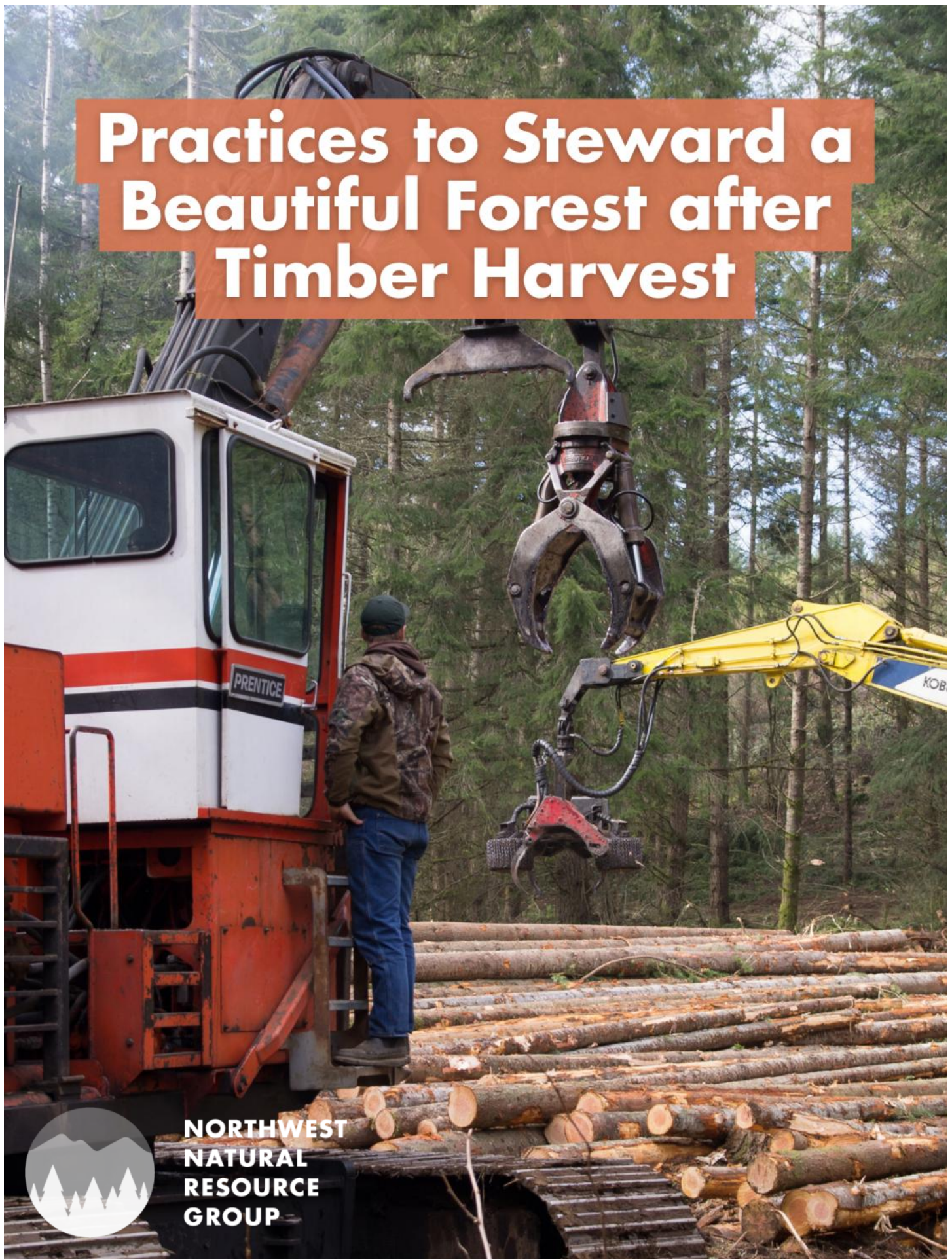


Practices to Steward a Beautiful Forest after Timber Harvest



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

DIY Enhancements for Forest Health and Productivity after Timber Harvest

What you do before and after a timber harvest depends on your goals and the condition of your land. 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 left-over 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
- Protecting and enhancing soil
- Planning for habitat and biological legacies
- Planting trees and shrubs
- Tips for successful plantings
- Identifying and removing invasive species
- Making the most of slash
- Wildfire management

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 hands-on activities — both before harvest and in the months and years afterwards.

Monitoring Your Forest

Walk your woods

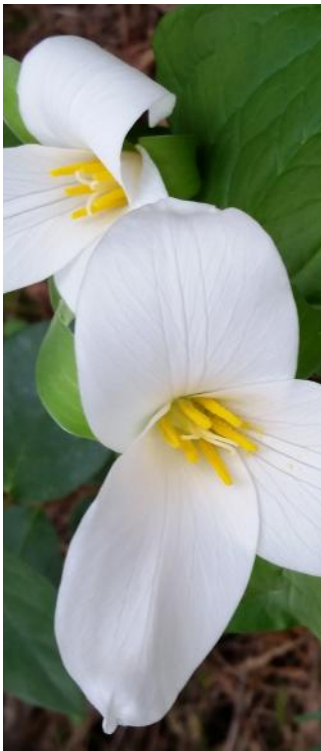
Monitoring your woods regularly and recording your observations is an important management activity both pre- and post-harvest. It is a means to identify what you want your forest to retain after the harvest and accurately observe how the forest responds to the treatment. It is also the way to anticipate 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.



Sensitive plants like trillium, snags, and wetlands are all examples of important biological hotspots to protect during a harvest.

Photos: Matthew Freeman-Gleason (left, center right, right), NNRG (center left).

Monitoring Checklist

Keep an eye out for these important features

Seedlings

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.*



Cages protect seedlings planted after a thinning. Photo: NNRG.

Invasive Species

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.



English ivy taking over a forest.
Photo: Washington State Noxious Weed Control Board.

Tree Health

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.



Fine, cinnamon-colored wood dust indicate bark beetle presence.
Photo: Bureau of Land Management.

Monitoring Checklist

Keep an eye out for these important features

Road Maintenance

During logging, forest roads may need extra gravel to avoid potholes and rutting after timber operations. The winter after your harvest concludes, it's important to monitor how your roads respond to run-off. To understand how changes in the forest cover and composition influence the flow of water, pick a time (during the wet season) to walk your forest roads. On a rainy day, bring a shovel as you evaluate your drainage systems' function and erosion control.

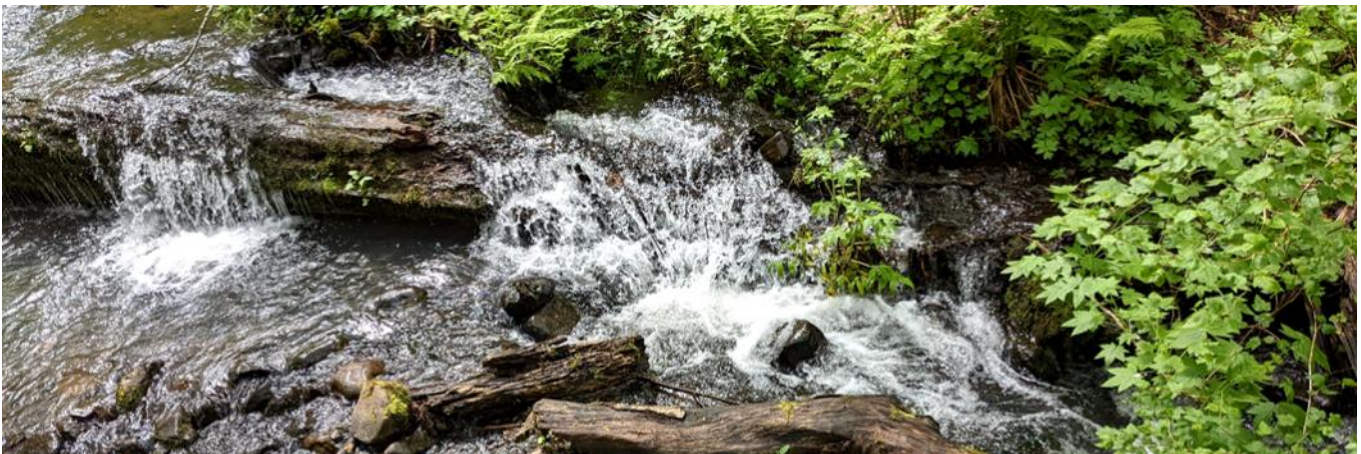
- Decommissioned spur roads and skid tracks should have sufficient slash on them. After harvest, check if adjacent areas have sufficient grass, cover crop, or native vegetation. As travel corridors for heavy equipment, these roads may need additional care.
- Check that water is draining safely off your 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. Ensure rocks or slash are placed to diffuse the water's energy and reduce slope erosion at waterbar outlets and rolling dips. Smooth out the rutted surfaces, and unclog ditches and culverts.

Year-round, continue to evaluate your road's ongoing maintenance needs of your road. Implement proper sloping measures, avoid unnecessary grading, manage roadside vegetation, and reduce erosion (via windblown dust) through occasional water application.

Stream

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. Additionally, note:

- Any soft spots or potholes in the road – they may require additional rock work.
- Bare ground or un-rocked roads need grass seed.
- Road surfacing can increase your road's longevity and operation season. By covering the dirt surface with weather resistant materials (often jagged rock of varied sizes), the reduced sediment load entering the water increases your road's durability.



A river in Benton County, OR. 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. 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.

Planning for Habitat and Preserving Biological Legacies

Keep an eye out for these important features:

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 tree in Gig Harbor, WA is home to at least one raccoon.
Photo: NNRG.

Planting Trees and Shrubs

Establish the next generation



A volunteer plants a tree in the Nisqually Community Forest.
Photo: NNRG.

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 GPS-ing 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.

Some questions to keep in mind 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 call for replanting. 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 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 after harvest in the Nisqually Community Forest. 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. Some plants like thistle emerge obviously 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.



An uprooted, non-native thistle. Photo: King County Noxious Weeds.



(Left to right) Tansy ragwort in its first-year rosette, second year (pre-flower), flowering, and seeding stages. Photos: King County Noxious Weeds.

Removing Invasive Species

Tips for post-harvest

After harvest, reduce the spread of invasive plants by mitigating disturbance impacts. As many invasive species thrive in the sunny gaps created by harvest, site revegetation with trees and shrubs is an effective long-term strategy to shade out invasives. To multiply your site's benefits, plant native species for an extra biodiversity boost. In addition to planting, consider the duration of time the site will be un-vegetated.

Make a revegetation plan early to reduce the total time invasive species may establish at your site. Seeding is another option if there is a delay in post-harvest planting. Like native plants, get to know the invasive species commonly found at your site. Remove any returning invasives as they emerge (and before seeding) to prevent their spread.



Removing "rings" of common ivy from a tree's trunk and base is an effective removal method. Photo: King County Noxious Weeds.

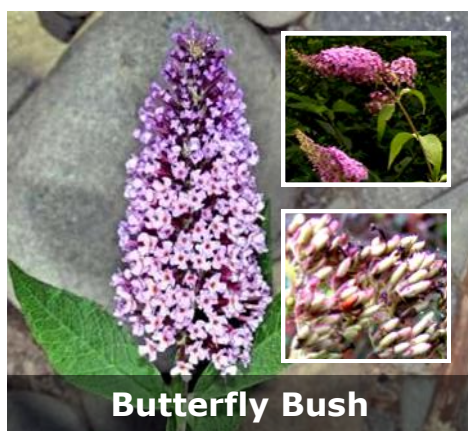
Identifying Weeds

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



Common Invasives in Northwest Forests



Herb Robert



Knapweeds



Knotweeds



Policeman's Helmet



Poison Hemlock



Purple Loosestrife



Scotch Broom



Shiny Geranium



Tansy Ragwort



Teasel



Thistle (Non-native Species)



Yellow Archangel

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 thigh height. 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.
- **Chop it.** If fire hazard is a concern, remove slash by chipping it, piling and burning it, or cutting it for firewood. 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. Photo: NNRG.



A habitat pile in Olympia, WA. Photo: NNRG.



A constructed log near Ashford, WA. Photo: NNRG.



Firewood piled in Montesano, WA. Photo: NNRG.

Wildfire Management

Creating a healthy, fire-resilient forest

Whereas wildfire in eastern Washington forests is characterized by frequent, low-intensity fires, wildfires in western Washington occur infrequently but intensely. Within western Washington, regional variances contribute to two distinct fire legacies (dry and moist forests).

Eastern WA forests:

- East of Cascade mountains
- Frequent, low-intensity fires regularly reduce fuel densities
- Mixed- and high-severity fires possible
- Increased ecosystem resilience to wildfire; some species (ex: lodgepole pine) require low-intensity fire to naturally regenerate.

Dry, western WA forests:

- Found in Puget lowlands and rain shadows
- Mixed-severity fire regime
- Smaller, moderate frequency fires (< 50,000 acres, every 10-100 years)
- Fuel densities, topography, and fire management influence wildfire intensity.

Moist, western WA forests:

- Common throughout western WA
- High-severity (stand-replacing) fire regime due to high fuel densities
- Large scale, infrequent fires (+100,000 acres, every 100-500 years)
- Caused by wind driven eastside fires

As human activity is the primary cause of wildfires in western Washington, proper management can further reduce overall fire severity. For smaller wildfires, thinning, fuel breaks, and defensible spaces improvements may help reduce fire severity in the forest; in larger, wind-driven events where these treatments are ineffective, preparedness at the homestead and community scale (building hardening, infrastructure, evacuation plans, etc.) is key.

Because increased structural diversity enhances forest resilience to wildfire, management that diversifies the landscape age of young, westside forests is also recommended. As trees mature and shed their lower branches, the chance wildfire reaches the crown and spreads across the landscapes is reduced. Planting broadleaf hardwoods in conifer-dominated stands may also increase forest resilience to wildfire, as they regenerate quickly after fire and can reduce a wildfire's ability to spread. In westside forests, Douglas-firs greater resilience to wildfire thanks to their thick, platy bark.

Looking thoughtfully at the land you steward is a critical step to reducing wildfire risk and improving your forest's overall health. Forest management and restoration activities informed by your forest type and that proactively prepare for wildfire are more effective and less expensive than reactive firefighting.

Ladder fuels (including dry down wood, branches low to the ground, tall grasses) are vegetation that connects surface fires from the forest floor to the canopy. By reducing ladder fuels and overcrowding present in a stand, you can increase your forest's fire safety. If your forest is considered overstocked, it might be time to do a thinning.

After harvest, slash is another fuel source perfect for a small fire trying to get bigger. Make sure to always clear slash 25-50 feet from roads to maintain fuel breaks. Move slash away from the base of trees and don't build slash piles near roads, bases of trees, and structures.

To learn more about fire prevention cost-share and financial assistance programs available for landowners, check out Washington's Firewise program.

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 **AND** where there are shrubs, snags, down wood, and any special habitat features (e.g., 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.
- ☐ Create a **wildfire management** plan.

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.
- ☐ Monitor your forest changes with your **wildfire management** plan. Talk with neighbors about their plans.

Resources

- [Oregon's Forest Protection Laws – An Illustrated Manual, Chapter 5: Steep Slopes](#) – OFRI
- [Weed Management Handbook](#) – Pacific Northwest Weed Management Handbooks
- [The Care and Planting of Tree Seedlings on Your Woodland](#) – Oregon State University
- [Monitoring and Inventory Tools](#) – NNRG
- [Forest Roads](#) – Washington DNR
- [Wildfire Resources](#) – Washington DNR
- [Fire-Resistant Plants for Home Landscapes](#) – Pacific Northwest Extension
- [Forests and Wildlife: What You Need to Know](#) – Western Forestry and Conservation



For a full complement of stewardship resources, please visit our library at:

nnrg.org/resources

Acknowledgements



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Our mission: to strengthen the ecological and economic vitality of Northwest forests and communities by connecting landowners with the knowledge, skills, and resources they need to steward their forests.

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