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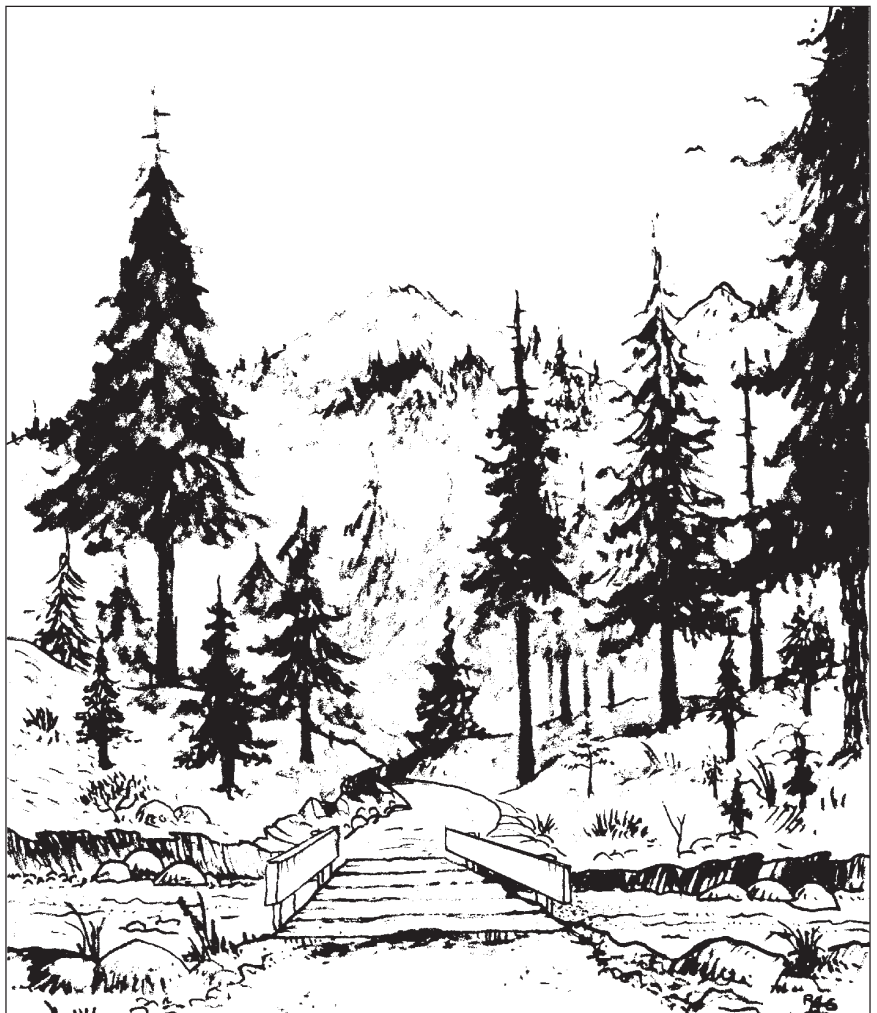
Soil and Water Conservation: An Introduction for Woodland Owners

P.W. Adams

Roads, timber harvesting, and other woodland activities can significantly affect the soil and water resources on your property and adjacent areas. They can reduce the productivity of the land and the quality of water supplies for domestic and other uses. However, if you plan and conduct forest activities properly, you can minimize these problems and help maintain or enhance the quality and value of your woodland.

You must conduct certain woodland activities within the limits set by Oregon's Forest Practices Act (see EC 1194). These limits protect the State's water resources and fish and wildlife habitat, and they maintain forest productivity.

Violations of the Act can result in orders to suspend activities or repair damages, or civil penalties. Also, damage to resources of downstream landowners or water users could result in legal liability, regardless of whether or not you violate specific laws.



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Table 1.—Woodland activities and their relationship to soil and water conservation (↑ = increase; ↓ = decrease).

Woodland activity	Possible soil and water changes	Potential problems from changes	Ways to prevent or minimize problems	Sources of further information ^a
Roads (including cuts and fills, drainage systems, etc.)	↑ Soil erosion ↑ Landslides ↑ Channel scour	↑ Road maintenance and repair costs ↓ Forest productivity if erosion or landslides extend beyond road ↓ Water quality for domestic use, fish, recreation, etc. ↓ Fish and wildlife habitat and migration Legal violations or liability	Appropriate road planning and location <ul style="list-style-type: none"> • Avoid very wet and unstable areas Suitable road design <ul style="list-style-type: none"> • Ditches and culverts should handle storm flows Appropriate construction practices <ul style="list-style-type: none"> • Restrict activities to dry season Good road maintenance <ul style="list-style-type: none"> • Keep ditches and culverts free from obstructions 	EC 1118, <i>Planning Woodland Roads</i> EC 1135, <i>Road Construction on Woodland Properties</i> EC 1137, <i>Designing Woodland Roads</i> EC 1139, <i>Maintaining Woodland Roads</i> PNW 209, <i>Slope Stability on Forest Land</i>
Timber harvesting (including felling, bucking, and yarding)	<i>Damage to streambeds and banks:</i> ↑ Debris in streams ↑ Debris torrents in drainages ↑ Water temperature in streams	↓ Fish and wildlife habitat and migration ↓ Water quality Legal violations or liability	Fell trees away from drainages and streams Use an appropriate harvest layout Leave trees or vegetation to protect stream (buffer strip)	EC 956, <i>Logging Woodland Properties: A Worksheet for Landowners</i>
	<i>Damage to soil:</i> ↑ Soil compaction ↑ Soil erosion	↓ Forest productivity ↓ Water quality ↑ Habitat damage Legal violations or liability	Use designated skid trails; design and maintain them appropriately Till soil Cable log steep areas (>35% slope) Provide log suspension during yarding	EC 1109, <i>Soil Compaction on Woodland Properties</i> EC 1110, <i>Designated Skid Trails Minimize Soil Compaction</i>

^aIn addition to these OSU publications, consider the following: (1) OSU Forestry Media Center slidetapes and films, available from Forestry Media Center, School of Forestry, Corvallis 97331; (2) *Oregon Forest Practice Rules and Forest Practice Notes*, both available from Oregon

State Department of Forestry, 2600 State St., Salem 97310; (3) the Natural Resources Conservation Service; and (4) county OSU Extension foresters, ODF forest practice foresters, and private consulting foresters and engineers.

The intention of this publication is to make you aware of the kind of soil and water problems woodland activities can cause. It also will provide you with ideas about how to

minimize these problems and sources of information on the causes and management of soil and water problems. Table 1 gives a handy summary of this information.

Roads

Roads are the principal source of soil and water problems on forest lands. They create surfaces that water cannot penetrate easily, expose bare mineral soil, and cross natural drainages. These conditions increase the likelihood of soil erosion, landslides, and channel scour. Substantial road maintenance and repair costs can

result, which may exceed the original road cost.

Soil loss and debris movement near roads can decrease land productivity; this also can damage water quality and fish habitat and migration. Problems such as these may result in citations under the Forest Practices Act or damage claims by downstream neighbors.

Appropriate planning, design, construction, and maintenance of roads will help prevent or minimize soil and water problems. For example, locate roads away from unstable areas and spots that remain wet throughout the year. Use construction methods

References to other publications

When you're referred to another OSU Extension Service publication, you'll find additional information in "For Further Reading," page 4.

Table 1.—Woodland activities and their relationship to soil and water conservation (↑ = increase; ↓ = decrease), cont.

Woodland activity	Possible soil and water changes	Potential problems from changes	Ways to prevent or minimize problems	Sources of further information ^a
Forest management Prescribed burning	↑ Soil erosion ↑ Nutrient loss to atmosphere and drainage water	↓ Water quality ↓ Forest productivity Legal violations or liability	Schedule to avoid very hot burn conditions Plan for rapid site revegetation Consider nonburning alternatives	PNW 195, <i>Impacts of Forest Practices on Surface Erosion</i>
Mechanical site preparation	↑ Soil erosion Topsoil scalping	↓ Water quality ↓ Forest productivity Legal violations or liability	Plan for rapid site revegetation Use appropriate techniques and equipment <ul style="list-style-type: none"> • Do not pile topsoil • Use equipment no larger than necessary 	PNW 195, <i>Impacts of Forest Practices on Surface Erosion</i>
Using chemicals (fertilizers, herbicides, and pesticides)	Surface or ground-water contamination	↓ Water quality Legal violations or liability	Use the appropriate chemical (for example, one with low toxicity and mobility in soil) Follow appropriate application technique and scheduling <ul style="list-style-type: none"> • Maintain unsprayed buffer areas near streams • Apply chemical during calm, dry weather 	EC 1194, <i>Oregon's Forest Practice Rules</i>

^aIn addition to these OSU publications, consider the following: (1) OSU Forestry Media Center slidetapes and films, available from Forestry Media Center, School of Forestry, Corvallis 97331; (2) *Oregon Forest Practice Rules and Forest Practice Notes*, both available from Oregon

State Department of Forestry, 2600 State St., Salem 97310; (3) the Natural Resources Conservation Service; and (4) county OSU Extension foresters, ODF forest practice foresters, and private consulting foresters and engineers.

and scheduling that minimize the opportunities for soil erosion—avoid activities during wet weather and keep waste material out of natural drainages.

Plan for ditches and cross-drains large and frequent enough to handle storm flows, and thereby reduce the likelihood of gullyng and washouts. Clean ditches and culverts regularly, especially during the rainy season, to help avoid costly drainage system damage. See Table 1 for information about publications on road planning, design, construction, and maintenance.

Timber Harvesting

Timber harvesting activities can create soil and water problems. Felling, bucking, and yarding operations in or near drainages can disturb streambeds and banks, add significant debris and sediment to streams, and promote “debris torrents” in drainages. These changes can reduce water quality and fisheries habitat and migration.

Logging with crawler tractors or rubber-tired skidders can compact large soil areas and make them less productive than undisturbed areas. Erosion problems also can increase on skid trails and landings because runoff is more common on compacted and exposed soil.

Proper harvest layout, equipment selection, scheduling, and supervision can prevent or minimize soil and

water problems, thereby also meeting the requirements of the Forest Practices Act.

Lay out skid trail systems before felling and yarding to help restrict soil compaction to a small area. Locate skid trails to avoid steep slopes and wet ground where equipment activities favor rutting and soil disturbance. For similar reasons, schedule timber yarding to avoid wet conditions.

Select cable logging equipment for use in unstable and excessively steep areas (those with slopes over 35 percent). With certain techniques and equipment, you can fell trees away from drainages to keep debris out of streams and reduce streambed and bank damage. You'll find additional timber harvesting information in the publications listed in Table 1.

Forest Management

Other woodland activities, particularly those related to stand and site management, can produce significant impacts on soil and water resources; yet proper precautions can minimize these problems.

Because fire can consume the surface duff layer that protects the mineral soil from raindrop impact and helps hold the particles against erosion, schedule prescribed burning to avoid very hot burn conditions. Mechanical site preparation also can expose bare mineral soil to the forces of erosion, and poor practices or equipment misuse can scalp and displace productive topsoil.

You can minimize these problems with careful equipment operation. For example, if scarification with a brush blade is called for, use a vehicle that is no larger than necessary and keep the brush blade high enough to avoid piling the topsoil. Follow site preparation activities with site revegetation before the rainy season, through either natural or artificial seeding or planting.

Potential health problems and legal violations and suits can occur when fertilizer and pesticide applications contaminate water supplies beyond accepted standards. Appropriate scheduling and application techniques

for chemical treatments, including the use of unsprayed buffer zones near areas of open water, can help avoid these problems. Chemicals that are of low toxicity and low mobility in the soil are preferred also.

Additional Help

For additional soil and water conservation information, contact your county office of the Oregon State University Extension Service. Local offices of the Oregon State Department of Forestry and the Natural Resources Conservation Service, and private consulting foresters and engineers also can be of assistance.

For Further Reading

To order copies of the following publications, send the publication's complete title and series number, along with a check or money order for the amount listed, to:

Publication Orders
Extension & Station Communications
Oregon State University
422 Kerr Administration
Corvallis, OR 97331-2119
Fax: 541-737-0817

If you would like additional copies of this publication, *Soil and Water Conservation: An Introduction for Woodland Owners*, EC 1143, send \$1.00 per copy to the above address.

We offer discounts on orders of 100 or more copies of a single title. Please call 541-737-2513 for price quotes.

Adams, Paul W., *Maintaining Woodland Roads*, EC 1139 (Oregon State University, Corvallis, reprinted 1992). \$1.25

Adams, Paul W., *Oregon's Forest Practice Rules*, EC 1194 (Oregon State University, Corvallis, revised 1996). \$1.00

Adams, Paul W., *Soil Compaction on Woodland Properties*, EC 1109 (Oregon State University, Corvallis, reprinted 1992). \$1.00

Garland, John J., *Designated Skid Trails Minimize Soil Compaction*, EC 1110 (Oregon State University, Corvallis, reprinted 1993). \$1.00

Garland, John J., *Designing Woodland Roads*, EC 1137 (Oregon State University, Corvallis, reprinted 1993). \$3.50

Garland, John J., *Logging Woodland Properties: A Worksheet for Landowners*, EC 956 (Oregon State University, Corvallis, reprinted 1992). 75¢

Garland, John J., *Planning Woodland Roads*, EC 1118 (Oregon State University, Corvallis, revised 1996). \$1.00

Garland, John J., *Road Construction on Woodland Properties*, EC 1135 (Oregon State University, Corvallis, reprinted 1993). \$2.00

Sidle, Roy C., *Impacts of Forest Practices on Surface Erosion*, PNW 195 (Oregon State University, Corvallis, reprinted 1996). 50¢

Sidle, Roy C., *Slope Stability on Forest Land*, PNW 209 (Oregon State University, Corvallis, 1980). 75¢

World Wide Web

You can access our Educational Materials catalog and some of our publications through our Web page at <http://www.wagcomm.ads.orst.edu/>



The Woodland Workbook is a collection of publications prepared by the Oregon State University Extension Service specifically for owners and managers of private, nonindustrial woodlands. The Workbook is organized into separate sections, containing information of long-range and day-to-day value for anyone interested in wise management, conservation, and use of woodland properties. It's available in a 3-ring binder with tabbed dividers for each section.

For information about how to order, and for a current list of titles and prices, inquire at the office of the OSU Extension Service that serves your county.

This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.

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