ANNOTATED SELECTED BIBLIOGRAPHY
of
SILVICULTURE IN SOUTHEAST ALASKA COASTAL TEMPERATE RAINFOREST

Note to user: This annotated bibliography provides a bridge between the title and the publication to determine interest in further examination of the abstract and publication

1)
Alaback, P.B. (1984). Plant succession following logging in the Sitka spruce ‑western hemlock forests of southeast Alaska: implications for management. USDA For. Serv. Gen. Tech. Rep. PNW-GTR-173. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Ore. doi:10.2737/PNW-GTR-173.

ANNONATION – This is an important paper as it Identifies Sitka black-tailed deer as an important ecological indicator for Southeast Alaska for four significant reasons:

1) Biology and ecology well known;
2) relatively large, seasonally migratory home ranges;
3) need for productive and nutritious food supply; and
4) important subsistence game species.

2)
Bannerman, Susan. Riparian Areas: Providing Landscape Habitat Diversity. Victoria, B.C: Ministry of Forests, Research Program, (1998).

ANNONATION – Riparian areas are less than 10% of the provincial land base but often considered the most dynamic. Natural disturbances and fluvial processes continually work together in these areas to create distinctive ecosystems that are crucial for biological habitat diversity and exert a great influence over animal and plant life.

3)
Barbour, R. James, Richard R. Zaborske, Michael H. McClellan, Linda Christian, Don Golnick (2004) Young-stand management options and their implications for wood quality and other values. Elsevier B.V.

ANNONATION – This study shows wood product recovery information for rotations of 70 years, 110, and 150 years by using forest vegetation simulator (SVS) predictions and expert judgements. Each rotation age had different combinations of treatments of PCT (age 20 yrs, 12’X12’ and 18’X18’ spacing), Commercial Thinning (CT 20’X20’) and passive management.

4)
Cole, Elizabeth C.; Hanely, Thomas A.; Newton, Michael. (2010). Influence of Precommercial Thinning on Understory Vegetation of Young-Growth Sitka Spruce Forests in Southeastern Alaska. Canadian Journal of Forestry Research. 40(4). 619-628

ANNONATION – This is a 12-year study of PCT of 16- 18-year-old, naturally regenerated stands or Sitka spruce and Western hemlock in SE Alaska. Its design is dramatic due to the proximity of each of the treatments to the control (no treatment) for easy visual comparison for lay and professional alike. Effects of PCT on understory of 16- 18 year-old, naturally regenerated stands or Sitka spruce and Western hemlock in SE Alaska were studied in seven replicate areas over seven growing seasons. Vegetation was analyzed at the class level.

- all vegetation analyses yielded significant difference between thinned and untinned treatments;
- no differences among thinning treatments;
- thinned stands had significantly greater understory cover when compared to unthinned controls;
- all thinned spacings led to similar understory.
- Understory nonconiferous cover increased during 2-4 years but began to decline with increasing conifer cover during next 3 years.
- Vegetative cover in unthinned understories declined and was significantly lower than beneath thinned stands.
- Summer food resource values for deer were increased by thinning.
- Winter food resources were increased for thinning for snow- free conditions but were unaffected for conditions when herb-layer forbs were buried by snow.

5)
Crotteau, Justin S.; Rue-Johns, Annelise Z.; Barnard, Jeffery C. (2019). Effects on Understory Biomass and Forage 8-10 Years After Precommercial Thinning of Sitka Spruce – Western Hemlock Stands in Southeast Alaska. Canadian Journal of Forestry Research. 50. 215-225

ANNONATION – This study helps to understand stand overstory and understory development following PCT at ages 15-25, 25-35, and 35-50 some 4-5 and 8-10 years following treatment. PCT biomass was at least twice that of untreated control stands through year 10. Deer forage responded similarly to biomass but thinned induced differences faded with winter snowfall, especially in older stands.

6)
Crotteau, J.S., McClellan, M.H., De Santo, T.L., Spores, S.R., and Barnard, J.C. (2020). Sharing the load to develop young-growth silviculture for forage and biodiversity in southeast Alaska. In Forest Management‑Research Partnerships: Proceedings of the 2019 National Silviculture Workshop, 21‑23 May 2019, Bemidji, Minn. USDA For. Serv. Gen. Tech. Rep. Edited by Pile et al. U.S. Department of Agriculture, Forest Service, Northern Research Station, Madison, Wis. GTR P-193

ANNONATION – Approximately 420,000 acres have been logged on the Tongass National Forest (TNF) resulting in a vast network of young, and even-aged Sitka spruce–western hemlock stands. The TNF began a hallmark of management-research, long-term collaboration project; Tongass-Wide Young Growth Studies (TWYGS). Authors at the National Silviculture Workshop presented forest development following three levels of precommercial thinning in 15- to 25-year-old stands from 5, 10, and 16 years. Key differences are reported in understory cover and forage biomass between thinned and unthinned treatments.

7)
D'Amore, Kiva L. Olken, Paul A. Herendeen, E. Ashley Steel and Paul E. Hennon (2015). Carbon accretion in unthinned and thinned young-growth forest stands of the Alaska perhumid coastal temperate rainforest. Carbon Balance Manage 10:25.

ANNONATION – Accounting for carbon gains and losses in young growth forests is a key part of carbon assessments. Thinning treatments reduce carbon stocks but carbon accretion rates recovered compared to untinned stands. Unthinned treatment is the optimal choice for short-term carbon sequestration but other ecological benefits of thinning override the loss of carbon due to treatment.

8)
Deal, R. L., & Farr, W. A. (1994). Composition and development of conifer regeneration in thinned and unthinned natural stands of western hemlock and Sitka spruce in southeast Alaska. Canadian journal of forest research, 24(5), 976-984.

ANNONATION – This report is a comparison of two age-classes of naturally regenerated stands 9 to 14 years after thinning of western hemlock and Sitka spruce. Young stands less than 30 years old before thinning had open forest canopies with understories of shrubs, herbs and forbs. Older stands 31 to 98 years old before thinning had closed canopies with little or no understory.

9)
Deal, R. L. (2001). The effects of partial cutting on forest plant communities of western hemlock Sitka spruce stands in southeast Alaska. Canadian Journal of Forest Research, 31(12), 2067-2079.

ANNONATION – This report examines partial cutting effects on plant species richness, community structure and understory plants important for deer forage. Species composition and abundance also appeared to be distinctly different between hemlock-dominated and spruce-dominated stands. Partial cutting did not significantly change abundance for most of the important forage species for deer. The similarity in plant community structure between partially cut and uncut old-growth stands may be related to forest stand structures. The heterogeneous stand structures that develop after partial cutting are more similar to old-growth stands than to the uniform young-growth stands that develop after stand replacing disturbances such as clear-cutting.

10)
Deal, R. L., Tappeiner, J. C., & Hennon, P. E. (2002). Developing silvicultural systems based on partial cutting in western hemlock–Sitka spruce stands of southeast Alaska. Forestry, 75(4), 425-431.

ANNONATION – The effects of partial cutting on species composition, stand structure and growth, tree size distribution, and tree disease and mortality were evaluated for 18 stands harvested 12 – 96 years ago. Partial cut stands had divers and highly complex stand structures similar to uncut stands. Silviculture systems using partial cutting could provide a sustain timber resource including more valuable spruce trees, while also maintaining stand structural diversity and old-growth characteristics.

11)
Deal, R. L., Barbour, R. J., Mcclellan, M. H., & Parry, D. L. (2003). Development of epicormic sprouts in Sitka spruce following thinning and pruning in south-east Alaska. Forestry, 76(4), 401-412.

ANNONATION – The frequency and size of epicormic sprouts in Sitka spruce were assessed in stands that were thinned and pruned. Results suggest that spruce responds to thinning and

pruning with epicormic branches and Sitka spruce may be a poor candidate for pruning if a goal is to produce clear, higher value wood.

12)

Deal, R. L., Hennon, P. E., Orlikowska, E. H., & D'Amore, D. V. (2004). Stand dynamics of mixed red alder conifer forests of southeast Alaska. Canadian Journal of Forest Research, 34(4), 969-980.

ANNONATION – This study determined that mixed red alder conifer stands provided more heterogeneous structures than pure conifer stands, even more even diameter distributions, multiple canopy layers, and similar numbers of large diameter conifers.

13)

Deal, R. L., Heithecker, T., & Zenner, E. K. (2009). Comparison of tree size structure and growth for partially harvested and even-aged hemlock-spruce stands in southeast Alaska. Journal of forest research, 15(1), 31-37.

ANNONATION – This study provides detailed information on tree size structure and stand growth as a result of partial cutting 53 to 96 years ago and compares with 50-year-old even-aged stands that developed after clearcutting. The net basal-area growth was greater in the partially cut plots than in the uncut plots, and basal-area growth generally increased with increasing cutting intensity. However, the basal-area growth of all of the partially harvested stands was significantly less than the growth of 50-year-old even-aged stands. Partial cutting maintained stand structures similar to uncut old-growth stands, and the cutting had no significant effect on tree species composition. The tree size distribution of the partially harvested stands was far more complex and well distributed in comparison with the 50-year-old even-aged stands.

14)

Deal, Robert L., Paul Hennon, Richard O'Hanlon and David D'Amore (2013). Lessons from native spruce forests in Alaska: managing Sitka spruce plantations worldwide to benefit biodiversity and ecosystem services. Forestry 87, 193-208.

ANNONATION – The authors suggest strategies for managing Sika spruce plantations to benefit biodiversity and enhance a variety of forest ecosystem services based on the synthesis of results from natural spruce forests in southeast Alaska. New silvicultural systems that use partial cutting in older spruce forests could alleviate some of the problems associated with conventional even-aged management and increase both stand structural diversity and biodiversity. Mixed red alder-conifer stands in Alaska provided more heterogeneous structures than the pure conifer stands that typically develop after clearcutting.

15)

Deal, Robert L., Ewa H Orlikowska, David V D'Amore and Paul Hennon (2017). Red Alder-Conifer Stands in Alaska: An Example of Mixed Species Management to Enhance Structural and Biological Complexity. Forests 2017, 8, 131.

ANNONATION – This study finds that well-planned silvicultural systems containing a mixture of broadleaf-conifer species have potential to enhance stand diversity and provide other ecosystem services earlier than typical even-aged conifer plantations. Mixed Sitka

spruce/western hemlock and red alder in young, managed stands in southeast Alaska are used to achieve these goals and identify potential for improving stand structural complexity, biodiversity and other ecosystem services over pure conifer forests. The opportunities and potential tradeoffs for managing mixed broadleaf-conifer stands for providing a number of natural resources are discussed.

16)
Doerr, J.G., and Sandburg, N.H. (1986). Effects of precommercial thinning on understory vegetation and deer habitat utilization on Big Level Island in southeast Alaska. For. Sci. 32(4): 1092‑1095.

ANNONATION –

This study reports on the effects of precommercial thinning on understory development and utilization by Sitka black-tailed deer on a small island 18 years after treatment. Precommercial thinning has been suggested as a method of prolonging or maintaining understory as young clearcuts develop into pole stands

17)
Hanley, Thomas A. (2005). Potential Management of Young-Growth Stands for Understory Vegetation and Wildlife Habitat in Southeastern Alaska. Landscape and Urban Planning. 72. 95-112

ANNONATION – This report compares results from recent studies to the classic Alaback 1982 model: understory vegetation is believed to increase dramatically but decreases to near zero levels as the canopy closes following treatment. Recent studies report three important deviations from this model:

- Red alder even aged stands produce understories comparable to old growth forests and greater than similar aged pure conifer stands;
- Commercial thinning of older, even-aged stands may result in greater biomass than previously thought but might take longer than thought;
- Extrapolation of data from small research plots greatly overestimates stand homogeneity and underestimate understory biomass of even-aged conifer stands

These new findings provide a basis for the design of new silviculture for specific understory objectives.

18)
Hanley, Thomas A., Robert L. Deal, & Ewa H Orlikwosak (2006). Relations between red alder composition and understory vegetation in young mixed forests of southeast Alaska. Canadian Journal of Forest Research, 2006, 36(3): 738-748.

ANNONATION – This study determined that Red alder offers prospects for increasing understory vegetation biomass and its food value for deer and other wildlife when include as a hardwood overstory species in mixed hardwood-conifer young growth forests.

19)
Hanley, Thomas A.; McClellan, Michael H.; Barnard, Jeffrey C.; Friberg, Mary A. (2013). Precommercial thinning: implications of early results from the Tongass-Wide Young-Growth Studies experiments for deer habitat in southeast Alaska. Res. Pap. PNW-RP-593. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 64 p.

ANNONATION – The Tongass-Wide Young-Growth Studies (TWYGS) is a land mark study because is expansive for such a wide range of the Tongass National Forest and Southeast Alaska, and covers a wide variety of precommercial thinning (PCT) conditions to understand the implications for deer habitat. Understory vegetation response to PCT analyzed with the Forage Resource Evaluation System for Habitat (FRESH)-Deer model that provides one quantitative metric that integrates the entire matrix of vegetation biomass and nutritional values into one number in order to compare treatments. The four experiments studied with nearly 20 block replications for each experiment are:

1) planting red alder 1 – 5-year-old stands:
2) PCT at narrow and wide spacings 15 – 20-year-old stands;
3) PCT at medium spacing with and without pruning in 25 – 35-year-old stands; and
4) PCT at wide spacing with and without slash treatment.

Except for Experiment 1 (planting red alder age 1-5), all treatments demonstrated greater benefits over untreated controls. Early treatment yielded greater benefits than later treatments. Early treatment yielded better food resources than old-growth forests do in summer and winter with low snow depths after 4 to 8 years posttreatment.

20)
Hard, John S. (1974). The forest ecosystem of southeast Alaska 2. Forest Insects. Pacific Northwest Forest and Range Experiment Station.

ANNONATION – The purpose of this report is to establish the context of insects historically in southeast Alaska and present information of the potential insect pests as the forest is converted to managed stands. Major species are identified and information presented and management alternatives.

21)
Harris, Arland S., and Wilbur A. Farr (1974). The forest ecosystem of southeast Alaska 7. Forest Ecology and Timber Management. Pacific Northwest Forest and Range Experiment Station.

ANNONATION – The purpose of this report is to describe Southeast Alaska's forest ecosystem and the development of southeast Alaska's timber industry.

22)
Lowell, E. C., Dykstra, D. P., & Monserud, R. A. (2012). Evaluating Effects of Thinning on Wood Quality in Southeast Alaska. Western Journal of Applied Forestry, 27(2), 72-83.

ANNONATION – This report found no significant differences in product recovery or value (quality) for structural lumber between thinned versus untreated for age classes 36 to 73 years for Western Hemlock and Sitka spruce. Treatments densities ranged from 10 X 10 to 20 X 20. It is also significant in that it did not address higher value appearance grade lumber.

23)
McClellan, M.H. (2008). Adaptive management of young stands on the Tongass National Forest. In Integrated Restoration of Forested Ecosystems to Achieve Multiresource Benefits: Proceedings of the

2007 National Silviculture Workshop. USDA For. Serv. Gen. Tech. Rep. PNW-GTR-733. Edited by R.L. Deal. USDA Forest Service Pacific Northwest Research Station, Portland, Ore. pp. 225‑232.

ANNONATION – This presentation explains the successes of the adaptive management strategy the hallmark of management-research, long-term collaboration project; Tongass-Wide Young Growth Studies (TWYGS).

24)
McClellan, M. H., Hennon, P. E., Heuer, P., Coffin, K.W. (2013). Condition and deterioration rate of precommercial thinning slash at False Island, Alaska. Res. Pap. PNW-RP-594. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 29 p.

ANNONATION – This study examines the strength and persistence of slash effects on forage availability and deer mortality within thinned areas. Various ages of wood density of slash are measured and a predictive model to estimate changes over time is presented.

25)
Meehan, W. R. (1974). The forest ecosystem of southeast Alaska 4. Wildlife Habitats. Pacific Northwest Forest and Range Experiment Station.

ANNONATION – The purpose of this report is to briefly summarize the know habitat requirements of southeast Alaska's major wildlife species and to point out some of the areas where further research is needed for effective management of wildlife populations and habitat.

26)
Newton, Mike; Cole, Liz. (2012). Sitka Spruce and Western Hemlock Stand and Tree Growth 10 Years after Precommercial Thinning in Southeast Alaska. Western Journal of Applied Forestry, 27(1), 5-11

ANNONATION – This is a 12-year study of PCT of 16- 18-year-old, naturally regenerated stands or Sitka spruce and Western hemlock in SE Alaska. Its design is dramatic due to the proximity of each of the treatments to the control (no treatment) for easy visual comparison for lay and professional alike. Ten years after treatment showed:

- Neither species responded in height growth to spacing
- Spruce diameter growth increased significantly all treatments
- Weak but increasing trend toward more rapid diameter growth at wider spacing
- Spruce basal area increased almost twice as fast compared to control
- Hemlock showed a trend for increased diameter but was less than spruce
- Shrub control did not improve growth in either species
- Branch diameter of spruce increased with spacing
- Pruning let to epicormic sprouting in the 3 years following pruning

27)
Petruncio, Markian Demetris (1994). Effects of Pruning on Growth of Western Hemlock (Tsuga heterophylla (RAF.) Sarg.) and Sitka Spruce (Picea sitchensis (Bong.) Carr.) in Southeast Alaska. Doctor of Philosophy Dissertation University of Washington 1994. Order Number 9509389.

ANNONATION – Growth responses of western hemlock and Sitka spruce to thinning and pruning were quantified Branch sizes and time-and-motion data were recorded and analyzed to determine the functional relationships between time required to prune and branch characteristics. Pruned height and stem diameter were significant variables for predicting time required to prune. Epicormic branching, sunscald, and tree mortality were monitored to determine how pruning to various heights affects stem quality and tree survival.

28)

USDA Forest Service. Region 10. (2014). Tongass Young Growth Management Strategy.

ANNONATION – This is a very significant and important study due to the hundreds of thousands of acres in the Tongass Region overall that are available for treatment and the resultant benefits thereof. The objective of this report is to describe the Tongass management strategy for the stands of young-growth created by timber harvest and initiate actions which will:

- Provide historical and current overview of the young growth resource on the Tongass.
- Provide managers with a set of tools for assessing young growth treatment opportunities that are consistent with the Tongass Land Management Plan, as well as with Regional and National Strategic goals.
- Provide information that helps highlight opportunities and areas of young-growth forest to begin the transition from old-growth timber harvest to one based primarily on young growth.
- Promote and further develop the adaptive management approach used in TWYGS to increase our young-growth management knowledge
- A source for past, present and future treatment information
- A monitoring/feedback strategy

29)

Zaborske, R. R., Hauver, R. N., McClellan, M. H., & Hanley, T. A. (2002). Understory vegetation development following commercial thinning in Southeast Alaska: preliminary results from the second-growth management area demonstration project. UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE GENERAL TECHNICAL REPORT PNW, 74-82.

ANNONATION – This study evaluates commercial thinning treatments potential to enhance the development of understory vegetation and the availability and quality of Sitka black-tailed deer forage. Results from this study show that thinning treatments can improve deer forage availability when compared to no thinning treatment and that individual tree selection thinning can provide summer habitat for deer similar to the values provided by old-growth forest.