From: Jeff Everett
To: Craig Hansen; amy_nicholas@fws.gov; Jesse_Delia@fws.gov
Cc: Jennifer Siani; Jeffrey Dillon
Subject: GRSG 2015: DRAFT conifer chapter
Date: Tuesday, February 24, 2015 2:21:01 PM
Attachments: GRSG2015_SpReport_Conifers_working_draft_JGE_2_24_15.docx

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All –

Attached is a very rough draft of the conifers chapter. It needs some polishing and there are significant place holders for CED results and USGS modeling, etc. It is really rough, but I didn't want to wait any longer to get the draft circulating. I am teleworking from home this week with a very sick little boy and I do not have access to Sharepoint from home, thus this email. I do plan to be on the writing team call this afternoon. Some background on how I got to this point and the steps I have taken:

First, I read through the 2010 and the COT report. I have to say I think the conifers section(s) of the 2010 finding were really well written – concise and right to the point, so I borrowed very heavily from those sections and plugged them into the current template. Not all of it fits perfectly but the meat of it is there. Same thing with some of the language from the COT report.

Then, I did the recent literature search through Web of Science and a few other searches to see what has been published since 2010 – the big one of course is Baruch-Mordo, but also Knick and a few others. There isn't really very much, and a lot of it has to do with pre- and post-fire vegetation communities etc., without a lot of direct connection to sage-grouse.

Next, I had a conversation with Jeremy Maestas from NRCS here in OR, recognizing that SGI would most likely be the single largest contributor to threat amelioration and his own expertise on the subject; we chatted before the original January 15 CED deadline and discussed what NRCS was going to submit. Part of the conversation centered around how what they have seen is that there is very little new Phase 1 conifer encroachment taking place throughout the landscape – most of what they are seeing is infilling from Phase 1 to Phase 2. I think this could be very important to this chapter and I am waiting on more information to write that section, but I don't have it yet. This part could be huge.

There are parts of the template – particularly the timing chart – that don't fit this threat very well. The threat to sage-grouse from conifers manifests itself in the habitat on a continual basis – it is not really seasonal in nature. As such there are impacts to sage-grouse throughout the year from a disturbance perspective, with direct impacts from lek attendance to nest success to brood survival to winter habitat use. This point needs to be fleshed out some but there is placeholder language in there.

There are big gaps in this draft – we are waiting on significant pieces from the CED and USGS, and I am reluctant to write the elevator speech/executive summary part until the very end when we have that. I think those pieces will have a ripple effect through this entire chapter.

All of that is to say, this draft probably is not as complete nor well written as you would like at this point, particularly recognizing the late hour. I have some flexibility in my schedule over the next couple of days, and tomorrow I will dive into the citations section. I will have the ability to respond to comments on this draft as they come in. Special thanks to Jesse and Craig who already have provided some guidance.

Cheers

J-

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Chapter 1: Conifers

INTRODUCTION

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Comment [KNorman1]: The Elevator Speech (please write this last)
- What is the take home message (this is very bad across the range, this may be bad locally, this really isn't a big deal for all but a few populations)
- What has changed since 2010? What's new or different in a nutshell?

THREAT DESCRIPTION

Greater sage-grouse are negatively impacted by the expansion of pinyon and/or juniper in their habitats, even if the underlying sagebrush habitats remain (Freese et al 2009). Sage-grouse avoid these areas of expansion (Casazza et al 2010), and as the pinyon and/or juniper increases in abundance and size, the underlying habitat quality for sage-grouse diminishes (COT REPORT pg 47)

Pinyon-juniper woodlands are a native habitat type dominated by pinyon pine (*Pinus edulis*) and various juniper species (*Juniperus spp.*) that can encroach upon, infill, and eventually replace sagebrush habitat. These two woodland types are often referred to collectively as pinyon-juniper; however, some portions of the sage-grouse's range are only impacted by juniper encroachment.

Pinyon-juniper woodlands are often associated with sagebrush communities and currently occupy at least ~~18~~ XX million ha (~~44.6~~XX million ac) of the Intermountain West within the sage-grouse's range (Crawford et al. 204, p. 8; Miller et al 2008, p. 1). Pinyon-juniper extent has increased 10-fold in the Intermountain West since European settlement causing the loss of many bunchgrass and sagebrush-bunchgrass communities (Miller and Tausch 2001, pp. 15-16). This expansion has been attributed to the reduced role of fire, the introduction of livestock grazing, increases in global carbon dioxide concentrations, climate change, and natural recovery from past disturbance (Miller and Rose 1999, pp. 555-556; Miller and Tausch 2001, p. 15; Baker, in press, p. 24; see also discussion under Fire, above).

Comment [EJ2]: Need updated numbers from USGS; these are from 2010.

When juniper increases in mountain big sagebrush communities, shrub cover declines and the season of available succulent forbs is shortened due to soil moisture depletion (Crawford et al 2004. p. 8). As with Bromus tectorum, the Great Basin appears more susceptible to pinyon-juniper invasion than other areas of the sage-grouse's range; however, Connelly et al. (2004, pp. 7-8) cautioned that a formal analysis of the risks posed in other locations was needed before such inferences could be made.

Pinyon-juniper expansion into sagebrush habitats, with subsequent replacement of sagebrush communities, has been well documented (Miller et al 2000, p. 575; Connelly et al 2004, p. 7-5; Crawford et al 2004, p. 2; Miller et al 2008, p. 1). However, few studies have documented woodland dynamics at the landscape level across different ecological provinces, creating some uncertainty regarding the total amount of expansion that has occurred in sagebrush communities (Miller et al 2008, p. 1). Regardless, we know that up to 90 percent of existing woodland in the sagebrush-steppe and Great Basin sagebrush vegetation types were previously dominated by sagebrush vegetation prior to the late 1800s (Miller et al, in press, pp. 23024). Based on past trends and the current distribution of pinyon-juniper relative to sagebrush habitat, we anticipate that expansion will continue at varying rates across

the landscape and cause further loss of sagebrush habitat within the western part of the sage-grouse's range, especially in parts of MZs III, IV, and V.

"Habitat lass is occurring from the expansion of native conifers (e.g. pinyon-pine (Pinus edulis) and juniper (Juniperus ssp.) (pinyon-juniper), mainly due to changes in fire return intervals and the overstocking of domenstic livestock, particularly during the latter 1800s and early 1900s (Miller and Rose 1999); however, these factors may not entirely explain the expansion of western juniper (Soule and Knapp 1999). Conifer encroachment may be facilitated by increases in global carbon dioxide (CO2) concentrations, and climate change, but the influence of CO2 has not been supporded by some research (Archer et al 1995) (COT REPORT)

CURRENT IMPACTS

Mechanism

Conifer encroachment is a large-scale threat in parts of MZ III, IV, and V (insert ref to COT); present in all MZs? Doherty et al (2008, P 187) reported a strong avoidance of conifers by female greater sage-grouse in the winter. Also, Freese (2009, pp. 84-85, 89-90) 2-year telemetry study in central Oregon found that sage-grouse used areas with less than 5 percent juniper cover. Therefore, pinyon-juniper encroachment into occupied sage-grouse habitat reduces, and likely eventually eliminates, sage-grouse occupancy in these areas.

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Comment [KNorman3]: What is the mechanism for impacts to sage-grouse persistence? Could do a quick summary and incorporate by reference 2010 or other more complete explanation. This should be very brief.

It is estimated that as much as 90% of conifer encroachment is the western US is occurring sagebrush habitats (Davies et al 2011; Miller et al 2011). Western juniper (Juniperus occidentalis) has exhibited geometric growth rates and expanded its range by as much as 600% in the last 150 years (Romme et al 2009). There is large variability in stand characteristics as they relate to successional phases after stand establishement (Miller et al 2005).

Results of impact **(vital rate/population level effects (direct, indirect)**

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Comment [KNorman4]: What is the result? So far, this has resulted in fragmentation which isolates populations resulting in inbreeding depression? So far, the individual deaths do not have population impacts?

Knick et al 2013 found that active leks were absent from regions with greater than/equal to 40% conifer and averaged less than 1% conifer forest within 5 km, compared to an average of 13% for the study area and 3.4% for historice grouse locations.

Baruch-Mordo et al 2013 found that sage-grouse incur population-level impacts at very low levels of encroachment, and leks were less likely to be active where smaller trees were dispersed.

Results in Baruch-Mordo et al 2013 suggest that sage-grsoue incur population-level impacts at a very low levl of encroachment as no leks remined active when conifer canopy cover exceeded 4%. This pattern corresponds with other finding of a negative relationship, or avoidance, of confier habitat suring

all sage-grouse life stanes (ie. nesting, brood-rearing, and wintering; Doherty et al 2008; Atamian et al 2010; Doherty et al 2010a; Casazza et al 2011).

Timing

Location and extent

Annual encroachment rates that were reported in five studies raned from 0.3 to 31 trees per hectare (0.7 to 77 trees per acre) (Sankey and Germino 2008, p. 413). For the three studies that measured the percent increase in juniper cover per year, cover increased between 0.4 and 4.5 percent annually (Sankey and Germino 2008, p.413). Sankey and Germino (2008, p. 413) compared juniper encroachment rates from previous research to their study. Their estimate that juniper cover increased 0.7 to 1.5 percent annually was based on a 22 to 30 percent increase in cover between 1985 and 2005 at their southeastern Idaho study site (Sankey and Germino 2008, pp. 412-413).

Conifer encroachment is a large-scale threat in parts of MZ III, IV, and V (insert ref to COT); present in all MZs?

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Comment [KNorman5]: Short and sweet narrative (1 paragraph)
Map if possible to use map with current threat layers (as available)
Table if possible – by management zone describe threats impacts.

Conifer encroachment is an ongoing, year-round issue, affecting sage-grouse use of habitat throughout the year. Conifer encroachment has direct and indirect effects on lek attendance, nest success, increased predation and brood survival throughtout the year.

Table 1-1: List of impacts by management zone.

Management Zone	Timing of Impacts (Season)	Immediacy of Impacts	Severity of Impacts	Extent of Impacts	Resource or Life stage impacted	Notes
Example	Spring (or all the time, etc.)	Happening right now (or planned)	Direct mortality (or habitat destruction, etc.)	Impacting X% of occupied range by MZ ~~pops~~ (see Kevin's models)	Lekking adults, broods	This is an example…
1						
2						
3						
4						
5						
6						

7

Map Showing Current Threats (this is "Map 2" that the GIS team is working on; ***we will not have this map for all chapters****)*

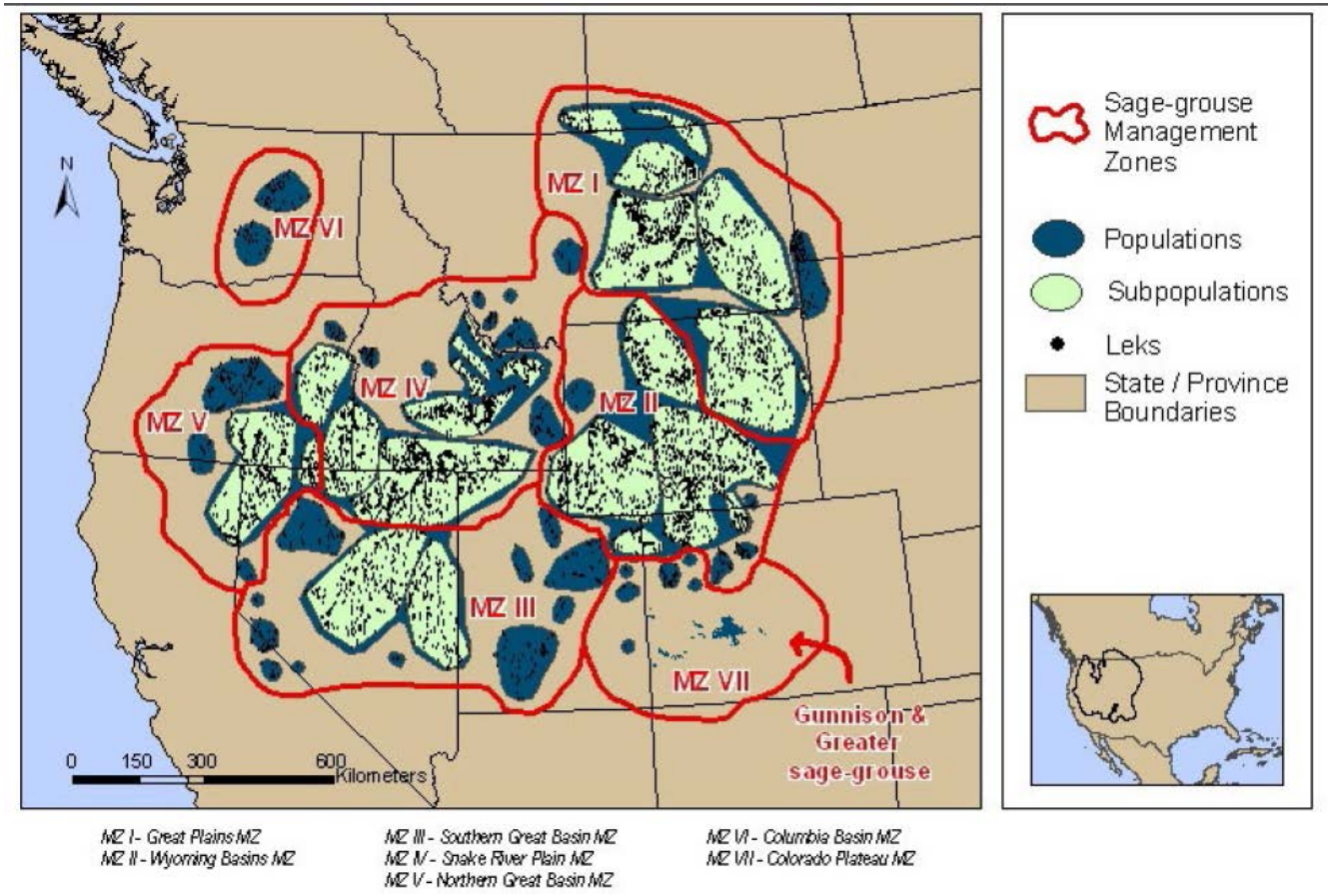

Figure 1-1: Current threat by management zone.

Compounded effects

The compounding effects will be discussed in greater detail in the Compounded Effects chapter.

In brief, the following impacts are likely to interact with the threat described in this chapter.

- Bulleted list showing potential impacts
- Fire/invasive grasses
- Climate change/increasing CO2 levels
- Livestock grazing

Comment [KNorman6]: Will be discussed further in compounding/ cumulative effects section

PROJECTED FUTURE IMPACTS

a. Timescale for Projecting this Threat

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Comment [KNorman7]: How far into the future can we reasonably predict this threat

Comment [acn8]: Clearly articulated, fact-based rationale for timeframe.

Connelly et al (2004, pp. 7-8 to 7-14) estimated that approximately 60 percent of sagebrush in the Great Basin was at low risk of displacement by pinyon-juniper in 30 years, 6 percent at moderate risk, and 35 percent at high risk. Mountain big sagebrush appears to be most at risk of pinyon-juniper displacement (Connelly et al 2004, pp. 7-13).

b.Likelihood of future impacts

Regardless of the cause of conifer woodland encroachment, the rate of expansion is increasing and is resulting in the loss and fragmentation of sage brush habitats – FWS 2010. Baker (in press, p. 24 (from 2010) and Miller et al (in press, pg 37) (2010) offer a suite of causes, acting in concert with fire exclusion that may better explain the dramatic expansion of conifer wodlands over the last century. These causes include alterations due to domestic livestock grazing (such as reduced competition from native grasses and forbs, and facilitation of tree regeneration by increased shrub cover and enhanced seed dispersal), climatic fluctions favorable to tree regeneration, enhanced tree growth due to increased water use efficiency associated with carbon dioide fertilization, and recovery from past disturbance (both natural and anthropogenic). (all above from 2010).

"At higher elevations, confier and juniper woodlands are encroaching into sagebrush shrublands (Tausch et al. 1982, Miller et al 2011), again resulting in lower habitat suitability for sage-grouse. Almost all leks were in areas containing little confier or grassland cover in the surrounding landscape. Thus two widespread trajectories of vegetation change are likely to further reduce habitat suitability across large areas of the sage-grouse range." Knick et al 2013 page 10

Pinyon-juniper expansion into sagebrush habitats, with subsequent replacement of sagebrush communities, has been well documented (Miller et al 2000, p. 575; Connelly et al 2004, p. 7-5; Crawford et al 2004, p. 2; Miller et al 2008, p. 1). However, few studies have documented woodland dynamics at the landscape level across different ecological provinces, creating some uncertainty regarding the total amount of expansion that has occurred in sagebrush communities (Miller et al 2008, p. 1). Regardless, we know that up to 90 percent of existing woodland in the sagebrush-steppe and Great Basin sagebrush vegetation types were previously dominated by sagebrush vegetation prior to the late 1800s (Miller et al, in press, pp. 23024). Based on past trends and the current distribution of pinyon-juniper relative to sagebrush habitat, we anticipate that expansion will continue at varying rates across the landscape and cause further loss of sagebrush habitat within the western part of the sage-grouse's range, especially in parts of MZs III, IV, and V.

c. Anticipated changes from present (direct, indirect; same amount of range? Populations?)

NRCS is projecting 8 million acres conserved through SGI by 2018, but not all of this is conifer control.

Need to compare results of modelling with the results from CED, and very carefully crosswalk this with the commitment of $$ from NRCS. See placeholder introduction language in threat amelioration summary below.

THREAT AMELIORATION

Comment [KNorman9]: The CED reports will include a summary of conservation actions designed to ameliorate each threat.

Based on January In-Person meeting, this list may include ALL self-certified actions. Service personnel may need to further review these actions in future.

Active Conservation

Introduction/background from the COT Report: The Conservation Objective: Remove pinyon-juniper from areas of sagebrush that are most likely to support sage-grouse (post removal) at a rate that is at least equal to the rate of pinyon-juniper incursion (COT REPORT 47) Treatments to remove pinyon-juniper trees in phase 1 (trees present but shrubs and hebs are the dominant vegetation that influence ecological processes) and phase 2 (trees are co-dominant with shrubs and herbs and all three vegetation layers influence ecological processes; Miller et al 2008) state of incursion should match the rate of incusion (minimally 200,000 acres per year, Stiver et al 2006). Removal should be prioritized by seasonal habitats, based on the habitat that is locally limiting populations. Removal techniques should not include prescribed fire in low elevation, xeric sagebrush communities.

Pinyon and/or juniper removal activities should focus initially on areas within PACs, but all opportunities to remove this threat should be considered if resources are available. Where sate sage-grouse management plans

provide an effective strategy for pinyon-juniper, those strategies should be implemented. In all other situations the following conservation options should be considered.

1. Prioritize the use of mechanical treatments for removing pinyon and/or juniper. These techniques allow for more selective removal of invading plants, and more importantly allows understory habitats to remain intact.

2. Use caution when planning use of prescribed fire in high elecation mountain big sage sites toprevent fire escape and any subsequent establishment of invasive annual grasses or other weeds.

3. Reduce juniper cover in sage-grouse habitats to less than 5% (Freese 2009, Cassaza et al 2010), but preferably eliminate entirely.

4. Employ all necessary management actions to maintain the benefit of pinyon and/or juniper removal for sage-grouse habitat, including long-term monitoring (greater than 30 years) with appropriate management responses should the resultant habitat quality decline.

SGI has cut invasive conifer from 405,241 acres, of which 84% of removal is focused in four Great Basin populations (Northern Great Basin, Box Elder, Central Oregon, and Western Great Basin)(NRCS SGI report 2/2015 page 7)

"Removing encroaching conifer reduces fuel load by half and can decrease the negative impacts resulting from catastrophic wildfire (Chambers et al 2008) in NRCS-SGI report 2/2015, page 17(COT REPORT 47-48)

Through the Conservation Efforts Database (CED), the Service collected information relating to conservation actions that were completed, in progress, or planned. Based on a summary report of that information created on XXXXXX, the following table indicate the number of actions and approximate areas for threat amelioration. These numbers are self-reported; the Service will further review and certify these actions if they are pivotal to any determination.

Comment [KNorman10]: Kate's attempt…

The Service addresses regulatory actions in a separate chapter????

Comment [KNorman11]: Do we want to make this easier on folks? Does that undermine the "take away"?

Table 1-22: List of Conservation Efforts (ameliorating threat described in this chapter) by management zone

Management Zone	Type of Conservation Effort	Sum of Acres or Miles	Number of Actions	Notes
1				
2				

3
4
5
6
7

Threat Amelioration Summary

Baruch-Mordo et al 2013 calculated the average cost of conifer removal as approximately US$250/ha based on J. Maestas personal observation), but noted that this is a relatively conservative estimate compared to McClain's (2012) estimate to remove early encroachment stands (US$75/ha) and given that costs vary by tree density, terrain, and degree of post-treatment slash reduction. Using these assumptions, Baruch-Mordo et al 2013 estimated the total costs to treat all phase 1 and phase 2 conifer stands within 5k, of all leks in Oregon was $87.5 million.

ASSESSMENT OF POTENTIAL THREAT

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Comment [KNorman12]: This should be a VERY brief restatement of the introduction. 1 paragraph. Remind reader of the overall message.

Conifer expansion is a significant threat to sage-grouse throughout the range of the species. The rate of conifer expansion into sage-grouse habitat is increasing despite significant efforts and concentrated local successes to address this threat. Due to the interconnected nature of conifer expansion with other compounding effects, it is unlikely that the recommendations from the COT report (to address conifer encroachment at least at the rate of expansion) will be met.

CITATIONS

Will insert as working through draft