

Practices to Steward a Beautiful Forest after Timber Harvest



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After a harvest like this one, good stewardship sets up the forest for its next seasons of growth. Photo: Matt Freeman-Gleason

Do-it-yourself ways to enhance forest health and productivity after timber harvest

What you do before and after a timber harvest depends on the condition of your land and your goals. After harvest, some forests may need minimal care because they have vigorous natural seedling establishment, minimal exposure to invasive species, and sufficient large woody debris for wildlife habitat and nutrient cycling. However, many forests don't enjoy such ideal circumstances and greatly benefit from active stewardship.

The months before harvest are the time to plan and make decisions so you can meet your goals for your forest. Given the felling and yarding systems, what precautions will the operator take to protect the soil? What trees, woody debris, and areas do you want to leave undisturbed? How do you want the logging contractor to address leftover slash? Monitoring your forest before the harvest informs your answers to these questions.

The first few years after a timber harvest are a critical time to understand how the forest is responding and to proactively address common forest health concerns. The post-harvest seasons are also an opportunity to connect family and friends to the land through stewardship activities you can do with minimal contractor involvement and without heavy equipment.

This guide is intended for forest owners who are preparing to log or have just finished a timber harvest. NNRG assembled it based on years of experience working with families, small businesses, and conservation groups across western Oregon and Washington. We've identified several best practices successful landowners use to improve biodiversity, habitat, and productivity in their forests after harvest.

These practices include:

- Monitoring your forest
- Planning for habitat and preserving biological legacies
- Planting trees and shrubs
- Removing invasive species
- Making the most of slash
- Protecting and enhancing soil

This is not an exhaustive manual with detailed instructions on how to complete these DIY practices; instead it describes the most important actions to help you and your forest start a new chapter. At the end of this booklet, you'll find a list of resources that can help you learn how to implement each of these practices.

You can steer your forest towards your vision with many hands-on activities – both before harvest and in the months and years afterwards.

Monitoring Your Forest

Walk your woods

Monitoring your woods regularly and recording your observations is an important management activity both pre- and post-harvest. It is a means to identify what you want your forest to retain after the harvest and accurately observe how the forest responds to the treatment. It is also the way to anticipate the actions you need to take to set the forest on an optimal trajectory to meet the goals and objectives you've set in your management plan.

Pre-harvest

Before harvest, regular monitoring helps you recognize the structural conditions of your forest – these include biological hotspots like nesting trees, water sources, patches with rare or beneficial plants, and character-rich trees you may want to retain. You can determine if the treatment area and its surroundings have sufficient snags and down wood (at least 4 snags and 4 large down logs per acre). If not, you might want to consider creating them during the harvest.

Post-harvest

Try to monitor your forest during each season in the first 2 to 3 years after harvest. This is a time when changes can come quickly, such as emergence of invasive plants, death of tree seedlings, or changes to road and culvert drainage patterns. In subsequent years, an annual inspection is usually sufficient.



Snags, sensitive plants like trillium, and wetlands are all examples of important biological hotspots to protect during a harvest.
Photos: Matt-Freeman Gleason

Monitoring Checklist

Keep an eye out for these important features:



Seedlings

Cages protect seedlings planted after a thinning in Olympia, WA.
Photo: NNRG

Check for natural regeneration and keep notes on quantity, species, and distribution. If you're not seeing the desired species or quantities, consider planting seedlings to augment those that are naturally regenerating. Track how natural and planted seedlings are doing:

- Are seedlings excessively browsed? If so, they

may need cages or a browse repellent.

- Are seedlings outcompeting other vegetation or do they need assistance to grow above competing grasses and other plants?
- Need help distinguishing and remembering planted vs natural seedlings? Use different-colored flagging or pin flags as indicators.



Invasive Species

English ivy taking over a forest.
Photo: Forterra

Invasive plants, such as Himalayan blackberry, scotch broom, thistle, and tansy, often colonize bare soils following a timber harvest, especially if they're near the forest before harvest. Diligent monitoring and

proactive hand-pulling or spot-spraying is essential to keep the forest free of non-native plants until the canopy closes to shade out the invasives or until native understory vegetation establishes dominance.



Tree Health

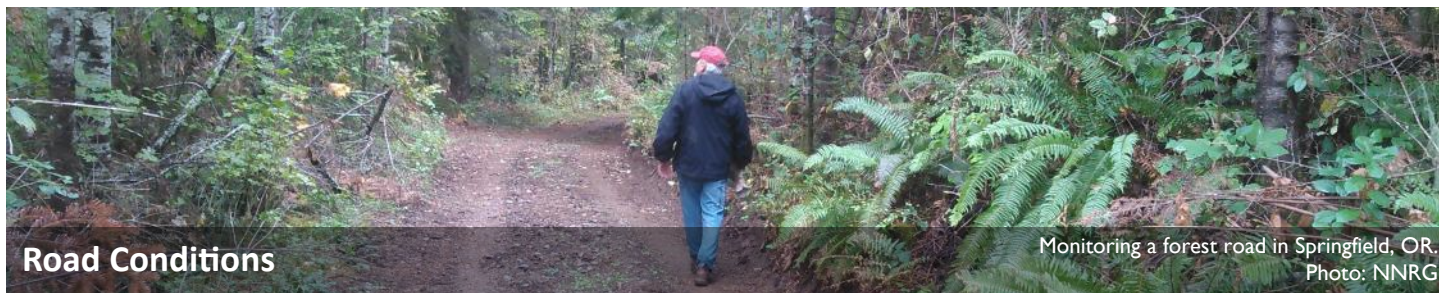
Fine, cinnamon-colored wood dust indicate bark beetle presence in this Douglas-fir.
Photo: Oregon State University

Sometimes retained trees can succumb to disease or pests following harvest. Are the trees that are failing ones you had planned on being your wildlife trees? Or are they the trees you'd imagined raising for timber? Look for indicators like bark beetle holes,

pitch weeping from the base of trees, sudden needle loss, and other symptoms like yellowing or sparse needles and dieback of branches or crowns. Any of these symptoms indicates a potential tree health issue that requires further examination by a forester.

Monitoring Checklist Continued

Keep an eye out for these important features:



Road Conditions

Monitoring a forest road in Springfield, OR.
Photo: NNRG

Ideally, during logging, the roads in your forest were refurbished or improved to support timber operations, and they should stay in shape for years to come. But it's a good idea to monitor roads during the wet season to understand how changes in the forest cover and composition influence the flow of water. Pick a time in the wet season to walk your forest roads during a good rain with a shovel and evaluate whether the drainage systems are functioning and minimizing erosion.

- Make sure that decommissioned spur roads and skid tracks have sufficient slash on them in the season after harvest and adjacent areas have sufficient grass, cover crop, or native vegetation. These travel corridors where heavy equipment were used may need additional care.
- Check that water is draining safely off your roads. If water is standing on the road surface or running down ruts in the road, install waterbars to direct flow off the road away from streams and ponds. Smooth out the rutted surfaces. Clean out clogged ditches and unclog blocked culverts. Make sure that at waterbar outlets and rolling dips, rocks or slash are in place to diffuse the water's energy so it doesn't erode the slope.
- Check areas where the road is soft or potholes are forming – they may require additional rock work.
- Note areas of bare ground or unrocked roads that will need grass seed.



Stream Health

Monitoring a stream in Sedro-Woolley, WA..
Photos: NNRG

If there is a stream or water source on your land, make sure to note changes in water clarity and bank stability. If erosion is observed, immediately divert

sediment and runoff from entering the water by using windrows, applying mulch, spreading grass seed, or planting groundcovers and shrubs.

The best prescription for a healthy forest is a landowner's caring gaze and frequent footsteps.



Planning for Habitat and Preserving Biological Legacies

Designate leave trees, future snags, and habitat pile locations

The monitoring you do prior to harvest is a critical component of stewarding habitat. During pre-harvest monitoring and planning, it's important to identify the biological legacies you will protect during the harvest operations. Use flagging or other indicators to mark retained trees, snags, stumps, nurse logs, biodiversity hotspots, and no-equipment areas.

Retaining these structures and features in the forest is important because dead wood is vital for a healthy living forest. Manage your forest to include more than 4 down logs per acre (the larger the better) and more than 4 snags per acre (at least 20 feet long and 20 inches in diameter or greater). You may have specific trees you wish to turn into wildlife snags, or you may work with your forester and logging operator to have them select these wildlife trees

while harvesting. Make sure your forester and operator know the resources you want to protect!

Also, be sure to identify areas where you may want slash to be dispersed or moved to create wildlife habitat piles. Pile location affects their success: in areas with little rain and hot summers, wildlife will benefit from habitat piles in shade; in cooler areas, a habitat pile on the edge of a clearing or anywhere with partial sun is best. Avoid installing habitat piles near roads, in areas that collect cool air or receive excess water, or in locations where the pile will increase fire risk.



A habitat pile in Olympia, WA.
Photo: NNRG

Protecting and Enhancing Soil

Minimize erosion and support robust development

Harvest operations can significantly change the soils in your forest. Heavy equipment can compact soil and alter the flow of water in the forest. When possible, schedule harvest during the dry season when soil isn't saturated to minimize compaction. It's important to also minimize compaction through the selection of equipment and hauling methods. When possible, have the vehicle operator redistribute slash material onto haul routes before navigating them.



Tracked equipment has less soil impact than vehicles with tires.
Photos: Matt Freeman-Gleason

Concentrating slash on skid trails and wet pockets can reduce soil impacts from heavy equipment.

Redistributing slash throughout the forest supports soil development and provides food for decomposer organisms. Maintaining hardwoods and shrubs supplies beneficial leaf litter to the forest floor and recycles nutrients back into the soil.

Harvest operations inevitably remove some vegetation cover from the forest floor and along haul routes, spur roads, and log landings, exposing these areas to erosion risk. Disperse grass seed or groundcover seed mixes onto bare soil, skid roads, and landings to help minimize the potential for erosion. A variety of local cultivators and seed companies supply seed mixes, from lower-cost non-invasive grasses and nitrogen fixers to higher-cost native grasses and wildflower mixes. Be prepared to reseed some areas that don't establish the first time around.

Planting Trees and Shrubs

Establish the next generation

Many forests benefit from planting additional native tree seedlings and shrubs after a harvest. Managing for species diversity increases the forest's resiliency to climate change and disease and also improves wildlife habitat. Growing a diverse portfolio of species may also meet the demands of future commercial markets.

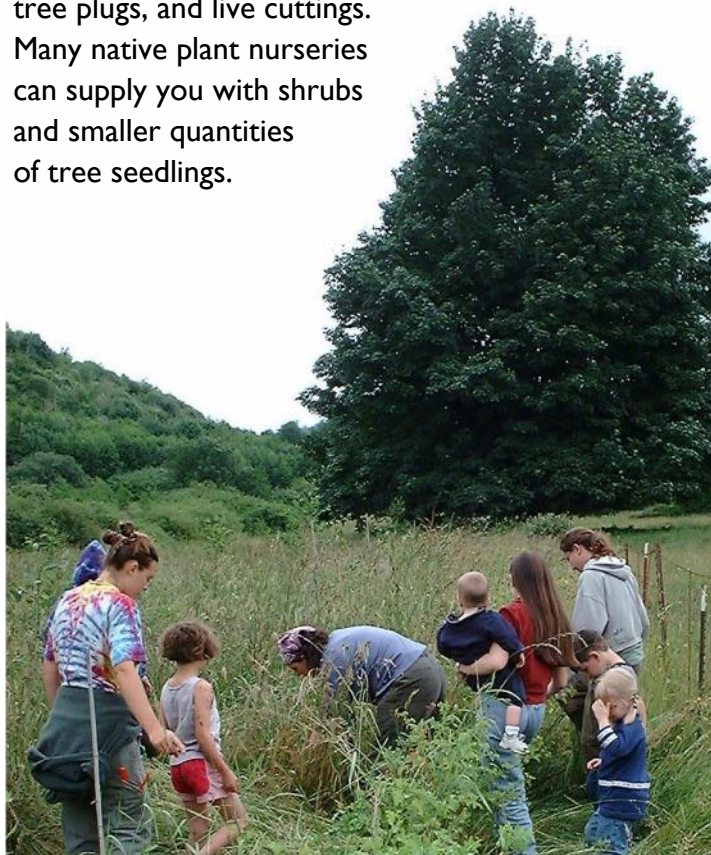
Planting trees after a harvest is a common practice. State regulations and county current-use programs require designated forest land to grow trees, either by natural regeneration or planting. Inter-planting after a thinning harvest is not always necessary, if: the stand has sufficient natural regeneration, the thinning removed a small portion of the trees in the canopy, or there are other management objectives for the harvested area.

Tree and shrub planting can be a fun and rewarding way to connect your family and friends to the forest. Consider having a planting party (or two or three) to get the work done. Many people like to return to the forest to check on "their trees". Make sure to take pictures of the tree planters and the newly planted trees to commemorate the event. Keep in mind, bare-root seedlings will need to get into the ground soon after you get them from the nursery, so coordinate accordingly with your tree planting team.

Good planning helps ensure seedling success. Start by walking your forest to determine: locations for planting trees and shrubs, desired species, plant spacing, and areas needing planting. Mark the sites to locate them later by hanging flagging, placing stakes, and/or GPSing planting areas.

Research sourcing options for seedlings. Make sure the seedlings are grown from a seed zone that is compatible with your forest's subregion and elevation. Seedling suppliers often run out of seedlings quickly, so order early, or confirm availability, for the species and quantities you want.

Common products include bare root seedlings, tree plugs, and live cuttings. Many native plant nurseries can supply you with shrubs and smaller quantities of tree seedlings.



Planting with the whole family in Oakville, WA. Photo: NNRG

Here are a few good questions to keep in mind while planning for planting:

- Is natural regeneration of desired species already happening?
- Does sufficient sunlight reach the forest floor to support seedlings in the understory?
- Is there adequate space in the canopy for a tree to grow into (or will there be after the next harvest)?
- Is the gap or small patch cut going to be managed to sustain early seral habitat?
- In areas with root rot or other diseases, which disease-resistant species are appropriate to plant?
- Are there sufficient fruit-bearing shrubs and flowering plants to support a broad range of wildlife and pollinator species?

Tips for Successful Plantings

Optimize seedling survival

After careful planning, you're ready to get plants in the ground! Try to time plantings during winter and spring depending on seedling availability. If using a contracted planting crew, request their services early in the year, and confirm who will be purchasing seedlings and supplies.

It is important to protect seedlings from browsing. Deer, elk, mountain beavers, voles, and other wildlife may browse on tree seedlings. You can deter these browsers from their herbivory with a variety of methods: caging, flagging, using foil collars, pairing a cedar with a spruce, and applying a topical repellent are all successful browse prevention methods.

After planting, it is important to monitor and care for your seedlings during their first few vulnerable years. Monitor survival and growth of seedlings, paying special attention to animal damage, tree vigor and vitality, and patches of mortality. Some mortality is expected, but more than 20 percent in any given

area may need further assessment. Replant areas with high seedling mortality and spots that were missed.

Control competition around seedlings until the tops of the trees won't be shaded by surrounding vegetation and are therefore "free-to-grow." Cut back brush around seedlings until the trees are at least a couple feet taller than their neighbors. Consistently remove invasive species so they don't establish themselves in disturbed soils.

Frequently check on any browse protection and/or deterrent you apply. Cages require annual monitoring to make sure they are still functioning: they need to be lifted to continue protecting the tip of the tree, and seedlings may need to be straightened in their cages. If you use a repellent, it may need to be reapplied once or twice a year, depending on seedling survival, height growth, and browsing.



Seedlings planted in an FSC®-certified forest in Olympia, WA. Photo: NNRG

Removing Invasive Species

Early detection is important

Invasive species like bull thistle, tansy ragwort, scotch broom, and Himalayan blackberry are likely to establish themselves on disturbed soils after a harvest. It's common in the first seasons and years after harvest for landowners to dedicate a lot of time to removing invasive species. Over time, you can make significant progress and get some good exercise removing invasive plants. Forests full of weeds can be transformed! The bramble patch that once took days of work to clear can be kept free of weeds with a few minutes of hand pulling.

Prevent the introduction of invasive species to your forest by cleaning heavy equipment between sites, minimizing disturbed soils, seeding with native seed mixes, and retaining established vegetation. Control methods for invasive species vary by species and location; many weeds can be managed by manual activities such as hand pulling, cutting, or digging, while some require herbicide application. Contact the noxious weed control board in your county to learn about invasives in your region and find out about control options.

To protect the natural biodiversity of your forest and prevent weeds from getting a foothold, make

sure you monitor for weeds that take root in the initial months and years after harvest. Often you can't identify them until they grow a bit, and management depends on correct identification. Get started identifying common Northwest weeds on the next pages. Some plants like thistle emerge obviously



English ivy taking over a tree, increasing vulnerability to wind blowdown.
Photo: King County Noxious Weeds

in their first year. Others, like tansy ragwort, form a small rosette in their first year and grow up into a larger flowering plant in their second year.

Remember shading out invasives with trees and shrubs is an effective long-term strategy, and planting natives will give your forest a biodiversity boost.



Goats feasting on Himalayan blackberry. Photo: Josh Wedin, Flickr CC

Identifying Weeds

Effective control depends on identification

Remove invasives using the control methods most appropriate to the target weed species:

- Hand pulling the entire plant is highly effective on knapweeds, tansy ragwort, and small populations of young blackberry, scotch broom, or sprouts of English ivy or holly.
- Removing flower heads before they go to seed is an option for plants like purple loosestrife, if pulling isn't an option. Some flower heads can still go to seed even after they are cut and dropped, so bagging the flower heads is your safest bet.
- Hand grubbing the root balls of established blackberry is time consuming but effective.
- Weed wrenches to pull plants out by the roots are great for removing large woody weeds like scotch broom and English holly – wrenches can often be borrowed from your county's noxious weed board.
- Cutting woody stems and pulling runners off of trees and the forest floor is an effective way to remove English ivy.
- Cover small, dense weed patches with black plastic for two growing seasons to shade them out.
- Goats can control many weeds like Himalayan and cutleaf blackberry – some will even browse English ivy.
- For some weeds like knotweeds and English holly, controlled herbicide application is often the most effective strategy. Use an injector to inject the chemical right into the plant's stalk to minimize ecological impact. If an injector is impractical (the plant is too small, the stalk is too dense), you can spot spray or cut the stalk and paint the chemical on the cut face.

Common Invasives in Northwest Forests



Blackberry (Cutleaf)



Blackberry (Himalayan)



Butterfly Bush



English Holly



English Ivy



False Brome

Common Invasives in Northwest Forests



Garlic Mustard



Gorse



Herb Robert



Knapweeds



Knotweeds



Policeman's Helmet



Purple Loosestrife



Scotch Broom



Shiny Geranium



Tansy Ragwort



Teasel



Thistle (Nonnative Species)

Make the Most of Slash

What to do with harvest byproducts

A secondary byproduct of a timber harvest is woody debris like scrap logs, branches, twigs, and needles. This material is called slash and is valuable for the forest: it can enhance soils, protect seedlings, and provide habitat for wildlife. As decomposers eat through slash, they gradually release key nutrients such as nitrogen or phosphorus into the soil. You can use slash in a variety of productive ways:

- **Spread it.** During timber harvest, instruct the logging operator to redistribute slash over the forest floor to enrich soil and minimize erosion. Concentrating slash on skid trails and wet pockets can reduce soil impacts from heavy equipment. Slash may be fine left where it falls, if it's less than a foot deep. Avoid piling slash at the bases of trees to reduce fuel loads around the trees you wish to keep.
- **Pile it.** Build habitat piles that a wide array of forest creatures will use. Stack perpendicular layers of larger poles at the bottom and finer branches and twigs on top. Piles should be at least 10 feet wide and 6 feet tall.
- **Stack it.** Build constructed logs that mimic large down wood and its critical habitat value. Lay poles parallel to each other in a crib to form a "log," that is a minimum of 20 inches in diameter and 20 feet long – the longer the better.
- **Remove it.** If fire hazard is a concern, remove slash by chipping it, piling and burning it, or cutting it for firewood. Lopping and scattering slash does little to reduce fire risk. And remember: all buildings should have defensible space free of woody debris. Prune trees near buildings, roads, and strategic locations to create shaded fuel breaks that disrupt the continuity of fuel. Consult your local Fire Safe Council for recommendations.



Slash distributed after harvest in Black Diamond, WA.
Photo: Matt Freeman-Gleason



A habitat pile in Olympia, WA. Photo: NNRG



A constructed log in Olympia, WA. Photo: NNRG



Firewood piled in Montesano, WA. Photo: NNRG

Checklist

This is a summary of the “to do” items in this handout to help you track priorities before and after harvest.

Before Harvest

- ☒ Monitor what's currently in the forest. Note tree species, density, size, and age. Note also where there are shrubs, snags, down wood, and any special habitat features like wetlands.
- ☒ Identify areas to be protected during harvest like retained trees, snags and down logs, and riparian buffers.
- ☒ Flag these areas with the logger to make sure they are untouched.
- ☒ Identify areas with a lack of dead wood (less than 4 snags and 4 large down logs per acre).
- ☒ Coordinate with the logger to create snags and down logs in areas with insufficient woody debris.
- ☒ Plan where you want slash to be gathered after harvest – identify sites for habitat piles and roads needing a slash mat.
- ☒ Plan to minimize erosion by scheduling harvest during the dry season, covering roads in slash, using tracked equipment, seeding roads with grass, and retaining hardwoods to enhance soil.
- ☒ Identify areas where seedlings are needed as well as desired species, spacing, and quantity.
- ☒ Research sources for seedlings native to your site.
- ☒ Buy necessary browse deterrents.
- ☒ Plan with the logger the location and size of landings, skid trails, and haul routes for trucks and lowboys, and identify any improvements needed before logging.

After Harvest

- ☒ Monitor the forest every season, and write down changes. Watch for:
 - ☒ **Seedling survival and health** – are seedlings being overly browsed? Check that browse deterrents are still functioning.
 - ☒ **Invasive plants** – identify the plants establishing in disturbed areas and apply appropriate control to nonnatives.
 - ☒ **Retained tree health** – do you see bark beetle holes? Pitch weeping from tree bases? Sudden needle loss? Sparse needles? Yellowing needles? Crown or branch dieback? If so, contact a forester.
 - ☒ **Road and culvert drainage changes** – monitor roads during rain to watch how water is flowing. Repair water bars to divert runoff from water bodies. Unclog ditches and culverts.
 - ☒ **Stream health** – keep track of water clarity and bank stability. If you can, monitor stream temperature as well as depth and width at set monitoring points. Immediately deal with erosions issues.
- ☒ Plant seedlings in areas without sufficient natural regeneration – make sure you pick seedling species ideal for your site.
- ☒ Schedule a planting party or hire a crew during winter or spring.
- ☒ Apply browse deterrents (caging, flagging, foil collars, etc.).
- ☒ Control competition around seedlings.
- ☒ Identify and control invasive plants.
- ☒ Implement your slash treatment.

Resources

These resources will deepen your knowledge of the stewardship practices noted in this guide and will help prepare you to get out in the woods!

MONITORING

- Monitoring and Inventory Tools
<http://www.nnrg.org/resources/monitoring-and-inventory-tools/>

EROSION

- Forest Practices Illustrated – Washington Department of Natural Resources
<http://www.dnr.wa.gov/forest-practices-illustrated/>
- Oregon's Forest Protection Laws – An Illustrated Manual
http://knowyourforest.org/sites/default/files/documents/OR_For_Protect_Laws_2011.pdf/
- The Effects of Forest Management on Erosion and Soil Productivity
https://forest.moscowfsl.wsu.edu/smp/docs/docs/Elliot_I-57444-100-0.html/

PLANTING

- The Care and Planting of Tree Seedlings on Your Woodland
<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/19240/ec1504.pdf/>
- Forest Steward Field Guide – Planting and Installation, p. 24
<http://www.greenSeattle.org/information-for/forest-steward-resources/field-guide/>

WEEDS

- Manual & Mechanical Control Techniques
<http://www.invasive.org/gist/products/handbook/03.manualmechanical.pdf/>
- Pacific Northwest Weed Management Handbook
<https://pnwhandbooks.org/weed/>
- Oregon Invasive Species Council
<https://www.oregoninvasivespeciescouncil.org/>
- Washington Invasive Species Council
<http://www.invasivespecies.wa.gov/>

SLASH

- Forest Biomass Retention and Harvesting Guidelines for the Pacific Northwest
https://www.forestguild.org/publications/research/2013/FG_Biomass_Guidelines_PNW.pdf/
- Wildlife-Friendly Fuels Reduction in Dry Forests of the Pacific Northwest
<http://woodlandfishandwildlife.com/wp-content/uploads/2016/09/WildlifeAndFuelsPNW2016Final.pdf/>

For a full complement of stewardship resources, visit our library at <http://www.nnrg.org/resources>



**NORTHWEST
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To strengthen the ecological and economic vitality of Northwest forests and communities by connecting landowners with the knowledge, skills, and markets they need to steward their forests.

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