 3 woodpecker species.

Q: Could our environmental stakeholders share their perspective – knowing the treatments work for LEWO and WHWO, could you imagine salvage logging with this prescription? What about other environmental groups?

A: We cannot manage for all species on all acres, but we do need to analyze for them and see the impacts.

A: You need to analyze it at the Forest Level for population viability. These 3 species of woodpeckers (and others that use post-fire environment) are MIS and require population viability. So, we need to look at the woodpecker species at three different scales: (1) Forest-level viability, (2) fire boundary, and (3) treatment units.

Comment: This looks bleak, but the Lewis's like it. A good reminder that we cannot use the human lens to account for what wildlife want or need. We need science and data that accounts for wildlife requirements and/or wildlife use.

Q: What species of tree do we need to be thinking of for snags that provide good nests for woodpeckers and wildlife?

Vicki: Ponderosa pine are favored because of the deep sapwood and the thick bark for protection. However, wildlife's use of snag species shifts based on the decay. Douglas-fir and lodgepole decay more quickly post-fire, so woodpeckers select those. Then they shift to ponderosa pine. Also, both tree size and species matter.

Q: Do black-backed woodpeckers use larch?

A: Sometimes. Because larch persist over time, those cavities are available to other wildlife species (secondary cavity nesters). This includes the Lewis's, which will enlarge the BBWO nest cavity to use it. There are Lewis's Woodpeckers using larch in this study.

Q: What about grand fir?

A: They are used, but it is uncommon.

Jon Dudley (middle) and Zach Williams (right) discuss the woodpecker salvage research next to a nest site that was depredated on by a black bear (far right tree). OPB Oregon Field Guide crew were filming during the field tour. Photo: Trent Seager

OVERALL THOUGHTS FOR THE STUDY

Based on what we've learned here, and the discussion over the past 4 years – knowing that we designed it and implemented it – what do we think about this?

We know it was difficult, everyone worked really hard, the FS implemented it. What do we think?

FS: With our Research Arm, we need technology transfer and help with the management implications. Research has to help interpret it for the MNF.

Vicki: With Firebird (program), the GIS Tool, we have step-by-step instructions through Vimeo video already up and going. You can access that here: https://vimeo.com/301080500 (see Appendix for more information). The habitat suitability models implemented in FIRE-BIRD, and their respective output, can inform forest management for woodpecker species of concern. The output of the FIRE-BIRD tool identifies areas most likely to support these species. The output can be used to

identify areas of high suitability which can be targeted for conservation (e.g., design criteria for post-fire salvage logging) and to identify areas of marginal suitability where habitat improvements could be conducted (e.g., dry forest restoration activities).

This is available now and people are using it. In fact, they have FIRE-BAT program that is built off of the FIRE-BIRD to help managers consider bat habitat. This tool lets resource specialists consider management implications.

FS: From a fire perspective, the roadside treatment helps for future fire suppression activities. Safety is a concern. We don't like to go into a snag heavy area. It was good to see the economics worked.

BMFP member: From a process perspective, the environmental and industry partners have been at loggerheads on what to do in a post-fire environment. It is great that we have a process to address and satisfy their concerns. It has to be ecological first then economics second. We learned that in the green program, and it is the same here in a post-fire environment. Access to timber in a post-fire environment is an important resource in a rural community. We addressed wildlife concerns and brought economics to the community. That is a success!

BMFP member: It is a success. The enviros have detested salvage, but from an industry perspective, we wonder, how can we worry about habitat in 5,000 treated acres of a 120,000-acre fire? But we figured out what we can with it, and that we can do that within a legal framework. That is what collaboration can do. We can harvest trees in a post-fire environment with minimal harm.

BMFP member: If we are going to do salvage, then it needs to be as ecological sensitive as possible. There are lots of dead trees still here, and some people don't like that. But there are no clearcuts. There is variability; a mosaic, and all birds can use it. That is a good outcome. The community wants more harvest here, but we can only do so much with mill capacity and limitations. I want a concrete path forward because fire is coming. Let's apply this to future fires. This should not be a 1-off. We can salvage; we can get logs to the mill; and the birds can keep their habitat.

FS: We can implement this faster next time. This was research, so it had to be done to specific standards (individual tree mark).

BMFP member: This should be a planned component of the Forest Plan. Then we don't need to do environmental analysis, we can save time and not shortchange the environment.

BMFP member: Substantial data here for our Zones of Agreement. Verifying predictions of the future. We can answer some or have data for that. Science and facts to inform that conversation and management.

FS: This is the first I have heard of this research, as I am new here to the MNF. This has application for project design criteria for retaining snags in salvage. People often wonder how feasible is that? With this, we know it is practical. We do need to be aware that Black-backed Woodpeckers are not successful or even present in the treated units, so we need to have untreated areas for them. Since we flooded the market with what timber was taken off of here, that shouldn't be a problem.

BMFP member: We put our efforts on the green program on hold for a year, as did the FS. Normally we would get 20-30 million board feet from that green program. So the FS had to agree to focus on the "black program" (post-fire) instead of green.

Q: NEPA writers, does this help for writing salvage EAs?

> **FS**: If researchers can help us interpret it, then NEPA will be much more efficient.

BMFP member: This study has been good to remind us to look through the lens of wildlife, not humans. Habitat and vegetation – science tells us what wildlife needs, not the visual eye of humans.

FS: HRV is telling us that the forest is out of range, but treatment can add ICO and get us back to HRV.

RMRS: we were fortunate to design this with the MNF silviculturists. We'll learn a lot once we analyze the data. This is the way to go – work with the FS to test for adaptative management.

Q: Is FIRE-BIRD set up to do that?

> **Vicki**: It is good for overall design of where to salvage, while minimizing negative impacts to woodpeckers. We also have a new module for a green forest program with the WHWO and CFLRP. Once we get the LiDAR classified for Canyon Creek, we can start estimating snag densities and diameters over entire burns. We will incorporate the LiDAR derived variables into Firebird too.

Jon: I would echo a lot of what Vicki has said. This is the role of the FS research branch. Addressing issues that are very challenging, do research, and help come to a solution with agreement, then writing up the findings. Applaud you as a collaborative for sticking with this. Resource management is challenging, and this type of approach is the way forward and through it.

Appendix:

FIRE-BIRD:
Habitat suitability model application tools for disturbance-associated woodpeckers

Homepage: https://www.fs.fed.us/rmrs/tools/fire-bird-habitat-suitability-model-application-tools-disturbance-associated-woodpeckers

Abstract

FIRE-BIRD is an ArcGIS spatial tool for applying habitat suitability models to generate maps that inform forest management planning. This tool focuses on disturbance-associated woodpecker species of conservation concern.

Vimeo Tutorial for FIRE-BIRD: https://vimeo.com/301080500