



Rating Spruce-Fir Silviculture

**FOR WILDLIFE
AND FORESTRY**

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Forest managers face a wide array of potential choices when they consider all of the products derived from woodlands. Many of these products compete with one another to some degree. For instance, hardwood regeneration may be removed in thinnings to favor softwood growth. Forest wildlife is also influenced by silvicultural practice and the manager must decide whether to encourage only a few species of wildlife or try to manage for the entire wildlife community. If a variety of wildlife is more important, management should attempt to create as much plant diversity as possible. A diversity of plant species, form, and

structure will provide a habitat suitable for many species of wildlife.

We rated several silvicultural practices for continued economical production of spruce-fir products and for how much habitat diversity the practice provides. The ratings are our own, based on results of research, professional training, and lengthy experience. Our ratings were tempered by the following reviewers, whom we thank: Barton Blum, Tom Charles, Robert Cope, Gary Donovan, Lyman Feero, Alan Kimball, Peter Ludwig, and Marcia McKeague. The ratings are presented in a series of tables. Each table concerns one specific silvicultural practice, including individ-

ual tree selection, group selection, clearcutting, shelterwood, seed tree, thinning and weeding, and site preparation to favor intolerant hardwoods.

Examples of silvicultural practices are rated numerically. Each example is rated for timber production and wildlife habitat. A score of 5 is best; 1 is poorest. In the "Remarks" section we explain briefly the rationale for the ratings. An expanded discussion of our evaluations of each silvicultural technique may be found in "Wildlife Habitat Responses to Silvicultural Practices in Spruce-Fir Forests" by Crawford and Frank, published in the Transactions of the 52nd North American Wildlife and Natural

Resources Conference.

We prepared this guide based on the best knowledge we have to date. Use it as a guide, not as an inviolate treatise. Our opinions may change as we continue to learn more about the interactions of silviculture and wildlife.

TABLE 1 Ratings for wildlife habitat and tree growth responses after individual tree selection harvests in spruce-fir forests.

STAND	Spruce-fir with hemlock & northern white cedar. Balanced uneven-aged structure.	Same	Same	Same
TECHNIQUE	Manage to favor spruce, hemlock, and white cedar on a 5- to 10-year operating interval.	Same	Manage to favor red spruce	Same
SITE (cords/A/Yr)	>1	½-1	>1	½-1
RATING-Timber	4-5	4	5	4
RATING-Wildlife	4-5	4	4	3
REMARKS	Maximum vertical diversity, fair horizontal diversity, continuous yield of wood products.	See previous. As the site value decreases, the value for tree growth and wildlife populations decreases proportionately.	Uniform yield of profitable wood products. Less species variety for wildlife.	Value for wood and wildlife decreases with decreasing site quality.



Selection of individual trees creates small openings, a distribution of different size trees, good vertical diversity, and a continuous yield of forest products from even small ownerships.

TABLE 2 Ratings for wildlife habitat and tree growth response after group selection harvests in spruce-fir forests.

STAND	Spruce-fir with hemlock and northern white cedar. Balanced uneven-aged structure.	Same	Same
TECHNIQUE	Manage to favor spruce, hemlock, and cedar on a 10- to 20-year operating interval.	Manage to favor red spruce.	Same
SITE (cords/A/Yr)	>1	>1	½-1
RATING-Timber	5	5	4
RATING-Wildlife	5	4	3-4
REMARKS	Excellent diversity to favor many wildlife species. More flexibility for managing tree species.	Concentration on more profitable wood products. Tree diversity less.	Value for wood and wildlife decreases with decreasing site quality.



Selection of trees in small groups enhances horizontal diversity for many animal species and maintains vertical diversity.



Narrow strip clearcuts are used to regenerate stands while maintaining adjacent cover in deer wintering areas.

TABLE 3 Ratings for wildlife habitat and tree growth response after clearcut harvests in spruce-fir forests.

STAND TECHNIQUE SITE (cords/A/Yr) RATING-Timber RATING-Wildlife REMARKS	Spruce-fir, near mature to mature, even-aged stand, established regeneration inadequate.	Same	Same
	Fell all stems on 200-acre block, plant (superior stock, if available) spruce, herbicide at 3 and 8 years if needed, other cultural treatments as necessary.	Same, except 50-acre blocks instead of one large block.	Same, 200-acre block.
	>1	>1	<1/2
	5	4	1-2
	1-2	3	1-2
	Good for production of spruce and fir; wildlife forage available in early years of succession.	Smaller areas would add diversity if surrounding area is wooded. Size less efficient for harvesting and planting.	Site too poor for investment. Wildlife forage available in early years of succession.

TABLE 3 (Continued)

STAND	Same	Same
TECHNIQUE	Fell all stems on 50- to 100-acre patches. Prescribe burn and plant.	Same, with follow-up herbicide in about 3 years.
SITE (cords/A/Yr)	1/2-1	1/2-1
RATING-Timber	3	3-4
RATING-Wildlife	4	2-3
REMARKS	If done properly a good seedbed for direct seeding or planting will be created. Burning will stimulate sprouting of pioneer hardwood species browsed by deer and moose which in pole stage will provide grouse habitat. Especially valuable for recycling bound nutrients. Danger that resprouting species will overwhelm planted species.	Cost of herbicide could make practice less economical. Some desirable wildlife food plants would be lost but diversity could be increased in high biomass conditions.

Same	Mature spruce-fir in deer wintering area (DWA).	Same	Same
Same	Strip cut 100 feet in width leaving 400-foot width uncut. Cut new strip every 10 years in DWA.	Cut 5-acre patches, not to exceed 20% of area in 10 years.	Strip cut, burn for site preparation with nearby cedar seed source.
>1	½-1	½-1	½-1
4	2	3	3
2-3	3	3	5
Treatment costs are better borne on best sites.	Increasing windthrow danger. Will provide early spring food for deer if oriented to provide maximum insulation (E-W) to melt snow along northern edge.	Low operational efficiency. Will provide some winter food around edges of cut and still provide over-story shelter and wind protection.	Regeneration more certain than previous but operational expense higher. Good winter and early spring food for deer.



Small clearcuts are also used to regenerate stands and maintain cover in deer wintering areas.

TABLE 3 (Continued)

STAND	Mature to near mature budworm defoliated fir and spruce with adequate natural regeneration of fir.	Same
TECHNIQUE	Fell all stems, salvage cut in blocks >200 acres.	Clearcut sites with best trees in 50- to 100-acre blocks, leaving remainder uncut.
SITE (cords/A/Yr)	>1	>1
RATING-Timber	3	4
RATING-Wildlife	2	3
REMARKS	Time and effort wasted in removing poor quality wood while better quality wood deteriorates, site potential wasted by not managing intensively. No diversity, deer and moose summer food for a few years followed by many years of food deficiency.	Harvest concentrated initially on most profitable timber; proceed to poorer sites if timber still merchantable. Greater diversity than previous case increases habitat value.

An unmanaged mature spruce, fir, and hemlock stand lacking advanced regeneration. Clearcutting this stand would fail to achieve proper stocking. Shelterwood is an appropriate alternative.

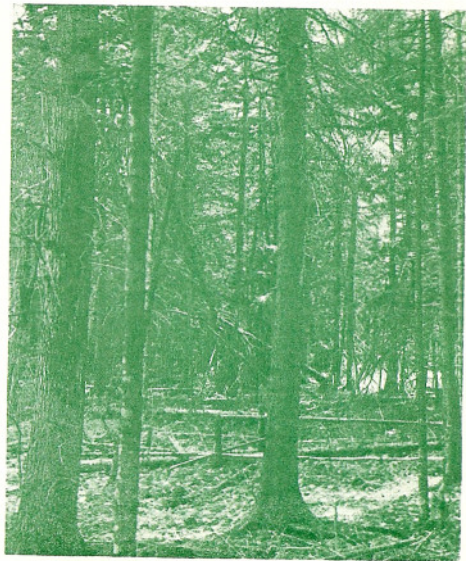
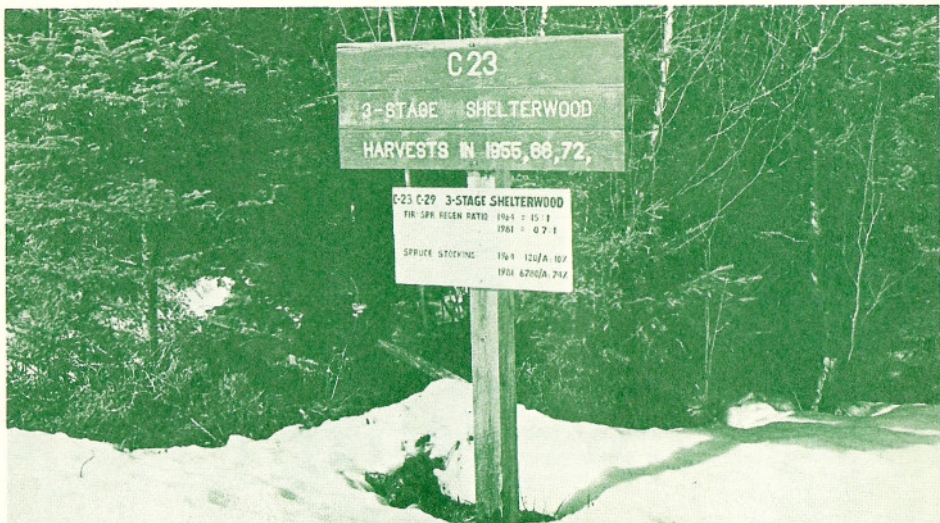


TABLE 4 Ratings for wildlife habitat and tree growth response after shelterwood harvests in spruce-fir forests.

STAND	Spruce-fir even-aged, mature, sparse regeneration of desirable species.	Same	Spruce-fir, mixed lowland conifers, deer wintering area.
TECHNIQUE	2-stage in 100-acre blocks. Second cut about 10 years after first.	3-stage in 100-acre blocks. Second cut about 8 years and third cut about 16 years after first.	3-stage in 25-acre patches. Second cut about 10 years, third about 14 years after first.
SITE (cords/A/Yr)	½-1	½-1	½-1
RATING-Timber	4	5	4
RATING-Wildlife	2-3	4	4
REMARKS	Shelterwood should provide regeneration. Horizontal and vertical diversity increased after first cut, but decreases after second cut.	Adequate time to guide the composition of regeneration before the final harvest. Creates good horizontal and vertical diversity. The detrimental impact of a large operation is moderated by more than one harvest.	Maintains overstory shelter until regeneration fully established. Provides adequate seed source and limits windthrow.

TABLE 4 (Continued)

STAND	Mature spruce-fir showing defoliation, inadequate regeneration.	Same
TECHNIQUE	Pre-salvage larger healthy fir on best sites—up to 50% of stand—and leave vigorous spruce and a wind-buffer of poor fir. Remove remainder after 10 years.	Same
SITE (cords/A/Yr)	½-1	>1
RATING-Timber	4	5
RATING-Wildlife	4	4
REMARKS	Harvest concentrated on most susceptible trees worth cutting. Some mature stand left. Excellent horizontal and vertical diversity. Danger of windthrow on wet shallow soils or where exposed to concentrated wind fetch as in wind gaps.	Deep soil sites more resistant to windthrow.



A regenerating stand after shelterwood treatment.

White pine seed trees provide habitat vertical diversity in addition to a seed source after a seed-tree harvest.



TABLE 5 Ratings for wildlife habitat and tree growth response after seed-tree harvests in spruce-fir forests.

STAND	White pine, spruce-fir and hardwood.
TECHNIQUE	Leave at least 20 of the larger white pine/acre, remove all other trees.
SITE (cords/A/Yr)	1/2-1
RATING-Timber	4-5
RATING-Wildlife	2-3
REMARKS	Provides seed source to enable pine to compete with other species for establishment. Trees also provide degree of vertical diversity lacking in clearcuts.

TABLE 6 Ratings for wildlife habitat and tree growth response after thinning and weeding in spruce-fir forests.

STAND	Spruce-fir, even-aged, small sawlog and small poles.	Same
TECHNIQUE	Thin from below, remove all suppressed trees. Light thinning from above to remove culls and high-risk trees only.	Same
SITE (cords/A/Yr)	>1	<½
RATING-Timber	5	2
RATING-Wildlife	2-3	3
REMARKS	Combined thinning from below and above will put all growth into crop trees. Vertical diversity decreased for wildlife. Short-lived increase in horizontal diversity.	Uneconomical forestry practice. Site quality too low to give return on investment. Horizontal diversity improved for longer period than on better sites, vertical diversity decreased.

Spruce overstory, even-aged, small sawlog with dense fir poles.	Same	Dense regenerating spruce and fir saplings.
Thin from below around best overstory trees, remove half of fir poles.	Same, plus remove 25% of overstory basal area.	Weed to favor spruce crop trees.
½-1	½-1	½-1
4	4-5	4
3	4	3
Cut larger fir for pulp and retain smaller stems for a later commercial cut. Midstory thinned to increase vertical diversity.	Increased yield from harvest plus release of crop trees. Horizontal and vertical diversity improved for wildlife.	Unthinned stand too dense, nutrient distribution diluted throughout phytomass inhibiting transfer to wildlife. Weeding increases horizontal diversity but reduces dense cover. Favoring spruce to grow without initial competition will produce a stand more resistant to spruce budworm defoliation.



Weeding, (background) releases spruce crop trees from dense competition (left; also see photo on page 17) allowing them to fully utilize the site. Horizontal diversity is increased but some cover value is lost.



Dense aspen sprouting 1 year following clearcutting and prescribed burning on a site of average quality.

TABLE 7 Wildlife habitat and tree growth response to site preparation for pioneer hardwoods.

STAND	Mature spruce-fir and mixed wood including pioneer hardwoods. Inadequate regeneration.	Same
	Fell all trees on 50- to 100-acre patches; follow with prescribed fire in April-May to favor aspen or late summer to favor paper birch.	Same
	1/2-1	<1/2
	3-4	1
	4-5	4
TECHNIQUE		
SITE (cords/A/Yr)		
RATING-Timber		
RATING-Wildlife		
REMARKS	Economic if hardwood pulp can be used. Value for wildlife retained through rotation.	Site too poor to produce economic wood crop. Manage for wildlife.

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