Southern Southeast Area
Operational Forest Inventory
And
Annual Allowable Cut Analysis
For
State Forest
And
General Use Lands

July 17, 2020

State of Alaska
Department of Natural Resources
Division of Forestry

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I. Executive Summary

This report documents results from the 2019 field forest inventory of State land in Southern Southeast Alaska (SSE), which serves as an update to the previous operating forest inventory completed in 2016. The 2016 forest inventory acreage and timber volume data were derived by means of aerial photo interpretation and by the best estimates provided at the time by Division of Forestry (DOF) staff with extensive timber experience in the region. Due to project timing and budget constraints, it was not supported by field collected cruise plot data to estimate timber volumes. The Annual Allowable Cut (AAC) has been revised downward in this report from 442 acres per year to 332 acres per year and the annual timber volume available each year has been revised downward from 11,200 MBF to 9,147 MBF.

Based on the newly acquired site-specific, accurate and statistically reliable field data, the analysis generated by the 2019 forest inventory yielded a reduction in the acreage of the net commercial timber base. The analysis reflects revised timber stand boundaries and newly applied operational and economic operability considerations. The net timber base (acres currently available for forest management including timber harvest) in SSE is 33,216 acres, and the AAC is estimated to be 9,147 thousand board feet (MBF) or 9.147 million board feet (MMBF) per year.

The 2019 field forest inventory project encompassed 74,555 gross acres of State land located in SSE. Inventory data collection and analysis was confined to those State lands in SSE made available for forest management activities, including commercial timber harvest, either legislatively by statute, or administratively by provisions contained in existing regional land management plans. The DOF completed the inventory by collecting and analyzing field data from 1,247 cruise plots established in 125 individual timber stands distributed within 8 separate sampling strata. Forestry-related data layers including ownership and old and young growth timber type descriptions are contained in the State's GIS system. The information was then applied to timber stand volume and stand acreage calculations in the process of re-determining the AAC for SSE. Growth and yield modelling of the inventory data were also applied in the young growth timber stands to consider predicted tree volume characteristics to better understand the forest potential at a variety of rotation ages.

II. Introduction and Background

A. Purpose

Operational level forest inventory data was acquired in 2019 and provided the basis for mapping, quantifying and assessing area-wide forest and commercial timber resources and for establishing the AAC for SSE. Forest inventory data from 2019 and the analysis in 2020 provides the following forest management benefits:

1. **Updated Timber Type data layer (map) contained in the State's GIS for SSE**
   Data acquired and analyzed through the forest inventory project was entered into the State's GIS to create an updated timber type layer (map) of the commercial forest timber base in SSE containing individual timber stands. Updated timber type descriptors for each individual stand include stand species composition, stand density and per acre timber volume.

Using the GIS to analyze the relationships between the commercial timber resource and other forest resources (transportation network, fish and wildlife habitat, cultural resources, etc.) allows the DOF to undertake and complete complex forest planning documents such as the Five-Year Schedules of Timber Sales (FYSTS), and Forest Land Use Plans (FLUPs) used to guide both broad scale and site-specific forest management activities. The GIS also allows DOF to track changes to the commercial timber base resulting from management activities including timber harvest, stand regeneration/reforestation, and timber stand improvement projects such as precommercial tree thinning.

2. **Updated Annual Allowable Cut for SSE**
   The GIS timber type map for SSE, updated with the 2019 forest inventory data, formed the basis for area (acreage) and timber volume (board feet) figures necessary to calculate an updated AAC. The new GIS timber type map and associated data files along with newly available LiDAR data provided the raw data necessary to perform the growth and yield modelling to estimate timber volume and characteristics in the developing young growth stands over the course of the rotation.

B. Background

The original SSE forest inventory was produced on February 9, 2016 and titled *"The operational inventory of the Southern Southeast Area".* That inventory has been updated following the field inventory conducted in 2019 by DOF field crews. This current inventory has also been updated to reflect economic operability considerations, and changes in land status since some State lands formerly included in the commercial timber base have since been transferred to communities and other state agencies. Updates to the Fish and Game Anadromous Waters Catalog have also been taken into consideration.

With the help of the Prince of Wales Island Lidar dataset and available imagery, all stand type calls were reviewed and edited to reflect the ground truth data more accurately. Numerous old growth type calls were changed and resulted in a significant downgrading of the previous old growth types into a lower volume strata. The low volume strata, more than doubled in acreage from 2016. The remaining old growth strata generally reduced in acreage except the higher-volume strata which more than doubled in acreage although still represents a small overall percentage of area. Comparison of old growth total board foot volume was 513,900,000 board feet in the 2016 inventory versus 395,053,192 in the 2019 resulting in a 26 % reduction.

C. Lands Included in the Inventory

Land ownership and management designations within the inventory area are based on the State Land Records Information System. Land evaluated during the inventory and the analysis reflected the status at the time. Future changes in land ownership and status are typically incorporated in the GIS as they occur. Significant changes in land ownership are frequent but typically not statistically significant at the scale of the inventory; never the less periodic updates to the inventory are appropriate to keep information relevant.

The inventory covers all designated General Use (GU) lands and other identified lands within SSE on which forestry is an allowed use as described in State of Alaska area plans established per AS 38.04.005 and legislatively designated State Forest lands plans per AS 41.17.230. The State land base in SSE includes parcels located on the major islands of Mitkof, Kupreanof, Kuiu, Etolin, Wrangell, Prince of Wales, Revillagigedo, and the surrounding smaller islands south of Fredrick Sound. In addition, the land base includes parcels located on the mainland from Thomas Bay in the north, to Hyder in the south. This inventory does not include land owned by the University of Alaska (UA) or the Alaska Mental Health Land Trust (AMHLT).

The inventory focuses on lands that have administratively been made available for timber harvest, as identified and authorized in the Southeast State Forest Management Plan, Prince of Wales Island Area Plan and the Prince of Wales Island Area Plan Amendment (POWAP), and the Central/Southern Southeast Area Plan (CSSAP). The primary purpose of the Southeast State Forest Management Plan (SESFMP) is to provide for managed timber production and harvest; consequently, most of the lands contained within the Forest are included in the current inventory. Most of the units described in the POWAP and CSSAP (Area Plans) that are available for timber harvest are designated as "General Use" (GU). Within GU areas, specific sites are excluded or restricted from forest management activities. Some of the land management classifications in the area plans are designated other than GU, but forestry is an explicitly allowed use. Specific Area Plan restrictions pertaining to forest management as reflected in the inventory are summarized in Appendix 1. The land base inventoried does not generally include Settlement designated land.

III. Methods

The areas identified for potential commercial forest management were quantified based on aerial photo interpretation and analysis. Several different aerial photo project sets and orthographic images were used as referenced (Appendix 4). The United States Forest Service (USFS) GIS road layers and vegetation models were used as the organizational structure and initial basis of classification in the process of delineating the boundaries of the various timber types in the 2016 Inventory.

In 2019, the State 2016 vegetation layer and GIS Road layers were the basis from which 2019 field work was scoped and planned.

The 2016 Inventory vegetation data was transposed to the "strata" used on the 2018 inventory on USFS lands. The converted data set matches the strata used on young growth timber contained in the Challenge Cost Share Young Growth Inventory of USFS land on the Tongass National Forest conducted by the State between 2016 and 2018. This reflects the inventory team's outlook that the data could then be pooled for collective analysis in the future across both ownerships if so desired. The strata nomenclature used is further described in Sub-Section IV.A.2.a. of this report.

Subsequently the vegetation polygons were edited for photo alignment, updated to reflect various objective constraints such as land lines, mapped anadromous streams and roads. The polygons were assigned unique identification numbers; polygons representing strata greater than 10 acres were segregated and random number sets applied by strata. The random numbers were sequentially used within strata to select the stands to sample. A work plan based on the available funding was developed to sample in a nonbiased manner 15 stands of each stratum. The result was that most of the geographic areas were visited for sampling more than one stratum and received some level of type verification that was later used to update the vegetation layer. Alternate stands were also randomly selected in similar manner by geographic area to provide feasible alternatives in case the primary stands proved to be inaccessible or unrepresentative of the target strata.

Crews visited the targeted stands during the field season of 2019 with the goal of visiting 130 stands and sampling 1,300 plots. The crews collected data on 125 individual stands collecting 1,247 cruise plots.

In 2020, the data was edited, and the vegetation layer was retyped to reflect the ground truth information acquired. Further discussion of this process and strata statistics is described in the 2019 Sample Strata Results in Appendix 2.

Various GIS data layers were updated based on the field inventory data, and by analysis of new satellite imagery and new LiDAR data acquired for Prince of Wales Island (POW) and its adjacent offshore islands.

A relational geodatabase (GIS) was developed to store, manage, and analyze the information accumulated by the project. Separate GIS data layers were developed to record and organize information pertaining to GU lands, State Forest lands, timber types (stands), roads, streams, lakes, property lines, rock pits, eagle trees, state pre-commercial thinning and state timber sales (proposed, active and closed). All distances and acreages referred to in the report and the data were developed using the measurement tools associated with the ESRI GIS Arc Map 9.3.1 through 10.7.1 software.

A paper graphic representation of the entire data set was not developed as part of this report due to the extensive geographic distribution of the data. Due to the multitude of recorded variables, graphic maps of the features will be developed as needed for planning efforts and projects and can be inspected electronically as required in DOF corporate GIS layers. The electronic data associated with the vegetation layer is available and viewable online at: https://forestrymaps-soa-dnr.hub.arcgis.com/

IV. Results

A. Net commercial timber base

1. Gross acreage available for timber management

Provisions contained in the SESFMP and the Area Plans specify which State lands are included in the gross commercial timber base. Through these Area Plans, DNR accounts for a variety of uses for forest lands including, but not limited to settlement, timber harvest, recreation and fish and wildlife habitat. The Area Plans designate forest management activities (timber harvest) as an appropriate use of the forest resource on land classified as General Use (GU). The DOF has estimated that out of the total State land acreage in the SSE, the total General Use (GU) land type at present is approximately 26,381 acres and the SESF land base contains 47,355 acres. In addition to GU lands, 819 acres of Recreation and Settlement lands also allow timber harvest. The combination of these four land designations (74,555 acres) is the gross acreage of State land in SSE that is potentially appropriate and available for forest management purposes, including commercial timber harvest.

2. Net acreage available for timber management

a. Cover types

To derive the net acreage available for timber management from the gross acreage available, DOF classified all State land in the gross available area into land and vegetation cover types, including water, muskeg, non-productive land (scrub) and several timber types that have the capability of having commercial value; the net effect of this cover type classification was a reduction in the gross acreage actually available for timber management. The commercial timber types identified by the inventory, mapped in the GIS and described below define the extent of the net commercial timber acreage and are based on the potential of each timber stand to grow and/or produce logs with commercial characteristics. The following timber types have the potential to grow and/or produce marketable saw log timber, either presently or at some future time over the course of the management rotation (100 years):

Old Growth (G)
Old growth timber was defined as a stand of timber exhibiting characteristics of an over-mature, multi-aged stand generally without a history of broad scale human-caused disturbance, and where

trees would generally be capable of producing, at a minimum, logs meeting the requirements of a #3 saw log as defined by the Official Rules of the Northwest Log Scale Bureaus[1]. Within old growth stands, volume classes were assigned, and the level of stocking was estimated based on aerial photo interpretation. These old growth stand types were aggregated into five different strata (Stratum 1 through Stratum 5) based on volume classes reflecting per acre volume estimates.

Stratum 1 - < 10 MBF/acre
Stratum 2 – 10 – 20 MBF/acre
Stratum 3 – 20 – 30 MBF/acre
Stratum 4 – 30 – 40 MBF/acre
Stratum 5 - > 40 MBF/acre

Young Growth (YG)
Young growth timber was defined as a stand of timber exhibiting the characteristics of an even-aged stand, originating either from natural disturbance (windthrow) or human disturbance (timber harvest). The young growth stand types were aggregated into the following timber strata based on the average age of the trees in each stand:

Stratum 7
These are stands that are 55 years old and older. Timber in this stratum is predominantly second growth timber that has saw log size characteristics as defined by the Northwest Log Scale Bureaus.

Strata 6 & 8
These are stands that are 40 to 54 years old. Initially there was a pole timber stratum 6 but the inventory showed this stratum to be so similar to the older reforestation stratum 8 that the two strata were combined.

Stratum 9
This stratum includes all recently harvested stands less than 40 years old. This stratum was not sampled as part of the 2019 field inventory.

Acreage of the various timber strata is shown in Table 1 on page 14.

b. Acreage reductions for multiple use considerations (regulatory exclusions)

Forest and Area Plan provisions and existing regulations that preclude commercial timber harvest and require the retention of a timber to protect other resources and land uses, required that some areas within commercial timber types be deleted from the commercial timber base. Typical plan and regulatory exclusions include:

- 100-foot no harvest timber retention buffer along known anadromous and high-value resident fish water bodies,
- 300-foot coastal shoreline timber retention buffer on all areas,
- 330-foot timber retention buffer for cataloged eagle nesting trees, and
- Timber retention buffers for subdivisions and other specific sites detailed in the Area Plans.

[1] #3 Sawlog is defined as: a log suitable for the manufacture of Standard and Better lumber to an amount of not less than 33% of the gross scale. The logs shall have a gross diameter of 6 inches and gross length of 12 feet, minimum volume of 50 board feet net scale.

A significant number of the management subunits of the Area Plans require coastal shore side management areas (timber retention) of 300 feet or greater. In other areas it has been the DOF's experience that ADFG recognizes the 300-foot no- harvest buffer as important to the maintenance of important wildlife habitat and has generally requested that specific protection. Therefore, for this analysis, the DOF removed the first 300 feet of land from the marine shoreline from the commercial timber base in all areas. In the past twenty years DOF and ADFG have worked to maintain this average shore distance of 300 feet contingent on terrain characteristics, accessibility, timber quality, and relative habitat need. Experience also indicates that the majority of the bald eagle nest trees in SE Alaska are located inside this 300-foot distance from saltwater. Evaluating all the coastal area in this manner allocates land area under the Alaska Forest Resources and Practices Act per AS 41.17.060.

c. Commercial operability acreage reductions

The commercial operability of timber located in a specific area is based on a variety of factors that can change over time such as market size and location, demand for various species, harvest methods, timber species and quality, harvesting technology and harvest access. The annual allowable harvest level is based on lands that can sustainably produce timber products over the long term, and in perpetuity. While technology and markets can change, DOF has always attempted to provide timber products that can be economically harvested in an environmentally approved manner. For this reason, the DOF has removed the lowest volume stands contained in strata 1 which average a little over 5,000 board feet per acre.

i. Low site/low volume stand acreage reductions

These are generally poor site quality timber stands located on very wet sites that most often yield low volumes of relatively poor-quality timber. Historically these stands have shown very little positive economic operability or marketability. It is unlikely that these stands, if harvested, would ever produce a viable timber component to be used in long term forest management, not least due to difficulties achieving sufficient levels of natural regeneration within regulatory time-frames. Therefore, these stands are removed from the annual allowable harvest calculation. They remain in the timber base and are still available for incidental inclusion in harvest plans and timber sales but are not included in the calculation of how much timber can be sustainably harvested each year. Should markets for these low volume and small tree size stands ever improve such that they are considered significantly and sustainably operable, they may be included in future AAC calculations.

ii. "Stranded" stands acreage reductions

A separate layer was created in the geodatabase to account for otherwise commercial timber stands that are stranded due to streams, coastal buffers, property boundaries, or terrain features that preclude reasonable harvest opportunity. These are generally small pieces of larger stands that are too small (mostly less than a couple of acres) to be economic as stand-alone harvest areas. This layer is called "stranded" and is removed from the AAC acres. The total acreage of the stranded stands outside of the strata 1 stands and the isolated remote area stands identified below is 43 acres.

iii. Isolated remote areas acreage reductions

Isolated remote areas with no existing infrastructure such as roads and log transfer facilities (LTF) that contain a high percentage of low volume old growth stands (strata 1 & 2 stands) and/or are on difficult terrain are also being removed. These areas have all received field visits to determine potential for a timber sale. As with the low volume stratum 1 stands these areas remain in the timber base and should conditions change, will be considered for inclusion in future timber harvests and AAC calculations. The following remote areas are removed from the AAC calculation: (also see worksheet in Appendix 3)

- South Lindenberg- This area is classified GU with a management intent of multiple uses, including dispersed recreation, future settlement, community harvest, and the protection of habitat and wildlife. Timber harvest is an allowed use. There are no existing roads or LTF's either inside or near the tract. The nearest existing road is two miles north across Tongass National Forest land presently classified Old Growth Reserve. Low volume strata 1 & 2 are 93% of the stands in this area are with stratum 1 comprising 43% of the area. The higher volume stands are scattered across the area with the forested stands comprising only 32% of the total land cover types mapped in the tract. There is a subdivision along the shoreline adjacent to significant portions of the identified timbered strata.

- Dall Island – Located in Hook Arm of Sea Otter Harbor on the West side of Dall Island. The State land here is mostly State Forest and is split with 421 acres of timbered stands on the North side of the bay and 176 acres of timbered stands on the South side. Due to the geographic separation of the areas they were evaluated separately.

    - North Dall – This area is 52% stratum 1 and 66% strata 1 & 2 combined. The remaining 143 acres are stratum 3. The stratum 3 stands are located on the steeper terrain with slopes ranging from 50% to 75%. There are no existing roads or a LTF in the area. Access may be possible from Sealaska Corporation land to the east with more than a mile of difficult road construction to access the tract.

    - South Dall – This area is 21% stratum 1 and 56% strata 1 & 2 combined. There are 56 acres of stratum 3 and 14 acres of stratum 4 in this block. The south side has moderate slopes, no existing roads or LTF. Access may be possible across Sealaska Corporation land around the head of the bay across steep ground or potentially with five miles of difficult road construction from an existing logging road to the South.

- Ingraham Bay – This is all classified GU with a long-term management intent to support opportunities for community development or other settlement activities. This area is 8% stratum 1 and 61% strata 1 & 2 combined. There are 202 acres of strata 3, 4 & 5 combined. There are no existing roads or an established LTF in the area. The timbered stands are dispersed and make up 55% of the total area.

- Little Coal Bay – This is classified GU and the management intent states that the uplands adjacent to Little Coal Bay should be retained for water access and community center uses. This area is 59% stratum 1 and 93% strata 1 & 2 combined bisected by an anadromous stream. The remaining 31 acres are stratum 3. The stands are somewhat scattered across the area with the forest typed stands comprising 47% of the total types in the block of land.

- El Capitan Island – This island is classified Settlement Commercial and Recreation Commercial with a management intent for commercial and industrial developments and limited residential uses to support the island development activities. While timber harvest is an allowed use on the island the intent is not for forest management. The island is 6% stratum 1 and 54% strata 1 & 2 combined. There are 173 acres of strata 3 & 4 combined and 16 acres of a 1960 second growth stand.

- Kendrick Bay – This area is classified GU with a long-term goal for eventual development of a prospective community. The area is 42% stratum 1 and 79% strata 1 & 2 combined. There are 71 acres of strata 3 & 4 combined. There are no existing roads or developed LTF in the area or nearby.

- Bradfield Canal West – This area contains 617 acres of State Forest Land and 351 acres of GU land. The area is 36% stratum 1 and 99% strata 1 & 2 combined. The remaining nine acres are stratum 3. The Central Southeast Area Plan states that timber harvest is allowed with no-harvest within 500 feet of the shoreline and selective harvest within 500 to 1000 feet. Besides the marginal timber, the terrain is very rugged and there are no existing roads or a LTF.

- Kitkun Bay West - This area is classified GU with a management intent of remote recreation, eventual community development with some timber harvest. This area is 72% stratum 1 and 94% strata 1 and 2 combined. The remaining 20 acres are from a 1950 timber harvest.

d. Calculation of net timber base

The Net Timber Base (NTB) is determined by adjusting the gross acreage available to reflect the exclusion areas described above and categorizing the cover types. Both old growth and second growth stands are included in the NTB for this report. The result is a NTB totaling 33,216 acres.

B. Annual Allowable Cut Analysis:

1. Assumptions

a. Sustained yield

The DOF is required to manage state timber harvesting on a sustained yield basis. "Sustained Yield" means the "achievement and maintenance in perpetuity of an annual or regular periodic output of the various renewable resources of the State land consistent with multiple use" (AS 38.04.910). The Division defines "regular periodic output" as the yearly average output over a ten-year period. This is done to allow for market fluctuations and to provide flexibility around operational and economic considerations.

b. Cutting method

In developing the AAC, the DOF assumed that most of the timber harvested in the region will be by the clear-cut method. Most of the area designated for partial cut management in the Area Plans has been transferred to municipal ownership. Where partial-cutting is required by default due to restrictions imposed by the Area Plans, it was assumed that the residual timber would eventually be harvested at some point during the rotation period.

c. Area regulation

The allowable cut calculation method that best utilizes existing information is the area regulation method. The area regulation method involves determining the net-forested acres available for harvest and dividing that number by the rotation period.

d. Rotation period

i. Young Growth simulation discussion

The DOF inventory forester completed a separate analysis of the AAC based on the 2019 field inventory. This report titled *"Annual Allowable Cut Analysis 2020 Southern Southeast State Forest and General Use Lands"* dated April 30, 2020 is attached as Appendix 2. The inventory forester's

report used the Forest Vegetation Simulator (FVS)[2] program which is a forest growth simulation model that simulates vegetation change in response to natural succession, disturbances, and management. The program grows out stands to predict volumes at different ages based primarily on growing site productivity classes. Total acres were used in these simulations (including strata 1) and the remote areas that have been called non-operable in this AAC.

The report completed four different simulations with resulting annual cuts based on growing the young stands for different periods of time and with different volume per acre goals. The FVS simulator grows the stand in 5-year intervals until a volume per acre goal is met or exceeded.

- Simulation 1: This simulation projects the young growth strata to most closely match the assumed volume estimates contained in the 2016 inventory report i.e. 35 MBF/acre for pole and repro and 40 MBF/acre for mature young growth. This would occur at about 80 years old.

- Simulation 2: This simulation projects the young growth strata to most closely match the log characteristics and volume used in the Forest Service's transition to young growth harvesting in the Tongass National Forest. This simulation grows the stand to a volume threshold of 25 MBF/acre and an average total tree height of 90 feet. This would occur at about 65 years old.

- Simulation 3: This simulation projects the young growth strata to the year of culmination of mean annual increment (CMAI). This occurred at about 115 years. This was then reduced to 100 years to match the 100-year management rotation.

- Simulation 4: This simulation projects the young growth strata to most closely match a volume estimate of 30 MBF/acre which the DOF has observed to generally exhibit log size classes needed to successfully market young growth timber sales in SSE to date.

Simulation 1 produces volume results as expected comparable to the 2016 inventory calculation which was a product of observed stands currently marketable. Simulation 2 will provide young growth volume in the shortest amount of time starting in 6 years but will provide 19% less overall volume than in Simulation 1. Simulation 3 will provide the most overall volume but will not provide any significant young growth volume for 51 years. Simulation 4 would first provide young growth timber volume in 11 years.

A hybrid of Simulations 1 and 4 providing for the young growth strata 7 and strata 8 to be harvested when they reach a volume of 35 MBF/acre is a preferred management paradigm with the more recent harvest units < 40 years old (strata9) being grown to 30 MBF/acre. It was observed that the older stands (strata 7 and 8) were harvested first and were thus likely to be relatively more productive sites than those that were cut later in the same area. The more recent harvest units were not sampled in the 2019 inventory but are on average discerned to be less productive and on average lower quality sites than the older stands. For this reason, these areas would be better represented and grown to the lower volume of 30 MBF/acre.

While the FVS simulation shows that the young growth stands may very well meet these threshold volumes in about 80 years, the DOF staff reviewing the data discerned that keeping the rotation age at 100 years for this AAC calculation was prudent due to the limited information on site variability especially in the younger strata and the uncertainty of the markets for young growth. Based on the demographics of the strata it is anticipated that mostly old growth will be harvested for the next 16 years before starting in on the young growth stands.

[2] Forest Vegetation Simulator (FVS) available for download at: https://www.fs.fed.us/fvs/

The simulations are based on averages; some stands may be ready sooner than the predicted 16 years and some stands will not be ready until later. However, all stands should meet the threshold volumes at an age of 100 years. While the annual allowable harvest rotation is set at 100 years, markets may lead to managing the young growth at a younger age. This will in time likely shorten the rotation age and, in some scenarios, increase the AAC.

ii. Rotation period used

The rotation period is the average time it takes to grow a commercial stand of trees. A 100-year rotation has been the established standard for Southeast and is used by the DOF in this calculation. This rotation age could be, and will be, adjusted in the future when more specific and scientific information on managed young-growth stands is available. Initial studies indicate that a rotation age as low as 70 years to 80 years may be feasible on managed young growth in Southern Southeast Alaska.

2. Annual allowable cut area calculation

When the total NTB acreage (33,216 acres) is divided by the 100-year rotation period, an annual allowable cut of 332 acres is derived. The annual allowable cut is as follows in Table 1.

a. Average volume per acre

The calculated average is 27.5 MBF/acre.

b. Calculated annual allowable cut volume

Dividing the total estimated NTB volume by 100 yields an allowable cut of 9,147 MBF per year, or a total of 91,468 MBF over a 10-year period.

3. Age class distribution

Based on all four FVS simulations if harvesting switches to "only" young growth when first meeting the volume threshold then a gap in supply of young growth volume will likely later occur. The 55 + (stratum 7) will run out before the 40 – 55 (stratum 8) is ready based on the simulations. The longer management waits before starting in on the young growth, the less this gap will be. It is likely that the switch to young growth stands will be phased and some old growth stands will be continued to be harvested for a time.

V. Updates

This inventory should be updated as significant changes are made to the land base or as markets or technology change to make the low volume and/or remote stands economically operable. The inventory should also be updated when harvesting of young growth begins in earnest.

Table 1: Timber type summary - Annual allowable cut

Table 1. Timber type summary – Annual allowable cut

Volumes are in thousand board feet (MBF).

Timber Type Strata	Acres	% by Acres	BF/ac	Total estimated MBF by timber type	% of Total Volume
2	8,028	24%	14,165	113,717	12%
3	5,075	15%	25,508	129,453	14%
4	1,035	3%	31,712	32,822	4%
5	421	1%	47,736	20,097	2%
6&8	7,259	14%	35,000	254,065	28%
7	4,518	22%	35,000	158,130	17%
9	6,880	21%	30,000	206,400	23%
Total for Net Timber Base	33,216	100%	27,537	914,683	100%
Annual Allowable Cut	**332 acres**			**9,147 MBF**	

KEY

Old growth volume classes:
- 1 <10 MBF/ac
- 2 10-20 MBF/ac
- 3 20-30 MBF/ac
- 4 30-40 MBF/ac
- 5 >40 MBF/ac

Young growth classes:
- 6&8 Young Growth 40-54
- 7 Young Growth 55+
- 9 Young Growth <40

Appendix 1: Site-specific considerations by subunit

Key to land use designations: The Central/Southern Southeast Area Plan (CSSAP) and the Prince of Wales Island Area Plan (POWIAP) use the following abbreviations to denote land use designations in the plans.

GU or Gu	General Use (CSSAP and POWIAP)
Ha	Habitat (CSSAP) or Crucial Habitat/Intensive Harvest (POWIAP)
Hv	Harvest (CSSAP)
P	Public facilities (POWIAP)
Pr	Public facilities-retain (CSSAP)
Pt	Public facilities-transfer (CSSAP)
R	Recreation (POWIAP)
Rd	Recreation and tourism – Public use site (developed) (CSSAP)
RU or Ru	Public recreation (undeveloped) (CSSAP and POWIAP)
S	Settlement (CSSAP and POWIAP)
W	Water resources and uses (CSSAP) or Water Resources (POWIAP)

All units

- Settlement/ subdivision areas were removed. A 100-foot buffer is retained around the perimeter of each State subdivision.
- All anadromous streams were given a 100-foot retention area on either side of the stream per AS 41.17118(a) (1). Streams of significant length and size (over 1 mile long) with multi-species runs or streams specifically identified in the plan were given a retention area of 300 feet on either side. The retention area reflects the intent of AS 41.17.060, AS 41.17.118(a) (1) and past experience working with timber in these areas.

Central/Southern Southeast Area Plan

P-01 Thomas Bay (Mainland)
- Deleted area on the west side of the Patterson River (subdivision).
- Deleted the Patterson River delta area for wildlife habitat potential.
- Coastal retention area of 300 feet was removed along with 300 feet retention adjacent to Patterson River.

Mitkof Island

P-14 Falls Creek
- Provided for 500-foot retention on Falls Creek 106-44-10060.
- Provided for 300-foot retention on anadromous stream 106-44-10060-2005.

P-25 South Mitkof
- Excluded area between Mitkof Highway and coast.
- Provided for 100-foot retention on Mitkof Highway.
- Provided for 300-foot retention on anadromous stream 108-40-10450.

P-27 Woodpecker Cove
- Provided for 300-foot retention on anadromous stream 108-40-10430.

- Provided for 100-foot retention adjacent to unnamed anadromous streams.

P-28 Fredrick Point
- Provided 300 feet retention on both sides of Pan Creek.
- Provided a 100-foot retention either side of the Waterline Road north of Cabin Creek.
- Provided a 500-foot coastal retention.
- Provided 100 foot retention on subdivision.

P-30 South Lindenberg
- Provided for 300-foot coastal retention.
- Removed subdivision.

Areas removed from inventory:

P-02	View shed.
P-03	GU, Plan specifically prohibits timber harvest.
P-04	Airport.
P-05/6/7/8/9/10	RU.
P-29	RU.
P-13	Alaska Mental Health Land Trust Selection.
P-15	Ru.
P-16	Pt.
P-19/20/21	RU, Ha.
P-22	Crystal Lake Hydro.
P-24	Ru/Ha.
P-31	S/Ru.

Wrangell Area

W-1 Crittenden Creek
- 1,000-foot retentions each side of Crittenden Creek estuary and tidelands at the mouth of creek.

W-08 Eastern Passage
- Retention around State subdivisions by 100 feet.

W-19, 20, 21, 22 Bradfield Canal Areas
- Known anadromous streams were given retention per FRPA.
- Provided a coastal retention of 500 feet on all subunits.
- Power line and powerhouse facilities were deducted.
- Lake Tyee watershed deducted.

Areas removed from inventory:
- W-03 Airport.
- W-06 Ru
- W-07 Mill Cr. Ru, Pr, Gu not practical for timber management due to other uses
- W-13 Ha/S/Gu.
- W-14 Ha/S/Gu.
- W-15/16 Gu/Ru Olive Cove dropped due to small size and isolation combined with subdivision on front half.

- W-17 H/Pr/Hv.
- W-28 Ru.

Ketchikan Area

K-09 Moser Bay
- Provided a 300-foot retention area on Stream 101-90-10600 (Wolf Creek).
- 300-foot coastal retention.

K-17 West George Inlet
- 300-foot coastal retention.
- Provided a 300-foot retention area on Stream 101-45-10450.

Areas removed from inventory:
C-01 Sunny Cove. Gu. Area plan restricts all development.
C-02 Square Island. Gu. Area plan restricts all development.
C-03 Spacious Bay. Gu. Area plan restricts all development.
C-04 Ru/Pr
K-03 Ru/Pr West Side Traitors Cove.
K-07/8 Ru/Pr
K-11 Bat Point. Drop areas not in State Forest due to S and Ru.
K-13 Ru/Pr
K-16 Ru/Pr Lake Harriet Hunt.
K-18 Rd
K-21 Gu AMHLT Replacement Pool.
K-26 Ru
K-27 S/Ru/H
K-28 Airport
K-29 Ru K-50 Ha/Hv
K-37 W/Ru
K-39 Ru/Gu Area plan restricts.
K-43 Mountain Point. Gu/W. The DNR Div. of Mining, Land, and Water (DMLW) wants it for S.
K-45 Ru/Pr
K-46 Ru
K-47 Ru. Dall Head Marine Park
K-56 Settlers Cove Park
M-01/2 Duke Island. Gu. Area plan restricts development.

Prince of Wales Island Area Plan

Subunit 1 Salmon Bay
- Ru land removed from consideration.

Subunit 2 Point Baker/Port Protection
- Port Protection All Ru, removed from consideration.
- Hole in the Wall Lake All Ru, removed from consideration.

Subunit 3 Shakan -- No state upland ownership.
Subunit 4a El Capitan

- Deleted R areas.
- Visual buffer required in plan for the lake; used 300 feet based on it being anadromous habitat.
- Provided a 300 feet retention area on both sides of anadromous stream 106-30-10800.

Subunit 4b El Cap Island – South
- Island zoned for Settlement and Forestry. DMLW requested retention area on southern lagoon and the northern area due to existing lodge. Initial analysis put a retention of 500 feet on the lagoon and portion of the southern part of the island dropped. Northern area utilized a 300-foot shore retention. The parcel was later dropped in its entirety due to compatible use issues and operability.

Subunit 5a Whale Pass
- Deleted existing subdivision and P/Ha and Ru areas.

Subunit 6a Coffman Cove
- Deleted subdivision and S/R and Ha areas.
- Provided a streams 106-30-10120 and 106-30-10160 300-foot retention both sides.

Subunit 7a Sea Otter Sound -No state upland ownership.

Subunit 7b Tuxekan Island – no site-specific applicable restrictions.

Subunit 7c Naukati
- Deleted settlement areas and P/Ha and Ru.
- Provided a 300-foot retention on both sides of Yatuk, Guchi and Naukati Creeks.

Subunit 9 Coronation -- No state upland ownership.

Subunit 10a Heceta Island
- Removed Ru and S.

Subunit 10b Shaheen
- All State land Ru; removed from consideration.

Subunit 11a Control Lake
- Dropped S area near Control Lake.
- 100-foot no-cut retention area on the State highways.
- 300-foot retention on Control Lake.
- The property lines in this subunit do not follow the protracted Public Land Survey lines due to an error in survey instructions in the original conveyance to the State. The lines platted and surveyed on the ground are approximately off 400 feet to the east from the protracted location. The survey line on the ground is the property line of record.

Subunit 11b Karta Bay -- No State uplands.

Subunit 11c Thorne Bay
- S and R areas removed.

Subunit 12a and b Kasaan/Hollis
- Removed S/W/Ha and R.
- Provided a 300 foot retention on both sides on Harris and Indian Creek.

Subunit 12c Kasaan Bay
- Coal Bay
- Provided a retention area of 300 feet on both sides on anadromous streams 102-60-10640 and 102-60-10620.
- All R land removed.

Subunit 12d, e and f Lower Twelvemile Arm, Polk Inlet, Skowl Arm -- No state upland ownership; area removed from consideration.

Subunit 13a West Cholmondeley -- No state upland ownership; removed from consideration.

Subunit 13b East Cholmondeley (Kitkun Bay)
- Provided for 100-foot retention on each side of anadromous streams.

Subunit 14a Dickman Bay -- No state upland ownership.

Subunit 14b Moria Sound
- Nowiskay Cove
  Provided a retention area of 300 feet on each side of stream 102-30-10900.
- Menefee
  All land R/H removed from further consideration.

Subunit 14c Ingraham Bay
- Removed 400 feet in selected areas for future settlement.
- Provided a retention area of 300 feet on each side of streams 102-20-10210 and 10220-10170.

Subunit 15a Kendrick Bay
- Removed 400 feet in selected areas for future settlement.
- Provided a retention area of 300 feet on each side of stream 102-10-10050.

Subunit 15b Cape Chacon -- No state upland ownership.

D-01 Port Delores (Suemez Island)
- Provided for 100-foot retention on anadromous streams.

Southern Southeast State Forest Management Plan

The following protections were derived from the CSSEAP, POWIAP and SESFMP scoping and used in the calculation of this AAC based on AS 41.17.060.

Rowan Bay Unit
- Provided 300-foot coastal retention.
- Provided for 300-foot retention for stream 109-52-10040.

Frederick Point Unit
- Pan Creek is to be retained 300 feet on both sides.
- Provide a 300-foot coastal retention.

South Mitkof Unit
- Excluded area between Mitkof Highway and coast.
- Provided for 300-foot retention on anadromous stream on 108-40-10600.
- Coastal retention of 300 feet in un-roaded area.

Earl West Cove Unit
- Provided for 300-foot retention on Earl West Creek (107-40-10780).

Pat Creek Unit
- Provided for 300-foot retention on Pat Creek (108-10-10050).

Crittenden Creek Unit
- 300-foot retentions each side of Crittenden Creek.
- 300-foot coastal retention applied (most of the shoreline is in a municipal conveyance).
- 100- foot retention adjacent to municipal conveyance.

Neets Bay Unit
- 300-foot coastal retention.
- Provided for 100-foot retention adjacent to lakes.
- Provided for 300-foot retention on Neets Creek.
- Hatchery area excluded.

Leask Cove Unit
- 300-foot coastal retention.
- Provided for 100-foot retention adjacent to subdivisions.

Vallenar Unit
- Vallenar Creek retention area 300 feet.

Bostwick Unit
- 300-foot retention/management provided on Bostwick Creek and Lake.

Thorne Bay North
- City of Thorne Bay code prohibits timber harvest in the Water Lake "watershed" (physical location defined in code) to protect the drinking water source. The watershed was deducted.

Coffman Cove Unit

- Provided a 300-foot retention on both sides of streams 106-30-10120 and 106-30-10160.

Naukati Unit

- Provided a 300-foot retention on both sides of Yatuk, Guchi and Naukati Creeks.

El Capitan South Unit

- Coastal retention of 300 feet retained.

Appendix 2: Young Growth Rotation Age and Annual Allowable Cut Analysis

By: Doug Hanson - Division of Forestry Inventory Forester

Annual Allowable Cut Analysis
Southern Southeast State Forest and General Use Lands
April 30, 2020

Background

Calculations for the AAC use data collected in summer 2019 during the inventory of the Southern Southeast State Forest and General Use Lands. Several remaining items to be conducted to improve the annual allowable cut determination are 1) update the general use land base to reflect sale of some state land into private hands, 2) verify areas of in-operability, 3) review isolated stands cut off by buffer formation and determine if some should be placed into a "stranded" timber class, 4) stratify young growth by more than one type to represent the mix of site class potentials, 5) consider applying a different rotation age to the different volume types or site classes, 6) consider whether the weighted average and area regulation methodology properly regulates the harvest for a sustainable yield and 7) evaluate stand ages to determine how parameters of the young growth stands might be appropriately represented relative to the goal of producing an AAC. This report investigates items 4-7 and provides four scenarios for consideration by projecting the second growth strata forward in the Forest Vegetation Simulator.

The AAC most recently was calculated in 2016 and results reported in the *"Southern Southeast Area Operational Forest Inventory for State Forest and General Use Lands February 9, 2016"*. A detailed analysis of the AAC was produced in this report utilizing volume per acre figures estimated based on aerial photo analysis. The mature second growth stands were based on information on like stands in the area while the pole timber and reproduction timber types were assigned a volume at time of harvest that was assumed to be less than the existing observed mature second growth. Table 1 displays the AAC as calculated in the 2016 report.

Table 1. Timber type summary -- State Forest and General Use land combined

Volumes are in thousand board feet (MBF). Rotation age is 100 years.

Timber Type	Acres	% by Acres	Approx. average MBF/ac	Total estimated MBF by timber type	% of Total Volume
0	3,797	9%	5	19,000	2%
1	11,815	27%	15	177,200	16%
2	9,980	23%	25	249500	22%
3	1,698	4%	35	59,400	5%
4	219	0%	40	8,800	1%
P	4,219	10%	35	147,700	15%
R	8,715	20%	35	305,000	27%
S	3,753	8%	40	150,100	13%
Total for Net Timber Base	44,196	100%	25	1,116,700	100%

Annual Allowable Cut	**442 acres**			**11,200 MBF**	

KEY

Old growth volume classes:

0 <10 MBF/ac P Pole timber (<6")
1 10-20 MBF/ac R Reproduction
2 20-30 MBF/ac
4 >40 MBF/ac

Young growth classes:

P Pole timber
R Reproduction
S Mature second growth

Note: The estimated volume by timber type and annual allowable cut are rounded to the nearest hundred thousand board feet.

2019 Sample Strata Results

The 2019 inventory sampled 125 individual timber stands across 8 different sampled strata. The reproduction type was split into two strata one 40-54 years of age and another less than 40 years. Only the 40 to 54-year strata was sampled. After the field work was completed, the timber type map was edited to incorporate the new ground truth information. All sampled stand type calls were changed to the actual ground truth volume class as determined in the stand's SuperACE volume report. With the help of the Prince of Wales Island Lidar dataset and available imagery, all stand type calls were reviewed and edited to more accurately reflect the ground truth data. Numerous old growth type calls were changed and resulted in a significant downgrading of old growth types into the low volume strata. A limited amount of changes into the non-commercial type were made. Most of the editing of the second growth types involved repositioning of type lines. Most of the type calls were not changed. The newly edited sample stands were then re-compiled in their appropriate strata in SuperACE to produce the final volume per acre values. Sample error statistics improved as a result except for stratum 1. Even with increased plots placed into stratum 1 as a result of the re-stratification, the sample error increased which indicates a relatively high variability in stocking and species composition within the type.
These per acre values were then multiplied by the newly calculated strata acreage to calculate total board feet by timber type.
Stand age was determined by tree coring and average ages were applied to each stratum with the old growth strata defaulting to the stand aerial photo type age estimate of year 1600 (400 years). The less than 40-year-old repro stratum had an estimated stand age applied of 20 years, roughly half of the repro (40-54) stand age. Age class distribution between pole timber and repro (40-54) was only 3 years but the volume difference was significant. Out in the field it appeared that the pole timber stands were more consistent and possibly had more PCT then the repro (40-54). The repro (40-54) was also more variable ranging from mostly sub merch to merchantable trees. The sample error % also indicates this variability. Some of this variability between stands could be reduced by more refined timber typing but variability inherent within stands may still be present.

2019 Southeast State Forest Inventory Results

Strata	Type	Description	Acres	% by Acres	Net BF/Ac	Total BF	% of Total	Current BH Age	Sample Error %
1	0	Saw <10MBF/ac	8,475	19%	5,147	43,620,825	8%	OG	17.2%
2	1	Saw 10-20MBF/ac	9,596	22%	14,165	135,927,340	24%	OG	8.6%
3	2	Saw 20-30MBF/ac	5,528	13%	25,508	141,008,224	25%	OG	8.2%
4	3	Saw 30-40MBF/ac	1,197	3%	31,712	37,959,264	7%	OG	12.6%
5	4	Saw >40MBF/ac	506	1%	47,736	24,154,416	4%	OG	12.4%
6	P	Pole timber	4,010	10%	12,428	49,836,280	9%	40	12.0%
7	S	Mature 2nd Growth	4,521	9%	23,972	108,377,412	19%	51	12.5%
8	R	Repro (40-54)	3,285	7%	8,811	28,944,135	5%	37	18.2%
9	R	Repro (<40)	6,880	16%	-		0%	20 (Est)	--
			43,998	100%	12,951	569,827,896	100%		

Comparison between 2016 and 2019 Results

Grand total acre differences include the revised type call changes and adjustments of the type map in the Leask Cove/George Inlet area. In the original GIS coverage (20160718_sse_dof.mdb) the types were shifted off the state forest/general use boundary and had to be repositioned with some retyping. A significant difference between the two inventory results is in the individual old growth type acres. As was mentioned above, strata 1, the low volume strata, more than doubled in acreage as a result of the retyping effort and now comprises 19% of the net timber base area. The remaining old growth strata generally reduced in acreage except the high-volume stratum which more than doubled in acreage although still represents a small overall percentage of area. Overall, the non old growth strata increased from 16,687 acres to 18,696 acres an increase of about 12%. Comparison of old growth total board foot volume was 513,900,000 board feet in the old inventory versus 395,053,192 resulting in a 26 % reduction. AAC results for old growth are straight forward based on the SuperACE results. FVS projections below simulate four possible scenarios of the second growth (strata 6, 7, 8) and their effect on the AAC.

The FVS Program

The Forest Vegetation Simulator (FVS) is a forest growth simulation model that simulates vegetation change in response to natural succession, disturbances and management. The simulator uses appropriate variants depending on the forest area location. Southeast Alaska timber is modeled under the Southeast Alaska and Coastal British Columbia variant (Keyser 2008). The FVS interface has been updated as of January 2020 and now runs out of a browser window utilizing tree list files stored in an Access database. FVS is free software and can be downloaded from the Forest Service's website. In creating the Access tree list files, queries were designed to import and filter the SuperACE exported Excel tree list files. Filtering only included live trees. Due to export issues from SuperACE, the seedling/sapling component was not included in the simulation. Test simulations with and without seedlings however did not significantly change future volume estimates. To better reflect second growth volume estimates, the remnant trees were filtered out of the tree list as these trees were not expected to be utilized in a subsequent harvest and would possibly overestimate volume available. The sub-merchantable trees (5-8.9" dbh) were however included. These trees especially in the Repro strata (strata 8) were a significant portion of the measured trees. The FVS Access tree list data items include plot ID, tree

species, diameter, height and 10-year diameter growth. The FVS Access stand list data items include stand ID, variant ID, age, BAF, fixed plot diameter, breakpoint diameter, number of plots and Sitka spruce site index. Site index calculations use Forest Service height growth curves for southeast Alaska (Farr 1984). Year 0 volume estimates in FVS are different than SuperACE because of a difference in the volume equations being applied to the data. Volume estimates have been adjusted to align with SuperACE figures and then prorated beyond in the 5-year growth increments.

FVS Simulation 1.

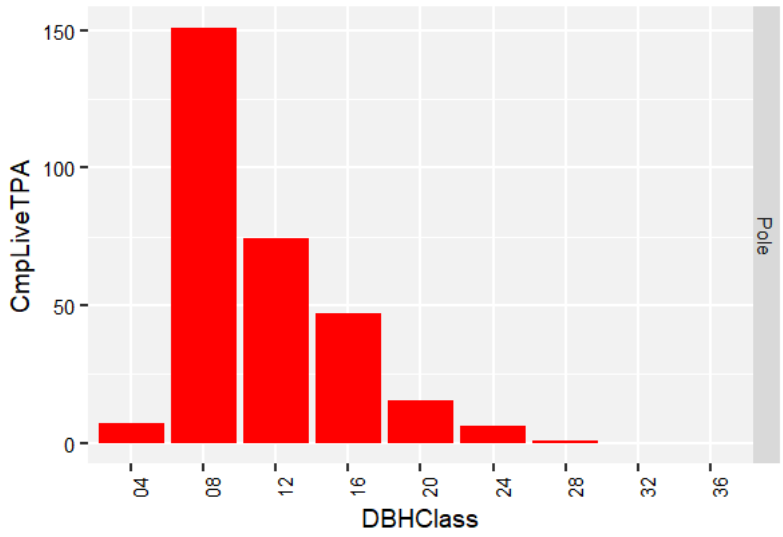
This simulation projects the second growth strata forward in 5-year intervals to most closely match the volume estimates contained in the original inventory report i.e. 35 MBF/ac for pole and repro and 40 MBF/ac for mature second growth. For the young growth strata 9, strata 8 projections are used with the appropriate additional age (20 Years) added.

Simulation 1 Summary

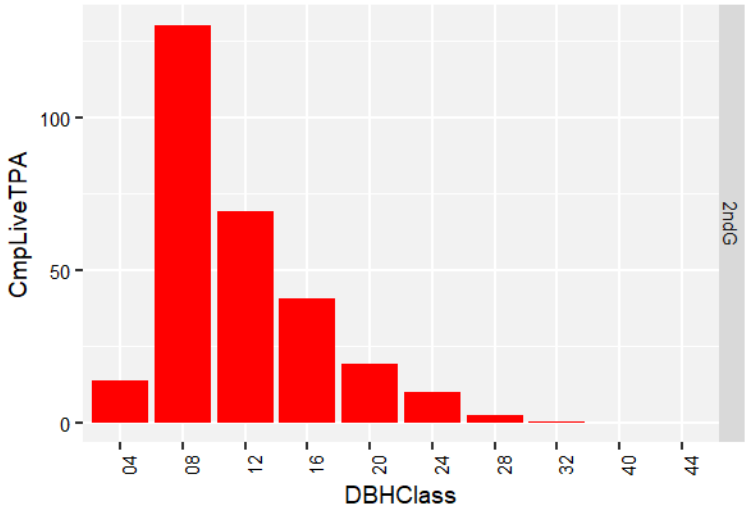
Strata Description	Acres	BH Age	2019	Future Net BF	Future Height	Future Age	Future Years	Future Date
Pole timber	4,010	40	12,428	34,341	117	71	31	2050
Mature 2nd Growth	4,521	51	23,972	39,882	122	72	21	2040
Repro (40-54)	3,285	37	8,811	36,169	121	83	46	2065
Repro (<40)	6,880	20 (est.)	--	36,169	121	81	61	2080

Simulation 1 Stand Tables

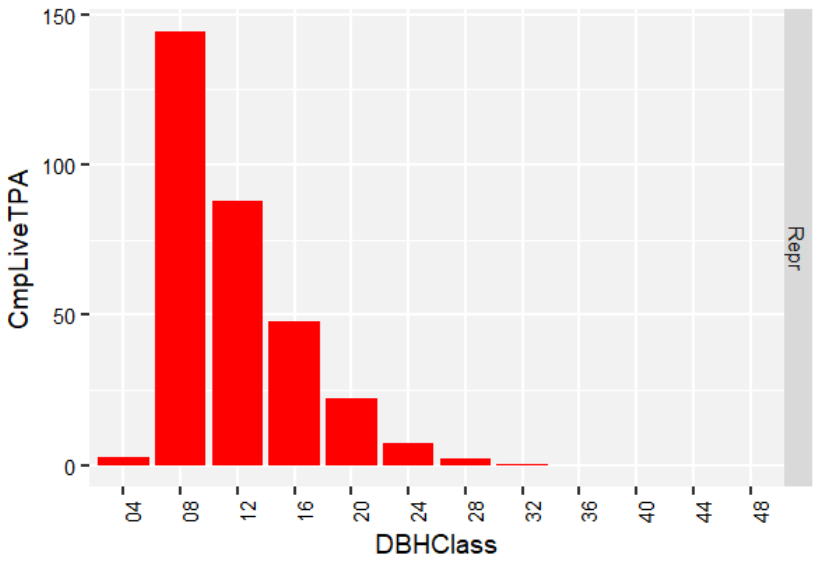
Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Pole	2050	All	04	7.21	1.3	0
Pole	2050	All	08	150.96	49.8	1,158
Pole	2050	All	12	74.36	59.15	7,919
Pole	2050	All	16	47.31	64.36	11,727
Pole	2050	All	20	15.64	33.12	7,666
Pole	2050	All	24	5.93	17.69	4,664
Pole	2050	All	28	0.92	3.74	1,126
Pole	2050	All	32	0.04	0.2	68
Pole	2050	All	36	0.01	0.03	12
			TOTALS	302	229	34,341



Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
2ndG	2040	All	04	13.58	2.47	0
2ndG	2040	All	08	130.33	41.47	886
2ndG	2040	All	12	69.1	55.19	7,523
2ndG	2040	All	16	40.56	55.64	10,143
2ndG	2040	All	20	19.38	41.5	9,600
2ndG	2040	All	24	9.93	30.4	8,014
2ndG	2040	All	28	2.33	9.63	2,791
2ndG	2040	All	32	0.45	2.45	727
2ndG	2040	All	40	0.02	0.19	56
2ndG	2040	All	44	0.04	0.47	142
			TOTALS	286	239	39,882



Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Repro (40-54)	2065	All	04	2.47	0.38	0
Repro (40-54)	2065	All	08	144.31	53.76	1,393
Repro (40-54)	2065	All	12	87.69	66.65	7,526
Repro (40-54)	2065	All	16	47.57	64.68	10,086
Repro (40-54)	2065	All	20	22.41	47.71	9,491
Repro (40-54)	2065	All	24	7.46	22.59	5,213
Repro (40-54)	2065	All	28	2.07	8.45	2,198
Repro (40-54)	2065	All	32	0.06	0.32	82
Repro (40-54)	2065	All	36	0.03	0.24	69
Repro (40-54)	2065	All	40	0.03	0.24	64
Repro (40-54)	2065	All	44	0	0.01	2
Repro (40-54)	2065	All	48	0.02	0.24	44
			TOTALS	314	265	36,169



Using the 2019 inventory volumes for old growth and the second growth volumes used in the old inventory the AAC is shown below. The earliest the average second growth stands could be harvested would be in about 20 years. At this time the mature second growth strata would be approximately 70 years old, yield 40 MBF/ac and the volume would be concentrated in the 12-24" diameter class.

Simulation 1 AAC

Strata Description	Acres	% by Acres	Net MBF/Ac	Total MBF	% of Total Volume	Years to Harvest	Years When Available
Saw <10MBF/ac	8,475	19%	5,147	43,620,825	4%	19	Now
Saw 10-20MBF/ac	9,596	22%	14,165	135,927,340	13%	22	Now
Saw 20-30MBF/ac	5,528	13%	25,508	141,008,224	13%	13	Now
Saw 30-40MBF/ac	1,197	3%	31,712	37,959,264	4%	3	Now
Saw >40MBF/ac	506	1%	47,736	24,154,416	2%	1	Now
Pole timber	4,010	9%	35,000	140,350,000	13%	10	31
Mature 2nd Gr.	4,521	10%	40,000	180,840,000	17%	9	21
Repro (40-54)	3,285	7%	35,000	114,975,000	11%	7	46
Repro (<40)	6,880	16%	35,000	240,800,000	23%	16	61
	43,998	100%	24,084	1,059,635,069	100%		
AAC	440			10,596,351			

FVS Simulation 2.

This simulation projects the second growth strata forward in 5-year intervals to most closely match the volume estimates used in the Forest Service's transition to young growth harvesting in the Tongass National Forest. The Forest Service's ad hoc definition of operable young growth is referred to the "Two Log Rule". Forest plan page 5-3 defines the Two-Log Rule:

> [2] On the Tongass, the Two-Log Rule was developed to better predict when stands reach a condition where economic harvest opportunities may exist prior to stands reaching culmination of mean annual increment (CMAI) of growth. The Two-Log Rule implies at least half of the merchantable volume within a stand is comprised of trees with two or more logs. A "two-log" tree is defined as a tree that is at least nine inches diameter at breast height, six inches in diameter at the small end and contains a minimum of two logs that are at least 34 feet long.

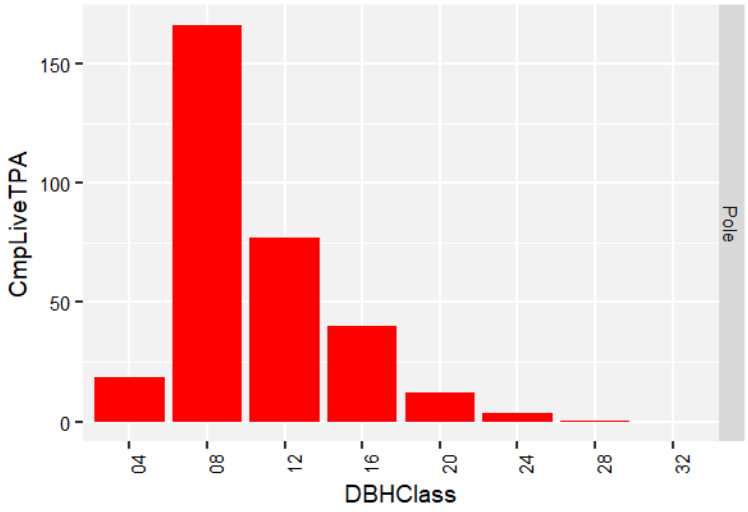
Terra Verde has been contracted through the Tongass Challenge Cost Share Agreement to build a 2 log rule output in the Forest Projection System as a model for economics and has further expanded this definition to include a volume threshold of 25,000 bf/acre and an average total height of 90 feet. FVS simulation 2 grows the stands to these thresholds.

Simulation 2 Summary

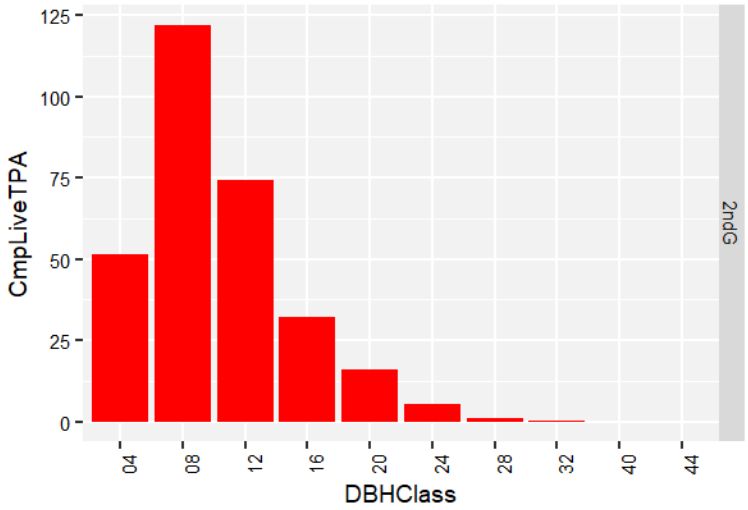
Strata Description	Acres	BH Age	2019	Future Net BF	Future Height	Future Age	Future Years	Future Date
Pole timber	4,010	40	12,428	26,869	102	61	21	2040
Mature 2nd Growth	4,521	51	23,972	28,228	110	57	6	2025
Repro (40-54)	3,285	37	8,811	26,529	107	68	31	2050
Repro (<40)	6,880	20 (est.)	--	26,529	107	66	46	2065

Simulation 2 Stand Tables

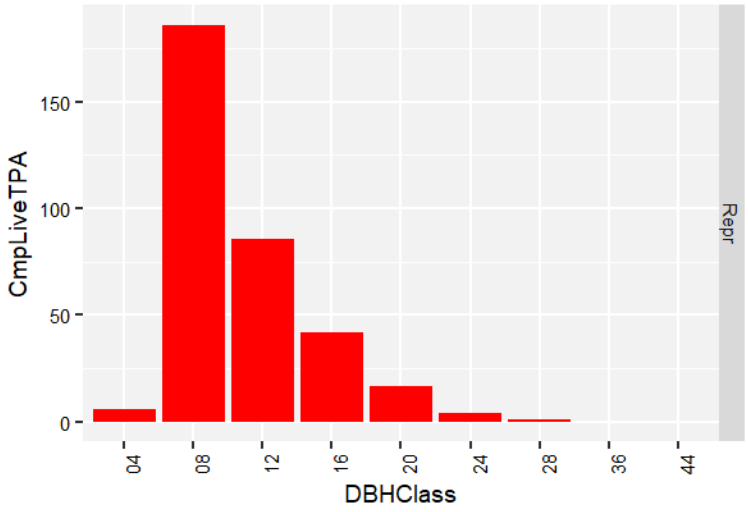
Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Pole	2040	All	04	18.81	3.39	0
Pole	2040	All	08	166.23	53.18	965
Pole	2040	All	12	76.92	60.42	7,701
Pole	2040	All	16	40.19	53.71	9,304
Pole	2040	All	20	12.1	26.02	5,780
Pole	2040	All	24	3.38	9.97	2,492
Pole	2040	All	28	0.53	2.06	581
Pole	2040	All	32	0.03	0.14	46
			TOTALS	318	209	26,869



Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
2ndG	2025	All	04	51.29	8.68	0
2ndG	2025	All	08	121.95	40.06	880
2ndG	2025	All	12	74.19	55.85	6,943
2ndG	2025	All	16	32.27	43.57	7,411
2ndG	2025	All	20	15.82	33.72	7,108
2ndG	2025	All	24	5.55	16.8	4,143
2ndG	2025	All	28	1.13	4.64	1,207
2ndG	2025	All	32	0.25	1.31	354
2ndG	2025	All	40	0.02	0.19	51
2ndG	2025	All	44	0.04	0.46	131
			TOTALS	303	205	28,228



Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Repro (40-54)	2050	All	04	5.72	0.93	0
Repro (40-54)	2050	All	08	185.98	63.5	1,130
Repro (40-54)	2050	All	12	85.67	64.74	6,762
Repro (40-54)	2050	All	16	41.94	56.5	8,220
Repro (40-54)	2050	All	20	16.57	35.19	6,553
Repro (40-54)	2050	All	24	4.25	13.01	2,807
Repro (40-54)	2050	All	28	0.92	3.71	904
Repro (40-54)	2050	All	36	0.06	0.44	117
Repro (40-54)	2050	All	44	0.02	0.24	37
			TOTALS	341	238	26,529



Using the 2019 inventory volumes for old growth and second growth volumes of 25 MBF/acre for an average of the FVS simulations, the AAC is shown below. The earliest the average second growth stands could be harvested would be in 6 years. At this time the mature second growth strata would be approximately 57 years old, yield 25 MBF/acre. The volume would be concentrated in the 12-20" diameter class. Overall volume of the AAC would be reduced 20 % from simulation 1.

Simulation 2 AAC

Strata Description	Acres	% by Acres	Net MBF/Ac	Total MBF	% of Total Volume	Years to Harvest	Years When Available
Saw <10MBF/ac	8,475	19%	5,147	43,620,825	5%	19	Now
Saw 10-20MBF/ac	9,596	22%	14,165	135,927,340	16%	22	Now
Saw 20-30MBF/ac	5,528	13%	25,508	141,008,224	17%	13	Now
Saw 30-40MBF/ac	1,197	3%	31,712	37,959,264	4%	3	Now
Saw >40MBF/ac	506	1%	47,736	24,154,416	3%	1	Now
Pole timber	4,010	10%	25,000	100,250,000	12%	10	21
Mature 2nd Gr.	4,521	9%	25,000	113,025,000	13%	9	6
Repro (40-54)	3,285	7%	25,000	82,125,000	10%	7	31
Repro (<40)	6,880	16%	25,000	172,070,069	20%	16	46
	43,998	100%	19,321	850,070,069	100%		
AAC	440			8,500,701			

FVS Simulation 3.

This simulation projects the second growth strata forward in 5-year intervals to the year of culmination of mean annual increment (CMAI).

Simulation 3a Summary

Strata Description	Acres	BH Age	2019	Future Net BF	Future Height	Future Age	Future Years	Future Date
Pole timber	4,010	40	12,428	63,716	132	111	71	2090
Mature 2nd Gr.	4,521	51	23,972	59,163	136	97	46	2065
Repro (40-54)	3,285	37	8,811	60,531	135	123	86	2105
Repro (<40)	6,880	20 (est.)	--	60,531	135	121	101	2120

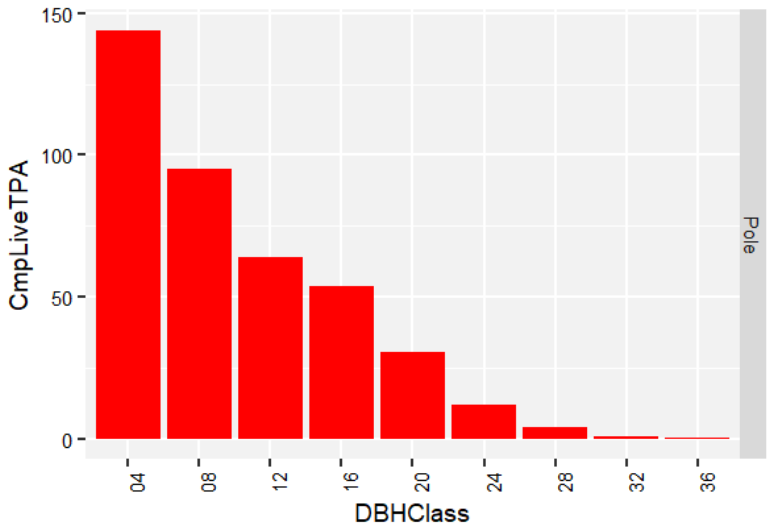
The weighted by acres average age of CMAI across the three strata is 115. If this age is rounded down to 100 years to equal the old inventory rotation age, then the simulation would change as follows.

Simulation 3b Summary

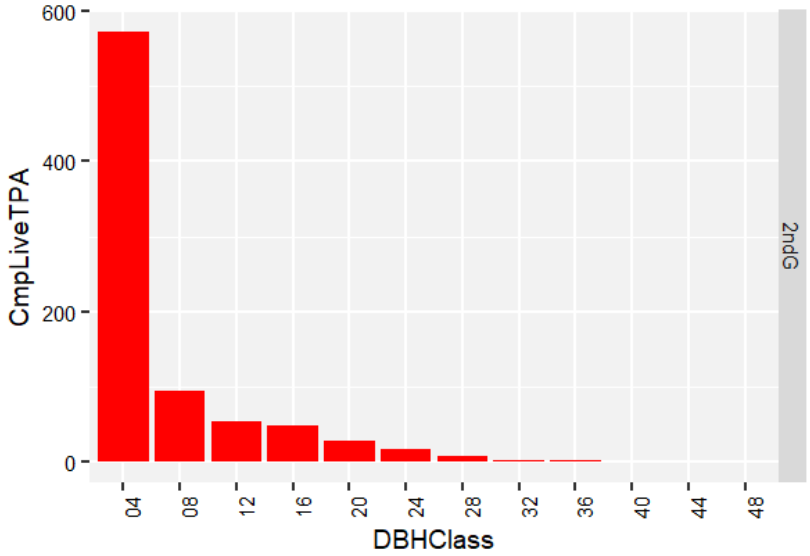
Strata Description	Acres	BH Age	2019	Future Net BF	Future Height	Future Age	Future Years	Future Date
Pole timber	4,010	40	12,428	57,443	128	101	61	2080
Mature 2nd Gr.	4,521	51	23,972	62,143	139	102	51	2070
Repro (40-54)	3,285	37	8,811	49,062	127	103	66	2085
Repro (<40)	6,880	20 (est.)	--	49,062	127	105	83	2100

Simulation 3b Stand Tables

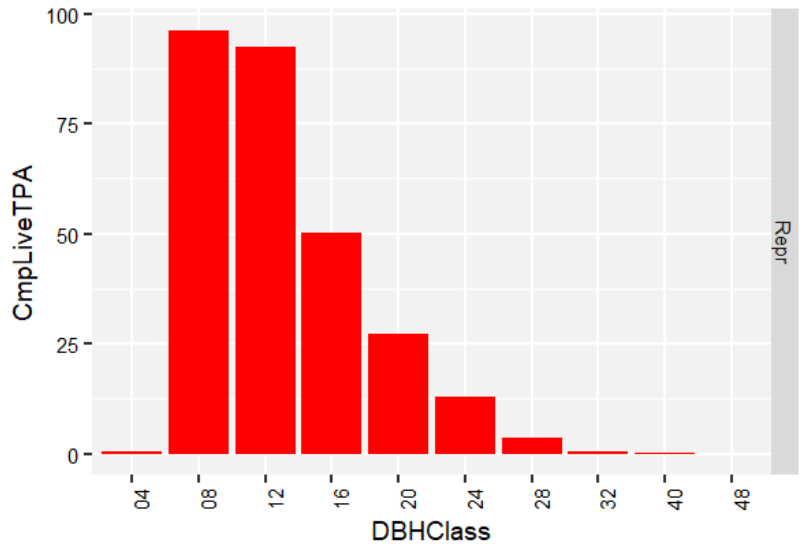
Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Pole	2080	All	04	144.01	5.29	0
Pole	2080	All	08	95.12	34.9	1,098
Pole	2080	All	12	63.86	49.71	7,315
Pole	2080	All	16	53.71	74.23	15,014
Pole	2080	All	20	30.4	64.75	16,592
Pole	2080	All	24	11.7	36.23	11,017
Pole	2080	All	28	3.82	15.59	5,179
Pole	2080	All	32	0.55	2.96	1,038
Pole	2080	All	36	0.07	0.5	189
			TOTALS	403	284	57,443



Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
2ndG	2070	All	04	573.36	0.16	0
2ndG	2070	All	08	93.09	32.52	747
2ndG	2070	All	12	52.96	41.92	6,063
2ndG	2070	All	16	47.14	64.42	12,738
2ndG	2070	All	20	27.83	59.62	14,752
2ndG	2070	All	24	15.6	48.52	14,458
2ndG	2070	All	28	7.38	30.6	9,824
2ndG	2070	All	32	1.58	8.42	2,870
2ndG	2070	All	36	0.22	1.44	493
2ndG	2070	All	40	0.01	0.11	39
2ndG	2070	All	44	0.02	0.21	64
2ndG	2070	All	48	0.03	0.3	96
			TOTALS	819	288	62,143



Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Repro (40-54)	2085	All	04	0.48	0.04	0
Repro (40-54)	2085	All	08	96.23	38.58	1,492
Repro (40-54)	2085	All	12	92.59	71.79	8,753
Repro (40-54)	2085	All	16	50.06	69.08	11,431
Repro (40-54)	2085	All	20	27.1	57.84	12,137
Repro (40-54)	2085	All	24	13.06	39.76	9,931
Repro (40-54)	2085	All	28	3.72	15.45	4,323
Repro (40-54)	2085	All	32	0.52	2.71	785
Repro (40-54)	2085	All	40	0.06	0.52	152
Repro (40-54)	2085	All	48	0.02	0.25	58
			TOTALS	284	296	49,062



Growing the second growth stands to roughly the age of culmination of mean annual increment or about 100 years would increase overall volume of the AAC 24% from simulation 1. The earliest the average second growth stands could be harvested would be in 51 years. At this time the mature second growth strata would be approximately 100 years old, yield 62 MBF/acre and their volume would be concentrated in the 12-28" diameter class.

Simulation 3b AAC

Strata Description	Acres	% by Acres	Net MBF/Ac	Total MBF	% of Total Volume	Years to Harvest	Years When Available
Saw <10MBF/ac	8,475	19%	5,147	43,620,825	3%	19	Now
Saw 10-20MBF/ac	9,596	22%	14,165	135,927,340	10%	22	Now
Saw 20-30MBF/ac	5,528	13%	25,508	141,008,224	10%	13	Now
Saw 30-40MBF/ac	1,197	3%	31,712	37,959,264	3%	3	Now
Saw >40MBF/ac	506	1%	47,736	24,154,416	2%	1	Now
Pole timber	4,010	9%	57,000	228,570,000	16%	10	61
Mature 2nd Gr.	4,521	10%	62,000	280,302,000	20%	9	51
Repro (40-54)	3,285	7%	49,000	160,965,000	12%	7	66
Repro (<40)	6,880	16%	49,000	337,120,000	24%	16	83
	43,998	100%	31,584	1,389,627,069	100%		
AAC	440			13,896,271			

FVS Simulation 4.

This simulation projects the second growth strata forward in 5-year intervals to most closely match a volume estimate of 30 MBF/ac which the Division of Forestry has determined to be the amount needed to successfully sell second growth timber sales in southern southeast. To better align with the Tongass timber typing scheme and to facilitate combined efforts to transition into a second growth industry, the Pole timber and Repro 40-54 strata were combined in SuperAce and in FVS and then projected. The Mature 2nd Growth was renamed to

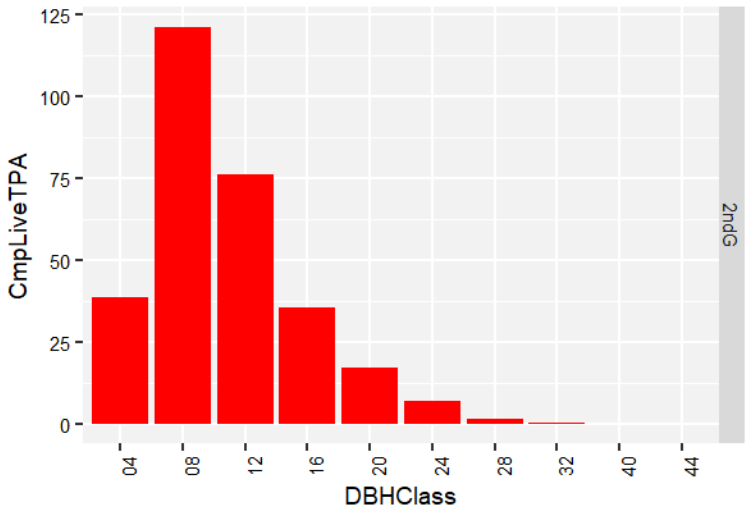
Young Growth 55+. Second growth would then be reduced into three strata defined by age (Young Growth 55+, Young Growth 40-54, Young Growth <40). For the young growth <40 the young growth 40-54 projections are used with the appropriate additional age (20 Years) added. These numbers within this age class can potentially be updated with Tongass data currently being developed by Terra Verde.

Simulation 4 Summary

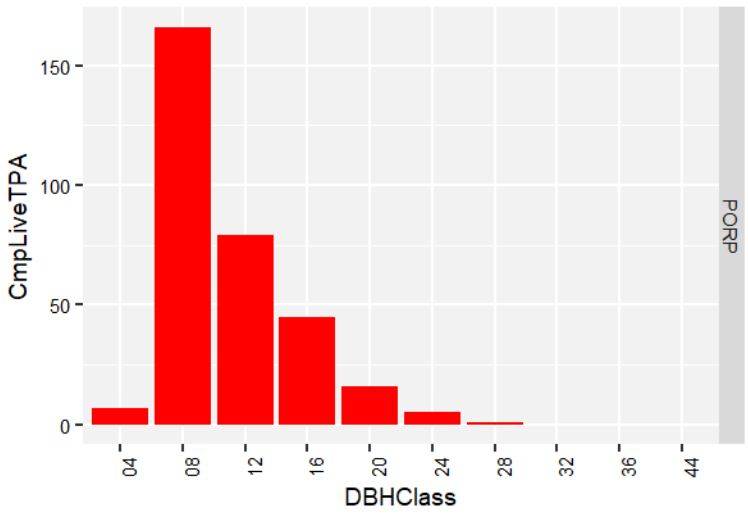
Strata Description	Acres	BH Age	2019	Future Net BF	Future Height	Future Age	Future Years	Future Date
Young Growth 55+	4,521	51	23,792	32,060	115	62	11	2030
Young Growth 40-54	7,295	39	11,438	32,693	109	70	31	2050
Repro (<40)	6,880	20 (est.)	--	28,908	107	71	51	2070

Simulation 4 Stand Tables

Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Young Growth 55+	2030	All	04	38.4	6.77	0
Young Growth 55+	2030	All	08	121.22	38.69	695
Young Growth 55+	2030	All	12	75.99	58	7,501
Young Growth 55+	2030	All	16	35.33	47.96	8,416
Young Growth 55+	2030	All	20	16.91	36.32	7,965
Young Growth 55+	2030	All	24	6.87	20.82	5,175
Young Growth 55+	2030	All	28	1.55	6.4	1,744
Young Growth 55+	2030	All	32	0.25	1.35	376
Young Growth 55+	2030	All	40	0.02	0.19	54
Young Growth 55+	2030	All	44	0.04	0.46	134
Young Growth 55+			TOTALS	297	217	32,060



Strata	Year	Species	DBH Class	Trees/Acre	BA/Acre	Adj Bd Ft
Young Growth 40-54	2050	All	04	6.57	1.14	0
Young Growth 40-54	2050	All	08	165.97	55.67	1219.68039
Young Growth 40-54	2050	All	12	79.21	61.55	7860.36812
Young Growth 40-54	2050	All	16	45.01	60.99	10746.1291
Young Growth 40-54	2050	All	20	16.04	34.01	7612.76621
Young Growth 40-54	2050	All	24	5.21	15.68	4043.43843
Young Growth 40-54	2050	All	28	0.92	3.73	1088.94012
Young Growth 40-54	2050	All	32	0.02	0.11	38.6142332
Young Growth 40-54	2050	All	36	0.03	0.21	64.9894996
Young Growth 40-54	2050	All	44	0.01	0.1	18.2003392
Young Growth 40-54			TOTALS	319	233	32,693



Simulation 4 AAC

Strata Description	Acres	% by Acres	Net MBF/Ac	Total MBF	% of Total Volume	Years to Harvest	Years When Available
Saw <10MBF/ac	8,475	19%	5,147	43,620,825	5%	19	Now
Saw 10-20MBF/ac	9,596	22%	14,165	135,927,340	14%	22	Now
Saw 20-30MBF/ac	5,528	13%	25,508	141,008,224	15%	13	Now
Saw 30-40MBF/ac	1,197	3%	31,712	37,959,264	4%	3	Now
Saw >40MBF/ac	506	1%	47,736	24,154,416	3%	1	Now
Young Gr. 55+	4,521	10%	30,000	135,630,000	14%	9	11
Young Gr. 40-54	7,295	17%	30,000	218,850,000	23%	17	31
Young Gr. <40	6,880	16%	30,000	206,400,000	22%	16	51
	43,998	100%	21,445	943,550,069	100%		
AAC	440			9,435,501			

Discussion.

The four simulations produce a range of results by varying the time the second growth strata can grow prior to harvest. If one is to leave the AAC acres constant by continuing a 100-year rotation period and using the 2019 inventory numbers for old growth, then the difference in AAC is solely dependent on the volume of second growth at time of entry. There are several issues in determining an appropriate AAC level including harvest scheduling and timber type volume variability. By extending the time of entry to the second growth, old growth harvesting will be lengthened which may negatively affect timber quality over this time period. By shortening the time to enter second growth more emphasis is placed on volume estimate reliability. This becomes an issue because a relatively high variation is present in the Repro 40-54 strata and there is an additional 16% of the second growth in stands that do not have any samples.

Appendix 3: Working spreadsheet of areas by strata

	STRATA 1	% STRATA 1	STRATA 2	% STRATA 1&2	STRATA 3	STRATA 4	STRATA 5	STRATA 6	STRATA 7	STRATA 8	STRATA 9	TOTAL	STRATA 3-9	% 3-9	EXISTING ROAD	EXISTING LTF	DENSITY %	DIFFICULT TERRAIN
S LINDENBERG	163	43%	218	100%								381	0	0%	2 miles	No	32%	N
N DALL	219	52%	59	66%	143	0						421	143	34%	No	No	99%	Y
S DALL	33	21%	56	56%	56	14						159	70	44%	No	No	100%	N
INGRAHAM BAY	39	8%	278	61%	89	28	85					519	202	39%	No	No	55%	N
LITTLE COAL BAY	251	59%	147	93%	31							429	31	7%	Yes	Yes	47%	N
EL CAP ISLAND	24	6%	174	51%	100	73		16				387	189	49%	No	No	81%	N
KENDRICK BAY	142	42%	128	79%	24	47						341	71	21%	No	No	73%	N
KITKUN WEST	255	72%	78	94%	0			20				353	20	6%	Yes	Yes	62%	N
BRADFIELD WEST	226	36%	396	99%	9							631	9	1%	No	No	99%	Y
ISOLATED REMOTE SUBTOTAL	1,352		1,534		452	162	85	36	0	0	0	3,621	735					
ROWAN BAY	145	38%	140	75%	93							378	93	25%	Yes	Yes	97%	N
BRADFIELD MAIN	422	18%	949	59%	144			655	4	157		2331	960	41%	Yes	No	75%	Y
SUMEZ	458	58%	152	77%	10	87	39	50				796	186	23%	Yes	Yes	99%	N
EL CAP WEST	167	48%	98	77%	62					19		346	81	23%	Yes	Yes	78%	N
EL CAP NW	945	53%	260	67%	10	21				444	113	1793	588	33%	Yes	Yes	92%	N
CRITTENDEN CR EEK	889	56%	499	81%	317							1705	317	19%	No	No	66%	N
MOSER BAY	47	8%	69	20%	460							576	460	80%	No	No	91%	N
SOUTH WHALE PASS	19	9%	190	96%					9			218	9	4%	Yes	Yes	25%	N
NOWISKAY COVE	0	0%	45	39%					69			114	69	61%	No	No	100%	N
KITKUN EAST	3	0%	326	54%	0			29			251	609	280	46%	Yes	Yes	100%	N
N HOLLIS	0	0%	0	0%	0	15	0	131	0	0	231	377	377	100%	Yes	Yes	100%	N
S HOLLIS	188	26%	77	37%	53	0	0	17	7		372	714	449	63%	Yes	Yes	84%	N
S THORNE	425	30%	17	32%	73	0		147			740	1402	960	68%	Yes	Yes	95%	N
KETCHIKAN	1	1%	0	1%	0	6		14		26	42	89	88	99%	Yes	Yes	95%	N
VALLNER	546	40%	297	61%	226	1		57	249			1376	533	39%	Yes	Yes	66%	N
BOSTWICK	387	32%	292	56%	259	24					248	1210	531	44%	Yes	Yes	27%	N
WHALE PASS	156	10%	611	51%	447			95		123	77	1509	742	49%	Yes	Yes	91%	N
N WHALE PASS	0	0%	0	0%	103					147		250	250	100%	Yes	Yes	100%	N

	STRATA 1	% STRATA 1	STRATA 2	% STRATA 1&2	STRATA 3	STRATA 4	STRATA 5	STRATA 6	STRATA 7	STRATA 8	STRATA 9	TOTAL	STRATA 3-9	% 3-9	EXISTING ROAD	EXISTING LTF	DENSITY %	DIFFICULT TERRAIN
WOODPECKER	26	3%	124	16%	388			384				922	772	84%	Yes	Yes	83%	N
S MITKOF	15	1%	340	22%	297	165		546	234			1597	1242	78%	Yes	Yes	84%	N
EAST MITKOF	383	30%	376	59%	206	28	127		2		170	1292	533	41%	Yes	Yes	77%	N
FALLS	0	0%	130	35%	12			234				376	246	65%	Yes	Yes	76%	N
THOMAS BAY	0	0%	16	3%	125			94	290		70	595	579	97%	Yes	No	99%	N
WRANGELL	580	21%	891	54%	160			97	284	155	573	2740	1269	46%	Yes	Yes	99%	N
EARL WEST	747	47%	198	59%	158	97		34			362	1596	651	41%	Yes	Yes	79%	N
NEETS	64	5%	41	7%	114	94			1093			1406	1301	93%	Yes	No	90%	N
TRAITORS COVE	0	0%	56	25%	16				152			224	168	75%	Yes	Yes	100%	N
GEORGE INLET	0	0%	1	0%	274			11	165			451	450	100%	Yes	Yes	96%	N
N THORNE BAY	42	3%	122	10%	77	238		331		273	577	1660	1496	90%	Yes	Yes	89%	N
HECETA	0	0%	278	12%	73	129	256	435	510	562	125	2368	2090	88%	Yes	Yes	88%	N
KOSCIUSKO	0	0%	167	6%	715			500	1320		13	2715	2548	94%	Yes	Yes	89%	N
NAUKATI	75	3%	536	22%	126	48	0	2	27	469	1518	2801	2190	78%	Yes	Yes	96%	N
TUXECAN	0	0%	25	4%	0	54			107	205	174	565	540	96%	Yes	Yes	98%	N
CONTROL LAKE	49	8%	208	44%	74						255	586	329	56%	Yes	Yes	61%	N
COFFMAN	343	13%	531	33%	7	26		110		704	952	2673	1799	67%	Yes	Yes	91%	N
SUBTOTAL	7,122		8,062		5,079	1,033	422	3,973	4,522	3,284	6,863	40,360	25,176					
TOTAL	8,474		9,596		5,531	1,195	507	4,009	4,522	3,284	6,863	43,981	25,911					

Appendix 4: Inventory Field Protocol

2019 Inventory Data Collection Procedures – Southern SE State Forest

1,300 Plots, 130 sample stands within 8 strata, sample stands are ≥ 10 acres

Strata	Type	Description	Acres	%	Total Stands	% Sample Stands	Design Sample Stands	Design Plots	Alternate Plots
1	0	Saw <10MBF/ac	3,614	10%	69	13	20	200	40
2	1	Saw 10-20MBF/ac	11,352	31%	169	40	20	200	40
3	2	Saw 20-30MBF/ac	9,526	26%	183	33	20	200	40
4	3	Saw 30-40MBF/ac	1,616	4%	42	6	15	150	30
5	4	Saw >40MBF/ac	203	1%	3	1	3	30	20
6	P	Poletimber	4,156	11%	51	15	20	200	40
7	S	Mature 2nd Growth	3,457	9%	65	12	16	160	40
8	R	Repro (40-55)	3,235	9%	38	11	16	160	40
			37,159	100%	620	130	130	1,300	290

Plot spacing 320 ft or less, all stands have 10 plots. Stands <30 acres are in a plot grid. Stands >30 acres are in a plot traverse

GPS Point Location

Garmin GPS set to WGS84

Plot fix 30ft< accuracy then use logger's tape for final distance to plot

Plot Center

White flag, stake

White flag above stake, plot number, crew initials, date

SuperACE Variable Plot Collection

All plots are measure plots. Use appropriate BAF to average 5 trees per plot. "In" trees are determined horizontal distance PC to "center of tree", *not face of tree*.

Data collected by sort and log grade will use a different sort for cedar

Data items: Spp, DBH, Merch Ht, Total Ht, Form Factor at 16 feet, crown position, vigor, damage

SuperACE Fixed Plot Collection

A 1/250 acre plot (7.45 feet) will be used to tally repro and poles. Measurements of seedlings (0.5'- < 1" dbh), saplings (≥1" dbh and < 5" dbh), and poles (5" dbh – 8.9" dbh) include species, estimated diameter at breast height, estimated height (no diameters/heights recorded on seedlings), crown position, vigor, damage.

From SuperACE Pocket Super Easy manual:

Data Recorder Master Screen Setup-The data recorder will have a new master screen set up for each sampled stand

Main Tab

Project Name- SSEInventory

Twn, Rge, Sec, Tract, Type, Acres will all be entered from data displayed on the field plot maps. The tract number is equivalent to the stratum number. The type number is equivalent to the individual stand ID number. Enter two- digit crew initials.

Age Tab

Age1- 100

BAF Tab

Enter BAF in the B1 entry box 27.78, 33.61 if using a 40 BAF, it can be entered directly on the tree entry screen in the PF column.

Repro Tab

Enter plot size .004 in the R1 entry box, Plot radius should display as 7.45'

Once all the Master Screen tabs have been filled in with the necessary values you can either tap **Save** to save the information and return to the Project Screen, tap **Plots** to save the entries and go directly to the Plot Screen or tap **Return** to leave the screen without saving any of the entries.

Data Recorder Plot Screen-

Enter plot number then tap on CRU to enter tree data for the plot. The plot screen will show a Y if the plot is cruised or if the plot contained a site tree.

Data Recorder Cruise Screen-

Identification

T#- Tree number. This is assigned by the computer

PF- Prism Factor. A whole number (40 BAF) can be entered here. If a decimal is used than use B1 from the Master Screen BAF entry.

A- Age. Default age code is 1

Spc- Species. SS Sitka Spruce, WH Western Hemlock, MH Mountain Hemlock, LP Lodgepole Pine, RC Red Cedar, YC Yellow Cedar, CW Cottonwood

S- Status. Used to indicate dead trees. Code is 1 for dead

Tr Ct- Tree Count. Will be used for the seedling count if crown position, vigor and damage are the same.

Measurments

DBH- Diameter Breast Height. 4.5 feet above the ground on the uphill side of tree or 4 feet above the stump (D4h).

FP- Form Point. This is where the tree is taken "in" with a BAF. Default is DBH (four feet above the stump). Form factor point is automatically set at 16 feet.

FF- Form Factor. The percent relationship of the diameter at 16 feet divided by the DBH.

TD- Top Diameter. Diameter outside bark at the top of the bole. Numbers are percent of DBH 6 = 60% of DBH. Letters are absolute values F= 6" top, G=7" top. This should be coded as an "F" for most trees (6" top).

Bole Ht.- Generally merchantable height to a 6" top.

Tot Ht.- Total Height

Classification

Po (T1) – Position

- O = over-story – Older age trees, usually residual
- D = dominant
- C = co-dominant
- I = intermediate
- S = suppressed
- U = under-story – younger trees than the main canopy

Vi (T3) – Vigor

- H = healthy, living tree, may have damage
- M = alive, but damaged and/or is not normal.
- D = dying

Da (T4) – Damage

A = animal
F = form (sweep, crook, breakage)
I = insects
M = mistletoe
R = rot

Log Segments

S - Sort - A single alpha or numeric code as described in the active sort/grade table.

G - Grade - A single alpha or numeric code as described in the active sort/grade table.

Ln – Segment length. Two digit numeric. On the final log segment of a tree, a "- -" may be entered instead of a numeric length. If a "- -" is entered, the program will compute the length of the segment to the minimum top diameter or to bole height, which ever it hits first. Log length min and max are defined in the species, sort and grade tables.

F - Board Foot length deductions. (This field will be entered when length defect is present)

I – Board Foot diameter deductions. (This field will be entered when diameter defect is present)

F –Cubic Foot length deductions

I – Cubic Foot diameter deductions

P - Numeric field left blank when using length or diameter deductions.

Data Recorder Site Index Screen-

Site tree data collected 1 in 5 plots (two site trees per stand), Dominant or Codominant (priority SS, WH) "free to grow" in any size class present, good vigor

When a tree is highlighted in the data recorder, spc., Dbh and Ht. are carried over to the SI screen.

BH Age- Breast height age.

Dbh R1- 10-year radial growth in hundredths of inch

Bark R1- Bark thickness in hundredths of inch

Data Recorder Calculator Screen-

Calculations for limiting distance, tree height, relaskop diameter and form factor.

Appendix 5: References

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Meiers, Sean, Forester, USFS Thorne Bay Ranger District – provided local knowledge of Kosiusko, Tuxekan, and Heceta.

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Prince of Wales Island Area Plan Amendment published by the Alaska Department of Natural Resources in May 2008.

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Imagery:

1996 black and white digital ortho-photography from USFS GIS database.

2006 color digital ortho-photography from USFS GIS database.

Ortho-photographs made for the Ketchikan Gateway Borough in 2001 and 2008.

SDMI 2.5 meter SPOT Color

-POW LiDAR imagery 2017

-POW LiDAR imagery 2018

-Bing Imagery, ESRI, a conglomeration of Digital Globe and GeoEye.

-USFS, low altitude DOQQ (Digital Ortho Quarter Quad), Aerometric Inc. 2006-2009.

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