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**PARTCUTS: A Computerized Annotated
Bibliography of Partial-cutting Methods
in the Pacific Northwest (1995 Update)**

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**CANADA-BRITISH COLUMBIA PARTNERSHIP AGREEMENT ON FOREST RESOURCE
DEVELOPMENT: FRDA II**

**PARTCUTS:
A Computerized Annotated Bibliography
of Partial-cutting Methods
in the Pacific Northwest
(1995 Update)**

by
Patrick W. Daigle
Compiler and Editor

Research Branch
BC Ministry of Forests
31 Bastion Square
Victoria, B.C.
V8W 3E7

March 1995

**CANADA-BRITISH COLUMBIA PARTNERSHIP AGREEMENT ON FOREST
RESOURCE DEVELOPMENT: FRDA II**

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For additional copies and/or further information about the Canada-British Columbia Partnership Agreement on Forest Resource Development: FRDA II, contact:

Canadian Forest Service
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C. V8Z 1M5
(250) 363-0771

or BC Ministry of Forests
Research Branch
31 Bastion Square
Victoria, B.C. V8W 3E7
(250) 387-6721

ABSTRACT

The PARTCUTS bibliography contains references describing partial cutting in Pacific Northwest forests. PARTCUTS is computerized for use on IBM-PC or compatible microcomputers; users can browse the current state of published knowledge about partial-cutting study and experience. Each reference includes: author(s) name, year of publication, title, source, abstract, and keywords.

Planners, silviculturists, and researchers can search references dealing with various aspects of partial-cutting practices. Citations, keywords, and abstracts can be displayed on the screen, stored in a file, or printed.

The species currently included in the database are:

- coastal Douglas-fir
- Engelmann spruce
- interior Douglas-fir
- lodgepole pine
- ponderosa pine
- subalpine fir
- western hemlock
- western larch
- western redcedar

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I appreciate the help of Phil Comeau for developing the retrieval program for the first edition of PARTCUTS: A Computerized Annotated Bibliography of Partial-cutting Methods in the Pacific Northwest (Daigle and Comeau 1992).

For their help in preparing this second edition of PARTCUTS, I wish to thank several individuals for their contributions. Contractor Tara Hastings assisted with library research and typing; co-op student Monica Provan also assisted with typing. Contractor Richard Bott made adjustments to the retrieval program for this edition of PARTCUTS.

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INTRODUCTION TO PARTCUTS

Forest resource professionals are challenged to develop biologically sound, economically feasible, and socially acceptable ways to manage public and private forest resources. Forest managers are facing growing social pressure against clearcutting practices.

The purpose of this bibliography is to compile citations describing partial-cutting methods in Pacific Northwest forests containing any of the following tree species:

- coastal Douglas-fir (Fdc)
- Engelmann spruce (Se)
- interior Douglas-fir (Fdi)
- lodgepole pine (Pl)
- ponderosa pine (Py)
- subalpine fir (Bl)
- western hemlock (Hw)
- western larch (Lw)
- western redcedar (Cw)

This bibliography provides a compilation of written materials describing alternatives to clearcut and seed-tree silvicultural methods in Pacific Northwest forest types containing these tree species.

Silvicultural Practices Included

Silvicultural techniques from both even-aged and uneven-aged management regimes are included in this bibliography. Terms used in the compiled literature include:

- commercial thinning
- diameter-limit
- group selection
- improvement cut
- individual-tree selection
- overstory removal
- partial cutting
- salvage cut
- sanitation cut
- selection cut
- shelterwood systems

Audience

Forest planners, silviculturists, wildlife and other specialists, and researchers have an opportunity to learn from other professionals working in the Pacific Northwest. Because most silvicultural research in North America is focused on even-aged management, research does not provide a complete answer to all questions. However, this bibliography gives users an introduction to the current state of published knowledge about partial-cutting study and experience in the Pacific Northwest.

Approach and Scope

The BC Ministry of Forests library in Victoria, B.C., and FS-INFO (Forest Service INFORMATION) in Ogden, Utah, scanned databases (AGRICOLA, BIOSIS, CAB, Forest Abstracts, TREE-CD) for many of the citations contained in this bibliography. About 15% of the citations were identified this way. the remainder were located

through libraries, or collected by phone calls to authors, universities, and U.S. Forest Service Research Stations.

The 1992 version of PARTCUTS (Daigle and Comeau) contained articles published since 1970 pertaining to partially cut forests in the Pacific Northwest. During 1995, the database was updated to include newer publications and some overlooked during the earlier search. To request updates, please complete and return the enclosed form (Appendix 4).

The computerized bibliography, which runs on IBM-PC or compatible microcomputers, was prepared using dBASE IV software. The PARTCUTS retrieval program and documentation were adapted from the COMB program and manual developed by Comeau et al. (1990).

Vegetation Classification, Ecology, Species, Cover Types, and Management

Because Canadian and American forest vegetation classification systems differ, forest resource managers may be interested in reading the following publications, which provide a summary of information for a type or species.

1. Ecological site classification (synecology)

British Columbia: Meidinger and Pojar (1991) describe the forest ecology and biogeoclimatic zones in which the tree species featured in PARTCUTS occur.

Western USA: Wellner (1989) reviews the literature pertaining to the habitat type classification systems widely used in the western United States.

2. Silvics (autecology) of species

British Columbia: The ecological characteristics and distribution of tree species are described by Lavender et al. (1990).

Western USA: The silvics, habitat conditions, and life history of individual tree species are summarized in Burns and Honkala (1990).

3. Cover types

North America: The broad North American distribution and ecological and successional relationships of the forest cover types contained in PARTCUTS are described by Eyre (1980).

4. Ecology and management monographs: species and cover types

Monographs addressing the ecology and management of the tree species contained in PARTCUTS include:

- coastal Douglas-fir (Oliver et al. 1986)
- Engelmann spruce (Alexander and Shepperd 1984)
- interior cedar-hemlock-white pine (Baumgartner et al. 1995)
- interior Douglas-fir (Baumgartner and Lotan 1991)
- lodgepole pine (Baumgartner et al. 1985)
- ponderosa pine (Baumgartner and Lotan 1988)
- subalpine fir (Alexander et al. 1984)
- western hemlock (Ruth and Harris 1979)
- western larch (Schmidt and McDonald 1995)
- western redcedar (Smith 1988)

Acquiring Hard Copies of Cited Publications

Appendix 5 lists libraries that stock the publications contained in this bibliography. Regional libraries can provide interlibrary loan assistance.

Discussion

There are many opportunities to apply existing knowledge to challenges faced in other areas of the Pacific Northwest to arrive at creative solutions that address biological, social, and economic concerns.

Articles featuring commercial thinning have been included in this material. Commercial thinning has been practiced for decades in some areas of this region; techniques, equipment, and skills have been developed, refined, and adapted for use in partial-cutting prescriptions. For example, thinning studies have investigated steep-slope cable yarding alternatives and yarding techniques designed to minimize residual tree damage. Other aspects of thinning that have been studied include: computer models, economics, genetics, growth and yield, and logging productivity.

Shelterwood systems have been studied extensively in the Pacific Northwest. The breadth of study covers: artificial, natural, and advanced regeneration; economics; fire management; genetics; growth and yield; landscape management; logging productivity; microclimate; nutrient cycling; pests; planning; residual tree damage; soil biology; and wildlife management.

INSTALLING PARTCUTS

Installation of the complete bibliography requires an IBM PC or compatible MS-DOS microcomputer with a hard-disk drive and a minimum of 640kb of RAM. The database package requires about 3.5 Mb of hard-disk space.

To install PARTCUTS:

1. Create a subdirectory on your hard-disk drive to contain PARTCUTS software and database files, and make this your current directory.
2. Place the PARTCUTS diskette into a disk drive.
3. Type the following:

A: PARTCUTS

(**B: PARTCUTS** if you have placed the diskette in drive B)

1. Wait while PARTCUTS is installed.

USING PARTCUTS

When the installation is completed, you can run PARTCUTS from within the PARTCUTS subdirectory. At the DOS prompt, type:

PARTCUTS

Main Menu

The main menu lists five options. To select a menu option, move the highlight bar to the appropriate selection using the up and down arrows. Press <**RETURN**> or enter the first letter of the selection. Each menu selection is described further in the following sections.

1. Search Database

Selecting this from the Main Menu reveals the Search Menu, which consists of the six options described below.

Because searches conducted with PARTCUTS are additive, the program can successively narrow the search for a specific

reference. You can select references published within a particular range of years, for a particular topic (keyword), and published by a particular author. Until you return to the Main Menu and choose "**Delete Previous Search**," searches will continue to narrow the number of selected references successively.

In author, title, and keyword searches, appropriate fields are searched in the database for the string of letters that you enter. You may enter complete words or partial words or phrases.

PARTCUTS searches the database for a string of letters that match the string you entered. For example, a search for the keyword "crown" will select references with words such as "crown closure" and "crown ratio" in the title or keyword fields. You may enter search strings using either upper- or lowercase letters.

Following a search, PARTCUTS display the number of selected references.

REMEMBER: Searches are additive until you select "**Delete Previous Search**" from the Main Menu. If you have already done any searching since you last selected "**Delete Previous Search**," you are combining the results of more than one search.

The six options on the Search Menu are:

Years to Search

When you select this option, PARTCUTS will prompt you to type both the "Oldest Year" and "Most recent year" for which you want citations selected. Type appropriate years at the prompt (for example, 1988) or select displayed default values by pressing <RETURN>.

Author Search

On selecting this option, you will be asked by the program to enter the name of the author to search. At the prompt, you can enter the full name, with or without initials. PARTCUTS databases list the author's surname, followed by initials without punctuation. For references with multiple authors, names are separated by semicolons (for example, DAIGLE P W; COMEAU P G).

Title Search

This option permits searching the title fields for a particular string. At the prompt, enter the string that you wish to locate.

Keyword Search

A keyword search scans both the titles and keywords for records containing the word or string.

Key words, generated from the text of the articles and from authors' original keywords, reflect the emphasis on partial cutting. The keywords include location, species, and other information such as topic or treatment. Use the keywords contained in Appendix 6 when searching the keyword database. Where the term "silviculture systems" is used in the keywords, the article describes or compares clearcutting and/or seed-tree methods in addition to partial-cutting methods.

Abbreviations used in the keywords include:

- for biogeoclimatic zone
- for habitat type
- for plant association
- for plant community
- spp. for species

Specific biogeoclimatic zones are abbreviated using three of four letters for the zone. For example, CDF b.z. means Coastal Douglas-fir biogeoclimatic zone. Habitat types, plant communities, and plant associations are abbreviated using the first two letters of each of the overstory and understory genera and species, separated by a slash(/). For example, ABLA/CLUN h.t. is the abbreviation for the *Abies lasiocarpa/Clintonia uniflora* habitat type.

Display Search

Display search reveals the result of the search on the screen. Use <**PgUp**> to see the preceding citation and <**PgDn**> to see the following citation. If you press <**PgUp**> when you are at the first record of the database, the program will return to the Search Database menu.

To display the abstract, move the cursor to the word "**MEMO**" and press <**CTRL**> + <**HOME**>. Scroll with the down arrow to read long abstracts. To leave the abstract and return to the citation display, press <**CTRL**> + <**END**> or <**ESC**>.

Nearly all of the abstracts are quoted from the material written by the original author; these are indicated by quotation marks. Partial quotes are indicated by ellipses ("..."). The PARTCUTS compiler annotated some citations; these have no quotation marks.

CAUTION: Do not cite information from the abstracts. Refer to the original source.

Return to Main Menu

Selecting this option returns you to the Main Menu.

2. Print Results

PARTCUTS prints the results of a search on a parallel printer attached to your computer. The Print Menu allows you to select three types of output, or return to the Main Menu.

Print Citations

PARTCUTS will print selected citations (authors, publication year, title, and source).

Print Citations and KWDS

The program will print keywords in addition to the citation.

Print Citations, KWDS, and Abstracts

When you select this option, PARTCUTS prints the citation, keywords, and abstract.

Return to Main Menu

This option returns you to the Main Menu.

3. File Results

If you want to use the search results with a word processor or other software, save the search in a file.

CAUTION: Sending results to an existing file will cause the file's contents to be overwritten.

Write Citations to a Text File

The program writes the citations (authors, publication year, title, and source) for the selected references to a text (ASCII) file.

Write Citations and KWDS to a Text File

PARTCUTS writes citations and keywords for selected references to a text (ASCII) file.

Write Citations, KWDS, and Abstracts to a Text File

This writes the citations, keywords, and abstracts for the selected references to a text (ASCII) file.

Store Selections in a New dBASE File

Search results can be stored in a dBASE file for later use by dBASE IV. If you select this option, the program prompts you to enter a filename for the new file.

Return to Main Menu

This option returns you to the Main Menu.

4. Delete Previous Search

This selection will delete previous search results before conducting a new search.

5. Quit to DOS

This option will end the running of PARTCUTS and you will be returned to the DOS prompt.

REFERENCES

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- Baumgartner, D.M. and J.E. Lotan (compilers and editors). 1988. Ponderosa pine: the species and its management. Symp. Proc., Spokane, Wash. Wash State Univ., Pullman, Wash., and Univ. Idaho, Moscow, Idaho.
- _____. 1991. Interior Douglas-fir: the species and its management. Symp. Proc., Spokane, Wash. Wash. State Univ., Pullman, Wash., and Univ. Idaho, Moscow, Idaho.
- Baumgartner, D.M., J.E. Lotan, and J.R. Tonn (compilers and editors). 1995 Interior cedar-hemlock-white pine forests: ecology and management. Symp. Proc., Spokane, Wash. Wash. State Univ., Pullman, Wash.
- Burns, R.M. and B.H. Honkala (technical coordinators). 1990. Silvics of North America. Vol. 1: Conifers. U.S. Dep. Agric. For. Serv., Washington, D.C. Agric. Handbk. 654.
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APPENDIX 1. Structure of PARTCUTS database files

Fields used in PARTCUTS files.

Field name	Type	Width
NO	Numeric	9
AUTHORS	Character	250
PYEAR	Character	5
TITLE	Character	250
SOURCE	Character	250
KWDS	Character	250
ABSTRACT	Memo	10
CHECK	Character	1

APPENDIX 2. Metric conversion

PARTCUTS presents information as it is used by the authors. The following conversions provide a convenient reference (Watts 1983).

- 1 cubic foot per acre = 0.06997 cubic metre per hectare
- 1 cubic foot = 0.0283 cubic metre
- 1 acre = 0.4047 hectare
- 1 square foot = 0.0929 square metre
- 1 square foot per acre = 0.2296 square metre per hectare
- 1 inch = 2.54 centimetres
- 1 foot = 0.3048 metre
- 1 mile = 1.609 kilometres
- 1 pound = 0.4536 kilograms
- 1 pound per acre = 1.1208 kilograms per hectare

Note: Metrication of broad foot measure is not included because many factors (such as log length, taper, scaling diameter, scaling rules, and merchant ability standards) affect the conversion ratio. For a discussion of roundwood metrication, see Dykstra (1978).

APPENDIX 3. Form 1: Additions to the PARTCUTS database

If you have, or know of, additional documents (published since 1970) that refer to partial-cutting methods in Pacific Northwest forests containing the species currently in the database, please provide the information below. Methods of interest include commercial thinning, diameter-limit cuts, group selection, improvement cuts, individual-tree selection, salvage cuts, sanitation cuts, and shelterwood cuts.

Author(s):

Publication year

Title:

Source:

Keywords:

If possible, please send a copy of the abstract and/or the publication to:

Patrick W. Daigle
Research Branch
BC Ministry of Forests
31 Bastion Square
Victoria, B.C.
V8W 3E7

Thank you.

APPENDIX 4. Form 2: Requests for PARTCUTS updates

If you wish to receive updates of the PARTCUTS database, please provide the following information and return it to the address at the bottom of the page.

Name:

Organization:

Mailing address:

Telephone:

I would be interested in seeing information on the following species or topics added to the PARTCUTS bibliography:

Comments:

Return to:

Patrick Daigle

Research Branch

B C Ministry of Forests

31 Bastion Square

Victoria, B.C.

V8W 3E7

APPENDIX 5. Acquiring hard copies of cited publications

Contact one of the following libraries to acquire publications cited in the PARTCUTS bibliography, or use the interlibrary loan services of a local library.

BC Ministry of Forests Library
1450 Government Street
Victoria, B.C., Canada
V8W 3E7

Canadian Forest Service
Northern Forestry Centre Library
5320 - 122nd Street
Edmonton, AB, Canada
T6H 3S5

Canadian Forest Service
Pacific Forestry Centre Library
506 West Burnside Road
Victoria, B.C., Canada
V8Z 1M5

USDA Forest Service Intermountain
Research Station Library
324 - 25th Street
Ogden, UT, USA
84401

USDA Forest Service Pacific Northwest
Research Station Library
P.O. Box 3890
Portland, OR, USA
97208

USDA Forest Service Pacific Southwest
Research Station Library
P.O. Box 245
Berkeley, CA, USA
94701 - 0245

Oregon State University
William Jasper Kerr Library
Corvallis, OR, USA
97331

Simon Fraser University
W.A.C. Bennett Library
Burnaby, B.C., Canada
V5A 1S6

University of Alberta
Cameron Library
Edmonton, AB, Canada
T6G 2J8

University of British Columbia
MacMillan Library
Vancouver, B.C., Canada
V6T 2A2

University of California
Forestry Library
Room 260, Mulford Hall
Berkeley, CA, USA
94720

University of Idaho
Library
Moscow, ID, USA
83843 - 4198

University of Montana
Mansfield Library
Missoula, MT, USA
59812

University of Northern British Columbia
Library
3333 University Way
Prince George, B.C., Canada
V2N 4Z9

University of Washington
Forest Resources Library
Bloedel Hall AQ-15
Seattle, WA, USA
98195

Washington State University
Library
Pullman, WA, USA
99164 - 5610

APPENDIX 6. Sample keywords

ABCO/CEVE h.t. (*Abies concolor/Ceanothus velutinus*)
ABGR/ACGL h.t. (*Abies grandis/Acer glabrum*)
ABGR/CLUN h.t. (*Abies grandis/Clintonia uniflora*)
ABGL/LIBO h.t. (*Abies grandis/Linnaea borealis*)
ABGR/PAMY h.t. (*Abies grandis/Pachistima myrsinites*)
ABGR/PHMA h.t. (*Abies grandis/Physocarpus malvaceus*)
ABGR/VAGL h.t. (*Abies grandis/Vaccinium globulare*)
ABGR/VAME h.t. (*Abies grandis/Vaccinium membranaceum*)
ABGR/XETE h.t. (*Abies grandis/Xerophyllum tenax*)
Abies amabilis
Abies concolor
Abies grandis
Abies lasiocarpa
Abies magnifica
Abies procera
Abies spp.
ABLA/ALSI h.t. (*Abies lasiocarpa/Alnus sinuata*)
ABLA/CACA h.t. (*Abies lasiocarpa/Calamagrostis canadensis*)
ABLA/CARU h.t. (*Abies lasiocarpa/Calamagrostis rubescens*)
ABLA/CLUN h.t. (*Abies lasiocarpa/Clintonia uniflora*)
ABLA/LIBO h.t. (*Abies lasiocarpa/Linnaea borealis*)
ABLA/MEFE h.t. (*Abies lasiocarpa/Menziesia ferruginea*)
ABLA/PAMY h.t. (*Abies lasiocarpa/Pachistima myrsinites*)
ABLA/VAGL h.t. (*Abies lasiocarpa/Vaccinium globulare*)
ABLA/VASC h.t. (*Abies lasiocarpa/Vaccinium scoparium*)
ABLA/XETE h.t. (*Abies lasiocarpa/Xerophyllum tenax*)
advanced regeneration
Alaska
Alberta
Arceuthobium spp.
Arthropods
balloon logging
bark beetles
basal area

bird management
British Columbia
cable logging
California
Calocedrus decurrens (see also *Libocedrus decurrens*)
canopy
CDF b.z. (Coastal Douglas-fir)
Chamaecyparis lawsoniana
Chamaecyparis nootkatensis
computer model
computer programs
costs
crown closure
crown ratio
cutting cycle
CWH b.z. (Coastal Western Hemlock)
defoliators
diameter-limit
duff
economics
energy balance
ESSF b.z. (Engelmann Spruce - Subalpine Fir)
esthetics
fertilization
fire (prescribed)
fuel management
genetics
germination
grazing
group selection
growth and yield
habitat series
habitat types
harvest scheduling
helicopter logging
horse logging
ICH b.z. (Interior Cedar-Hemlock)
IDF b.z. (Interior Douglas-fir)

Idaho
improvement cut
increment (diameter)
increment (height)
increment (volume)
indicator species
individual-tree selection
interdisciplinary planning
land use planning
landscape management
Larix occidentalis
Larix spp.
Libocedrus decurrens (see also *Calocedrus decurrens*)
logging patterns
logging productivity
MH b.z. (Mountain Hemlock)
microclimate
mixed conifer stands
moisture stress
Montana
mortality
multiple use
nontimber resources
northern Rocky Mountains
nutrient cycling
old growth
optimization
Oregon
overstory removal
Pacific Northwest
partial cutting
Picea engelmannii
Picea glauca
PICEA/LIBO h.t. (*Picea/Linnaea borealis*)
Picea mariana
Picea sitchensis
Picea spp.
PICO/PUTR h.t. (*Pinus contorta/Purshia tridentata*)

Pinus albcaulis
Pinus contorta
Pinus jeffreyi
Pinus lambertiana
Pinus monticola
Pinus muricata
Pinus ponderosa
Pinus spp.
 PIPO/CEVE h.t. (*Pinus ponderosa/Ceanothus velutinus*)
 PIPO/CEVE p.c. (*Pinus ponderosa/Ceanothus velutinus*)
 PIPO/SYAL p.c. (*Pinus ponderosa/Symphoricarpos albus*)
 PIPO/PUTR h.t. (*Pinus ponderosa/Purshia tridentata*)
 planning
 plant association
 plant communities
 PPBG b.z. (Ponderosa Pine - Bunchgrass)
 prebunching
 product recovery
Pseudotsuga menziesii
 PSME/AGSP h.t. (*Pseudotsuga menziesii/Agropyron spicatum*)
 PSME/BEAQ p.c. (*Pseudotsuga menziesii/Berberis aquifolium*)
 PSME/BENE p.a. (*Pseudotsuga menziesii/Berberis nervosa*)
 PSME/BENE p.c. (*Pseudotsuga menziesii/Berberis nervosa*)
 PSME/CAGE h.t. (*Pseudotsuga menziesii/Carex geyeri*)
 PSME/CARU h.t. (*Pseudotsuga menziesii/Calamagrostis rubescens*)
 PSME/CLUN h.t. (*Pseudotsuga menziesii/Clintonia uniflora*)
 PSME/COCO p.c. (*Pseudotsuga menziesii/Corylus cronuta*)
 PSME/HODI p.c. (*Pseudotsuga menziesii/Holodiscus discolor*)
 PSME/LIBO h.t. (*Pseudotsuga menziesii/Linnaea borealis*)
 PSME/LOHI p.c. (*Pseudotsuga menziesii/Lonicera hispidul*)
 PSME/PHMA h.t. (*Pseudotsuga menziesii/Physocarpus malvaceus*)
 PSME/SPBE h.t. (*Pseudotsuga menziesii/Spiraea betulifolia*)
 PSME/SYAL h.t. (*Pseudotsuga menziesii/Symphoricarpos albus*)
 PSME/SYAL p.c. (*Pseudotsuga menziesii/Symphoricarpos albus*)
 PSME/VACA h.t. (*Pseudotsuga menziesii/Vaccinium caespitosum*)
 PSME/VAGL h.t. (*Pseudotsuga menziesii/Vaccinium globulare*)

quality premium
regeneration
regeneration (artificial)
regeneration (natural)
regulation
release
residual stocking
residual trees
residue management
root rot
rotation
salvage cut
sanitation cut
SBS b.z. (Sub-Boreal Spruce)
seed dispersal
seed production
seedling
selection cut
selection systems
Sequoia sempervirens
shelterwood systems
silviculture systems
silviculture
simulation
site preparation
skid trails
skidder logging
skyline system
soil biology
soil compaction
soil disturbance
soil expectation value
soil moisture
soil temperature
species composition
stand density
stand development
stand prescriptions

stand structure
stand table
stocking
stocking control
succession
swinging
thinning
thinning (commercial)
THPL/ATFI h.t. (*Thuja plicata*/*Athyrium filix-femina*)
THPL/CLUN h.t. (*Thuja plicata*/*Clintonia uniflora*)
THPL/PAMY h.t. (*Thuja plicata*/*Pachistima myrsinites*)
Thuja plicata
timber appraisals
timber harvesting
tractor logging
tree damage
tree processors
TSHE/ACCI h.t. (*Tsuga heterophylla*/*Acer circinatum*)
TSHE/CLUN h.t. (*Tsuga heterophylla*/*Clintonia uniflora*)
TSHE/PAMY h.t. (*Tsuga heterophylla*/*Pachistima myrsinites*)
TSME/CARU h.t. (*Tsuga mertensiana*/*Calamagrostis rubescens*)
TSME/LIBO h.t. (*Tsuga mertensiana*/*Linnaea borealis*)
TSME/VACA h.t. (*Tsuga mertensiana*/*Vaccinium caespitosum*)
TSME/VASC p.c. (*Tsuga mertensiana*/*Vaccinium scoparium*)
Tsuga heterophylla
Tsuga mertensiana
Tsuga spp.
understory vegetation
uneven-aged management
utilization
vegetative competition
vegetative propagation
Washington
watershed management
western United States
whole-tree processing
wildlife habitat

young growth