Mitigating and Preventing Noxious Weeds on Decommissioned Roads

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Restoring roaded areas has been demonstrated to restore hydrology and improve fish and wildlife habitat, however, little research has been conducted on the efficacy and effects of treatments for restoring native plant communities or minimizing weeds. InRoads Consulting, LLC and the University of Montana have been monitoring the impacts of road decommissioning on vegetation and noxious weeds as part of the Southwest Crown CFLRP. Specifically, we have recorded vegetation composition and soil characteristics before and after road treatments on roads on the Helena, Lolo, and Flathead National Forest. We are in the process of analyzing this data and expect to have a formal report of results next year. However, anecdotally, we have observed that several treated roads had dramatic increases in noxious weed density.

Noxious weeds are common along roadsides, and open forest roads provide key habitat for their dispersal (Birdsal et al. 2012). One of the goals of decommissioning roads is to restore native plant communities and reduce weed infestations. However, roads are inherently difficult to revegetate because of compaction, lack of soil and organic material, low native seedbank, and presence of noxious weeds (Simmers and Galatowitsch 2010, Ramlow et al. 2018). Furthermore, the restoration work is typically conducted during the heat of the summer when temperatures are high and precipitation is low.

Each road site is unique, and the aspect, canopy cover, and site history are all important factors for noxious weed vulnerability. For example, most Legacy Lands roads have limited canopy cover, little woody debris available, and a large weed seedbank. Thus, revegetation is going to be particularly challenging on these lands. Quickly eliminating noxious weeds may not be feasible, but the goal is to move the weed-infested community to a successional trajectory that leads to a more desirable plant community. Additionally, secondary weed infestation has been documented following targeted weed control efforts, so it is important to re-establish native vegetation to fill the void (Pearson et al. 2016).

This document presents Best Management Practices (BMPs) to prevent the spread of noxious weeds during the restoration treatment, and ideas to reduce noxious weeds on decommissioned roads after treatment. Fundamentally, applying BMPs during restoration treatments should reduce the need for secondary treatments. These suggestions are based on the scientific literature, discussions with weed management professionals, and 15 years of experience with road decommissioning treatments and monitoring in the northern Rockies, including experience with the CFLRP projects. We welcome any feedback, additional ideas, or other research or monitoring results to improve this document.

Additional guidance for weed management and revegetation on Forest Service lands can be found in *Forest Service Manual 2080 – Noxious Weed Management* (USDA FS 2001a), *Forest Service Guide to Noxious Weed Prevention Practices* (USDA FS 2001b), and individual Forest weed management documents (e.g., USDA FS 2006, USDA FS 2007). Another good resource is *Revegetation Guidelines for Western Montana: Considering Invasive Weeds* by the Montana State University Extension (Goodwin et al. 2006).

Best Management Practices (BMPs) for native plant restoration and weed control during road decommissioning

- Inventory noxious weed infestations prior to restoration treatments (USDA FS 2001b).
- Reduce weed interference on site by pre-treating noxious weeds on the roadbed with herbicide (USDA FS 2001a, Merrill and Casaday 2003, Goodwin et al. 2006).
    - Multiple years of treatment may be necessary.
    - Use backpack sprayers if not able to access site.
    - Ensure herbicide will not enter waterway (USDA FS 2006, USDA FS 2007).
    - Consider the risk of secondary noxious weed invasion (Pearson et al. 2016)
- Regularly clean all vehicles, and ensure heavy equipment is thoroughly cleaned before reaching the restoration site (USDA FS 2001, Merrill and Casaday 2003, USDOT 2007, Rew et al. 2018).
    - Contractors and Forest employees often work on different districts and forests in one season and may unintentionally spread weeds.
- Use road recontour treatment (rather than just ripping) to ensure decompaction and incorporate native soil that was side-cast and buried during road construction (Switalski et al. 2004, Kolka and Smidt 2004, Simmers and Galatowisch 2010, Switalski and Nelson 2011).
- Transplant sods, shrubs, and seedlings in clumps (Goodwin et al. 2006). The vegetation is already adapted to the site, and when transplanted may speed revegetation.
    - Ideally, plant in a depression and tamp in place with excavator bucket.
    - At stream crossings, water transplants with excavator bucket if possible.
- Spread duff along road from undisturbed hillside to inoculate with mycorrhizal fungi and soil micro-organisms, and to provide a seed bank (Goodwin et al. 2006).
- Add sufficient woody material including whole trees and branches to increase resistance to erosion, improve soil development, increase soil moisture, and provide microsites for plants (Merrill and Casaday 2003, Petersen et al. 2004).
    - Branches on felled trees provide perching for birds and further seed dispersal. Bears are attracted to early successional foods on recontoured roads (Switalski and Nelson 2011), and their scat is also a good seed source.
    - If on-site woody material is not available consider incorporating other organic soil amendments such as wood bio-char, wood strand mulch, or other compost such as biosolids (Henry and Bergeron 2005; Ramlow et al. 2018).
- Seed with native plant species:
    - Use a high diversity seed mix, and choose site-adapted species (USDA FS 2006, USDA FS 2007, Goodwin et al. 2006, Simmers and Galatowitsch 2010, Grant et al. 2011).
    - Include forbs in addition to grasses in the seed mix and species that are aggressive and more resistant to herbicide (Goodwin et al. 2006, Grant et al. 2011).
    - Ideally, include shallow- and deep-rooted forbs and grasses that grow early and late in the year to maximize nutrient and water resource use (Goodwin et al. 2006)
    - Balance the trade-off of seed densities. Use higher seeding density (30lbs+/acre) where noxious weeds spread is a high risk. In areas without weeds, lower seed density (15-20 lb./acre) may speed on-site native plant recovery (Goodwin et al. 2006, Grant et al. 2011).

    - Ideally, seed immediately after treatment, then again during the late fall (late October / early November), just before the soil freezes, and when moisture remains low enough to prevent germination.
- Limit fertilizer use. While some studies have found increased vegetative growth and reduced erosion, (e.g., Sosa-Pérez 2017), it may encourage further weed growth and reduced mycorrhizal activity (Goodwin et al. 2006, USDOT 2007). Soil amendments and woody debris can provide nitrogen over the long-term (Henry and Bergeron 2005; Ramlow et al. 2018).
- Limit motorized use and grazing to reduce noxious seed dispersal until native species become established (Goodwin et al. 2006, USDOT 2007, Chuong et al. 2015, Rew et al. 2018).
- If a road-to-trail project, fully de-compact the road first, then install a trail prism.
    - Leaving a section of road in place as a trail affects infiltration, hydrology, and potentially revegetation success.
- Monitor if post-restoration revegetation treatments are needed (USDA FS 2001a, USDA FS 2006, Goodwin et al. 2006, USDOT 2007, USDA FS 2017, Sutherland and Nelson 2010).

Post-treatment revegetation techniques on decommissioned roads

- Map noxious weed infestations on restored roads
- Prioritize treatments in areas receiving motorized use and areas with low road densities (Gelbard and Harrison 2003).
- Re-treat noxious weeds with herbicide, hand pulling, and/or seed head removal to reduce weed interference with revegetation.
    - Spray in the summer (May, June, July), then again in mid-summer if needed (Goodwin et al. 2006)
    - Consider that there may be non-target species harm to plants and seeds (e.g., Crone et al. 2009, Wagner and Nelson 2014, McManamen et al. 2018).
    - Consider the risk of secondary weed invasion (Pearson et al. 2015).
    - Use backpack sprayers.
    - Chemical, concentration, and timing and are species specific (see USDA FS (2006) or USDFA FS (2007) for guidelines).
- Re-seed with native species if low germination to cover bare ground and prevent further weed invasion (Pearson et al. 2016).
    - Ideally, seed during late fall (late October / early November), just before the soil freezes, and when moisture remains low enough to prevent germination.
    - Allow adequate time for residual herbicide to dissipate (Wagner and Nelson 2014, McManamen et al. 2018).
    - Include forbs in addition to grasses in the seed mix and species that are aggressive and more resistant to herbicide (Goodwin et al. 2006, Grant et al. 2011).
    - Ideally, include shallow- and deep-rooted forbs and grasses that grow early and late in the year to maximize nutrient and water resource use (Goodwin et al. 2006)
    - Use higher seeding density (20-30lbs+/acre).
- If available, add woody material (larger the better) to increase resistance to erosion, increase soil moisture, improve soil development, and provide microsites for plants.
- Consider hand planting trees and shrubs in difficult to revegetate areas and road entrances.

    - Container plants can speed vegetation establishment, and create a visual and physical screen to discourage motorized use.
    - Protect saplings from browse if needed.
- If needed, hand pull, remove seed heads, or selectively backpack spray with herbicide after seed is established the following summer.
    - Anticipate and suppress secondary invasion of other noxious species (Pearson et al. 2016).
- Consider using biological controls if noxious weeds are present on hillside (if available for species of concern (e.g., leafy spurge, Dalmatian toadflax, spotted knapweed, musk thistle, (USDA FS 2006). No bio control is available for mullein; Clewley et al. 2012).
- Limit motorized use and grazing to reduce noxious seed dispersal until native species become established (USDOT 2007, Chuong et al. 2015, Rew et al. 2018).
- Monitor noxious weeds and revegetation over time and adaptively manage (US DA FS 2006, Goodwin et al. 2006, USDA FS 2007, USDOT 2007, Sutherland and Nelson 2010).

A restored road and developing vegetation near the South Fork Poorman Creek five years after treatment. The photos show seeded grass species and other native species re-colonizing the site including lodgepole pine and serviceberry. Not all treated roads have noxious weed problems.

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