The Efficacy of Signs to Protect Standing Snags

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INTRODUCTION

Snags (i.e., standing dead trees) are critical components of forested ecosystems. In the Pacific Northwest, between 25 and 30 percent of terrestrial wildlife (>100 species) use snags (Bunnell et al. 2002a, Thomas et al. 1979), including threatened, endangered or sensitive species such as Northern Spotted Owl (*Strix occidentalis*) and White-headed Woodpecker (*Dryobates albolarvatus*). A large body of literature shows that low snag availability is an important factor limiting diversity and populations of snag-dependent wildlife (e.g., Zarnowitz and Manuwal 1985, Hershey et al. 1998, Buchanan et al. 1999, Hutto 2008). Snag availability, and thus populations of cavity-dependent wildlife, can be negatively impacted by some forest management activities, especially the salvaging of dead trees after fire or insect outbreaks (Haggard and Gaines 2001, Hutto and Gallo 2006, Russell et al. 2006, Saab et al. 2007, White et al. 2015). Likewise, research indicates that road access and snag felling for home and recreational firewood gathering can limit habitat for these wildlife species and should be a major concern where management of these species is a priority (Scott 1978, Goodwin and Balda 1983, Hicks 1983, Morrison et al. 1986, Wisdom and Bate 2008, Hollenbeck et al. 2013).

In Washington, most land management agencies prohibit snag felling for firewood by the public – even those that allow snag felling during salvage logging. This is in part due to the difficulties in regulating and managing public snag felling, unlike salvage logging which is well-regulated and measured. Along the east slope of the Cascades, the Washington Department of Natural Resources (WDNR) and Washington Department of Fish and Wildlife (WDFW) prohibit snag felling by the public on lands owned by those agencies. Despite this restriction, snags are routinely felled for firewood by the public on state owned lands due in part to a lack of enforcement. One area in particular where snags are felled for firewood illegally is in the Wenas. The Wenas area has a high road density, gentle topography, a long history of timber management, and is heavily utilized for outdoor recreation (camping, hunting, horseback riding, riding ATVs, birdwatching, etc.). The combination of these factors has resulted in this area having a high degree of illegal of cutting of snags for firewood, many of which result from falling snags for campfires during hunting season. As illustrated in Figure 1, snags containing active nests of cavity-nesting species are especially vulnerable to illegal cutting of snags (Figure 1; also see Kozma 2011). Illegal snag cutting, in combination with a long history of timber management, has resulted in many areas being snag deficient, or if snags are present, many are small [≤ 12-inch diameter at breast height (DBH)] or extremely old and heavily decayed; making them less suitable for nesting substrates by cavity-excavators.

An important tool to use in the conservation of snags and wildlife trees on the landscape are signs. Signage has been used as a way to mark valuable wildlife habitat trees by numerous land management agencies such as WDNR, WDFW, and U.S. Forest Service. However, because of the time and staff required to put up the tags, along with potential liability issues of marking snags during timber management, signs are rarely used. This is unfortunate as signs convey to the public that snags and wildlife trees are valuable habitat components that should be left on the landscape, especially in areas where falling them is illegal. Unfortunately, there is no consensus that signs actually work in preventing snags from being cut. Therefore, we conducted a study to assess the effectiveness of signs at protecting snags. We predicted that snags with a larger DBH and snags closer to a road would be cut down at a greater frequency.

METHODS

This study was conducted from 2021 to 2024 in the Wenas area, Yakima and Kittitas counties, Washington (Figure 2). We conducted our study within the black hatched area of Figure 2; all of which is owned by WDNR, and we did not need to go into the area designated as a potential expansion area.

In late summer of 2021, we located snags to be monitored that were ≥ 10-inch diameter at breast height (DBH), ≥ 6 feet in height, and ≤ 250 feet from the nearest green dot marked road (i.e., roads open to public travel and marked with green dots on posts). The location of each snag was recorded with a GPS and the distance from the road measured with a range finder. We also measured the DBH with a DBH tape and the height of each snag either with a telescoping measuring pole for snags <30 feet tall or a clinometer for snags >30 feet tall. We randomly determined if snags did or did not receive a sign that was printed with an image of a woodpecker on a tree and with the words “Habitat Tree for Wildlife” (Figure 3). Each spring and summer from 2022 through 2024 we recorded if a snag was still standing, if it was cut, or if it fell due to natural causes. We used T-tests for statistical comparisons and all results are presented as means ± standard error.

RESULTS

We monitored a total of 151 snags; 83 received a sign and 68 did not have a sign. Snags were located a mean distance of 108.6 ± 6.3 feet from a road, had a mean DBH of 16.2 ± 0.4 inches, and a mean height of 48.7 ± 1.7 feet. The majority of snags (80%) had a DBH of < 20 inches (Figure 4). Of the snags with signs on them, 22 (26%) were cut down, 9 (11%) fell naturally, and 52 (63%) were still standing in 2024. Of the snags without signs on them, 20 (29%) were cut down, 5 (7%) fell naturally, and 42 (62%) were not cut down. In total, 56 (37%) snags were either cut (28%) or fell naturally (9%) over the three-year monitoring period.

Distance from road, DBH, and height of snags with signs did not differ from those without signs ($P = 0.42$, $P = 0.37$, and $P = 0.40$, respectively). The maximum distance from the road a snag was cut was 225 feet. Though snags were observed to be cut down greater than this distance, our sampling was only limited to within 250 feet of a road. Distance from the road and DBH of snags that were cut down did not differ from those that were not cut (Table 1; $P = 0.07$ and $P = 0.12$, respectively). However, snags that were cut down had a significantly greater mean height

than those that were not cut down (Table 1; P = 0.02). Snags with signs that were cut down had a greater mean distance from a road than snags cut down without signs (Table 1; P = 0.04), while mean DBH (P = 0.12) and mean height (P = 0.35) did not differ between cut snags with signs and cut snags without signs (Table 1).

DISCUSSION

This study investigated if putting signs on standing snags in an area with a history of snag falling by the public would help prevent snags from being cut. We found that just about equal numbers of snags with and without signs were illegally cut down. It appears signs did not deter people from cutting down snags. Snags with signs that were cut down were located a greater mean distance from a road than snags that were cut down without signs. This suggests that one of the unintended consequences of putting signs on snags is that signs may draw people's attention to snags located further from roads that they may not have noticed otherwise. Alternatively, people may have gone further from a road to cut snags with signs in order to not get caught or make it look less obvious that a snag was cut.

Overall, distance from a road that snags were cut down did not differ from those not cut down. This differed from our prediction that snags closer to a road be cut down at a greater frequency. This suggests that snags closer to a road were not preferentially selected compared to those further from a road. Indeed, we found snags cut down up to 225 feet from a road, and we documented additional snags cut further than that distance, but those snags were not part of the intensive monitoring for this study. Interestingly, snags that were cut down did not have larger DBH than those that were not cut; another finding that was the opposite of our prediction. We did, however, find that snags that were cut down were taller than those that were not cut. Woodcutters apparently were attracted to taller snags, perhaps because when cut down and processed, taller snags resulted in more logs for a campfire. It is also evident from our results that large-diameter snags >20 inches are rare in this area; a common finding in areas that have a long history of timber management.

In conclusion, signs did not deter the cutting of snags and may actually have caused snags further from roads to be targeted for cutting. Perhaps if signs had contained stronger wording, such as "do not cut", our results may have been different. Cut snags were taller than snags that were not cut, suggesting that woodcutters target taller snags rather than those with a bigger diameter. With 28% of snags cut down in 3 years, this will negatively impact the cavity-nesting bird community (e.g., 20 bird species nest in cavities in this area) as well as all other species that use cavities, because the number of potential nesting sites has been depleted and research has found that <15% of snags are suitable for excavation by woodpeckers (Lorenz et al. 2015). Therefore, the more snags that are cut down, the less chance that cavity-excavating species have to find a suitable snag for nesting. Because this area has a high incidence of illegal snag cutting, we suggest DNR and other state land agencies put signage on reader boards at the entrance to green dot road systems and camping areas that explicitly states it is illegal to cut snags on state owned property. We also suggest increased enforcement patrols during hunting season and educating hunters about the importance of snags, because most snags appear to be cut down from September – November.

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Table 1. Distance from road, DBH, and Height of snags cut, snags not cut, snags cut that had a sign, and snags cut that didn't have a sign from 2022-2024.

	Cut	Not cut	Cut with a sign	Cut without a sign
Distance from road (feet)	94.9 ± 11.7	117 ± 8.2	114.4 ± 17.1	73.5 ± 14.7
DBH (inches)	15.4 ± 0.5	16.5 ± 0.6	15.8 ± 0.8	14.6 ± 0.8
Height (feet)	52.9 ± 2.7	44.7 ± 2.3	56.2 ± 3.6	53.2 ± 3.5

A. B.

Figure 1. Photo A shows a snag containing a White-headed Woodpecker (*Dryobates albolarvatus*) nest that was found on 5/19/20 and was 100 ft from North Wenas Road. Photo B shows the same area (note the two small pines to the right of the snag in both pictures) with the snag now gone on 5/28/20, having been cut for firewood (note saw dust on the ground in the foreground of the photo).

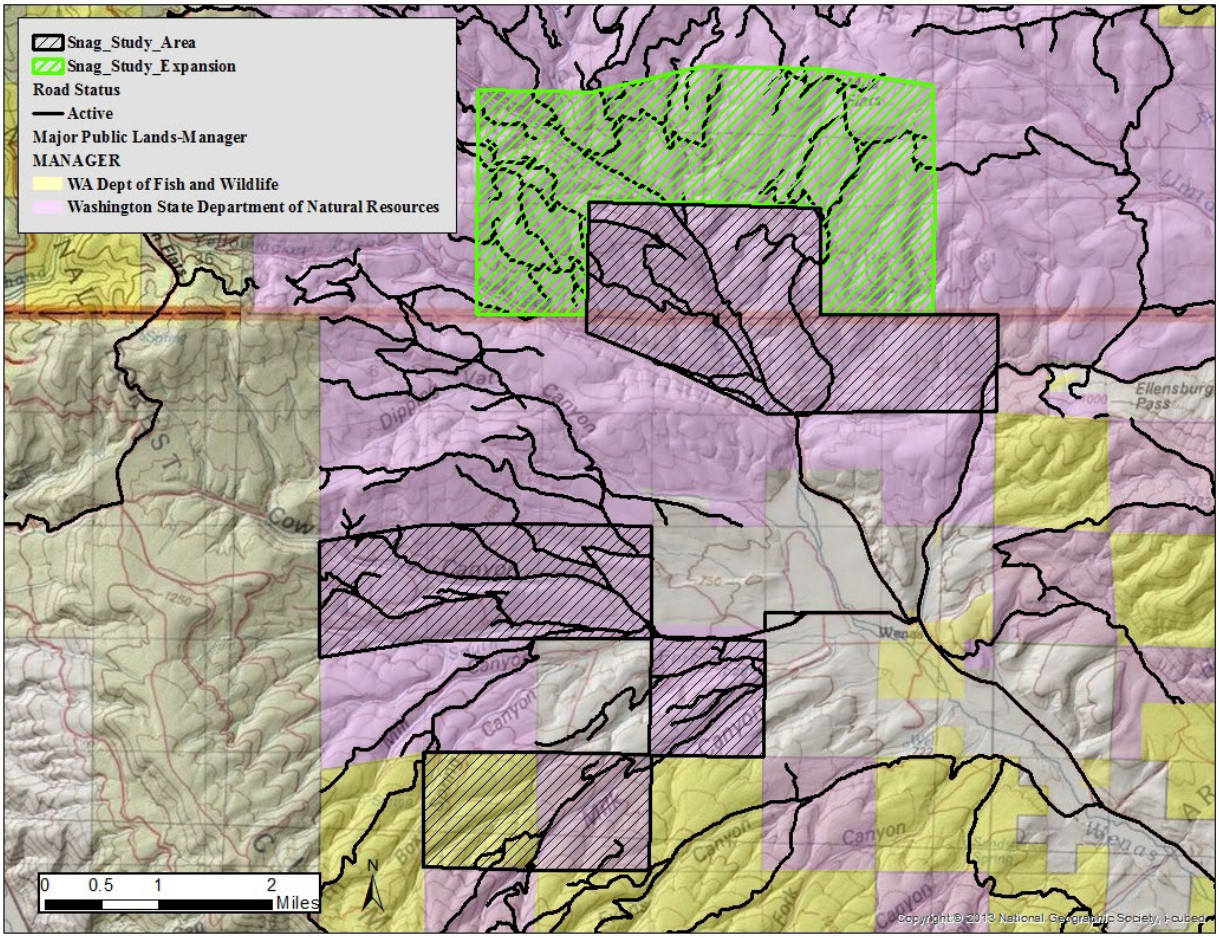

Figure 2. Study area (black hatched lines) and potential area to expand study if needed (green hatched lines) in northern Yakima and southern Kittitas counties, WA.

Figure 3. Sign used to mark snags; each sign was 4-inch x 4-inch.

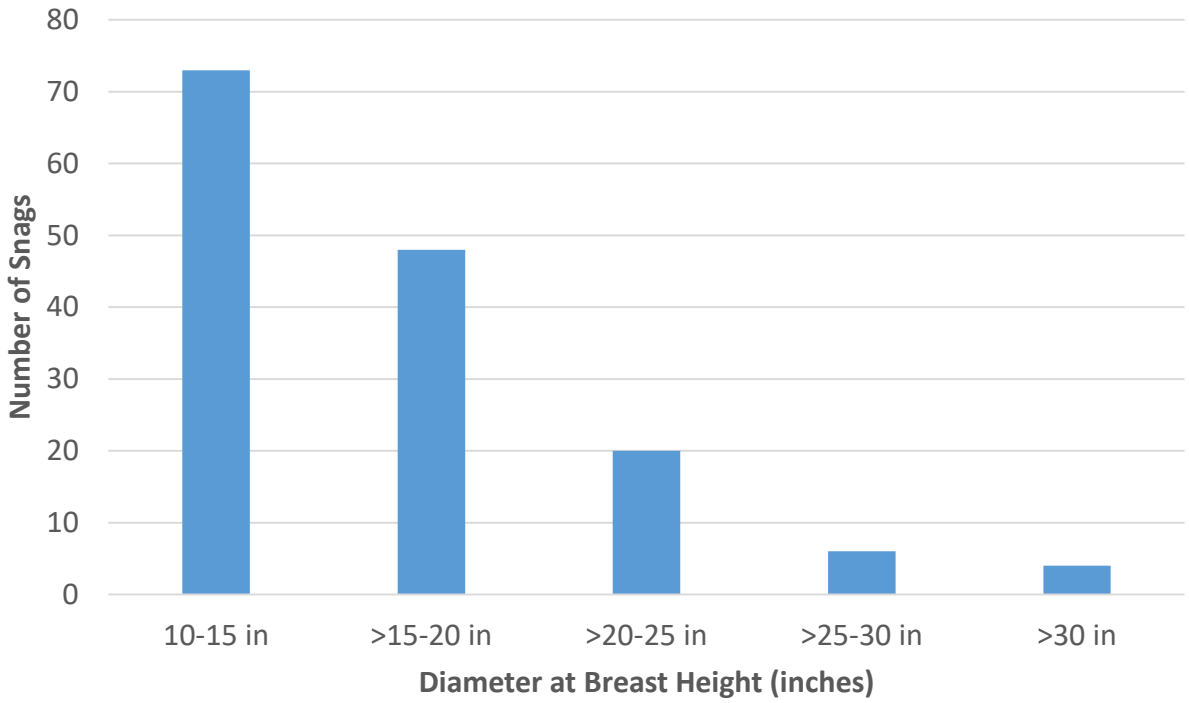

Figure 4. Distribution of the number of snags within each of five, diameter at breast height categories, Yakima and Kittitas counties, WA, 2021.