FORESTLAND INVENTORY

STATE LANDS ON THE KENAI PENINSULA
2024 ASSESSMENT

April 14th, 2025

PREPARED BY

TERRA VERDE
TRUST · VALUE · PERFORMANCE

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Executive Summary

The State of Alaska Department of Natural Resources, Division of Forestry (DOF), contracted Terra Verde, Inc. (TVI), to construct a comprehensive and fully integrated forestland inventory for state lands encompassed by the geographic area known as the Kenai Peninsula. This project commenced in mid-2023 and will be referred to as the 2024 Kenai Inventory Project.
This project's design is to develop and implement a forestland inventory program to enhance the State's understanding of the timber resource and inform management decisions with the intent to maximize opportunity for economic development, stability, and diversity of these state managed forest lands. The objective is to accomplish these goals with responsible use of forestland resources while maintaining the natural values and ecological integrity of the forest.

Regulatory agencies, primary stakeholders and preferred secondary markets recognize the significant advantages of sustainable informed forest management. Whether we are talking carbon stocks, bio-fuel potential, or timber products, all need to be projected and monitored in a scientifically robust analysis that is transparent and ultimately widely accepted as a credible accounting. This inventory effort provides us with the spatial distribution, composition, and metrics of the forest today and enables us to analyze and project tomorrow's forest with increased confidence. This inventory provides DOF decision makers with the reliable, defensible datasets to enable accurate, detailed management planning and projections.

The forest industry in Alaska is becoming more dynamic and migrating to the management of integrated natural resources. With this inventory we now have the ability to analyze the intrinsic value these forestlands present for many other considerations such as wildlife, fisheries, cultural conservation, carbon sequestration, and alternative energy opportunities. This forestland inventory of available and potential forest resources on the Kenai Peninsula is the most robust and complete in-place stand based inventory effort in this area of the state. State lands that are included are classified in Table 1 below for a broad range of land uses including forestry.

The subject land base addressed by this inventory comprises a total of 910,899+/- total acres and summarizes the vegetative type stratification and sampling effort to collect field data during the 2024 field season. A total of 320,761+/- acres of potentially merchantable timberland are present on this land base. Of these timbered acres, 142,947+/- are administratively restricted or subject to fish bearing stream protective buffers and road buffers. The acre net down exercise results in 177,815+/- net acres across 6,503 unique stands forming the available timber land base. This net down of restricted acres created numerous stands with insignificant area resulting in only 4,121 stands representing 177,814+/- net acres. Merchantable volumes calculated on the available timber subset is 348,974,000 net cubic feet, 1,690,538,000 net board feet, and 5,150,916 net tons. There are approximately 172,323+/- acres of what is deemed non-commercial forestland consisting of seedling/sapling sized trees on poorly stocked low site ground with little potential to produce merchantable timber. There is also 417,815+/- acres of non-forest type calls.

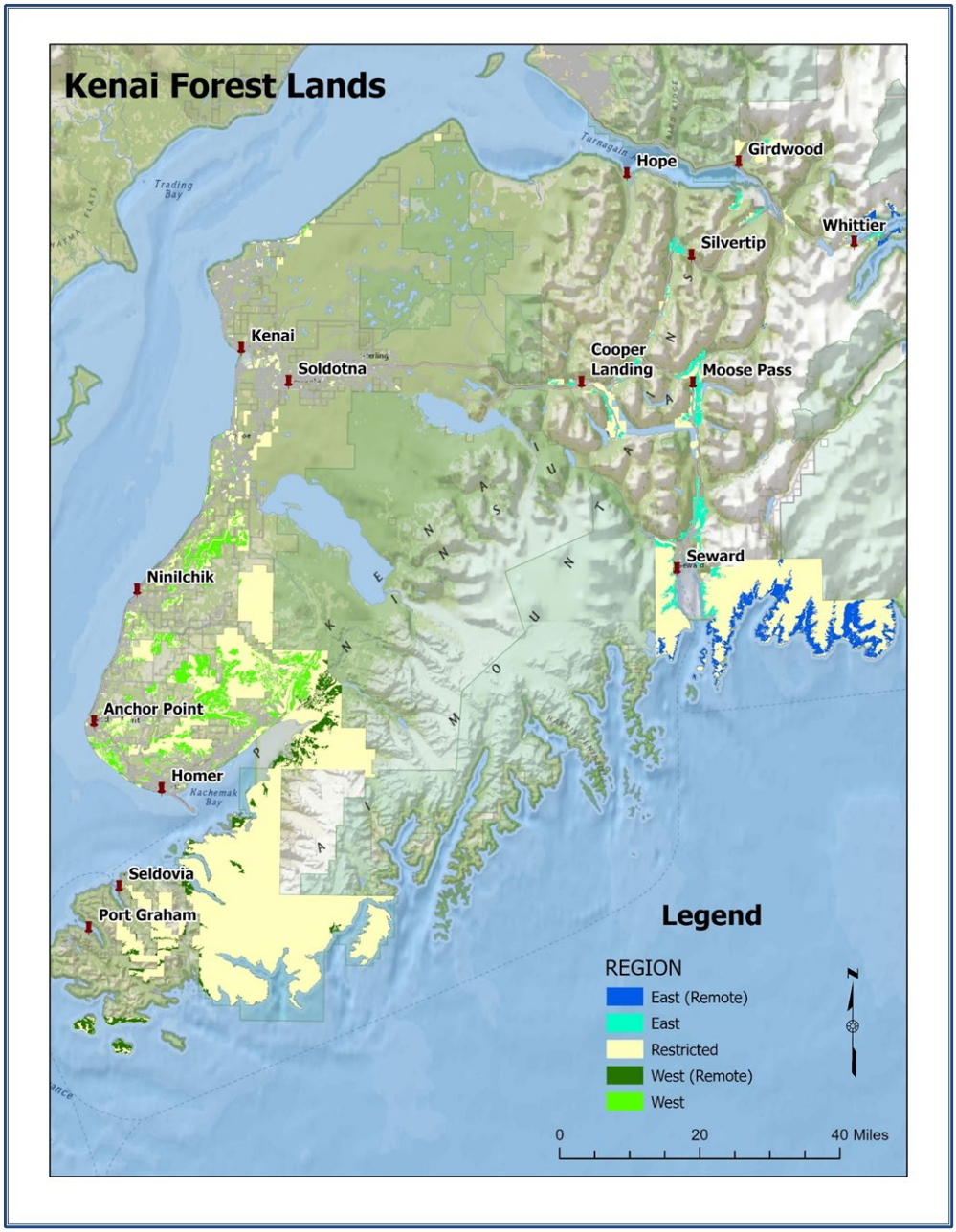
The timber market assessment on the Kenai Peninsula reveals a network of small local mills operating on approximately 250mbf Scribner scale annually, primarily serving specialty markets for products like cabin wall cants, wide-face lumber, and timber-frame beams. A custom stumpage calculator tool was developed to establish fair timber values on State of Alaska lands, with results showing positive stumpage values of $113.57/mbf for Hemlock and $170.51/mbf for Spruce under typical conditions, despite challenging operating costs. The project has delivered comprehensive resources including raw plot data, compiled inventory information, a detailed stand-based GIS product with species-specific timber volume estimates, and a thorough land records review. These deliverables provide the high-resolution data necessary for implementing a 5-year harvest plan. This approach will enable DOF foresters to develop economically viable timber sales while providing industry stakeholders with investment-grade resource information essential for long-term planning and market development.

Table 1: State of Alaska Land Classification

CODE	DESCRIPTION	ACRES	% TOTAL ACRES
ACRES	Total GIS Project acres	910,899	100%
AVAILABLE (Non-Forest)	Non-forest type	417,815	46%
AVAILABLE (NCF)	Available acres in non-commercial forestland	172,323	19%
AVAILABLE (Timber)	Available commercial timbered acres in reportable strata	320,761	35%
Net_Ac_Timber	Available timbered acres net of all restrictions	177,815	20%
SOA_ASR_AC	Agreement, Settlement, Reconveyance	6,259	1%
SOA_ASR_MI		18	0%
SOA_CONV_D	Land Disposal - Conveyed	2,413	0%
SOA_AVAIL_	Land Disposal - Available	18	0%
SOA_LEGIS_	Legislatively Designated Areas	352,826	39%
SOA_MGMT_A	Management Agreement	9,319	1%
SOA_MUNIC_	Municipal Entitlement	37,593	4%
SOA_OTHER_	Other State of Alaska - Acquired	58,070	6%
SOA_INTER_	State Interest Native Allotment	2	0%
SOA_PRO_AL *	Total Not Available/restricted	387,572	43%
Roads	Buffers for roads	29	0%
AWC	Buffers for AWC -Fish bearing streams	10,413	1%
NC	No classification	46,367	5%
		910,899	100%

* Note: This is an inclusion of all the designations. The total of all classes listed above and the geospatial total differ as some lands are impacted by more than one SOA designation.

Figure 1: Map of Reporting Regions



A total of four regions are utilized for this report. The East and West regions are areas that are on or adjacent to existing road and transportation networks while the remote regions are isolate from current infrastructures and communities. For the purposes of this report "restricted" simply means not available for commercial timber management. This definition includes non-forest lands and areas under various administrative land classifications that restrict commercial timber harvest operations. It includes resource driven restrictions such as stream buffers but also includes administrative destinations such as recreation areas.

Table 2: Kenai Inventory Acreage and Volume Summary

Inventory Area Land Classification	**Acres**	
Commercial Timberland	320,761	
Non-Commercial Forestland	172,323	
Non-Forest	417,815	
Restricted	142,947	
Total PROJECT Area:	910,899	
TOTAL NETNET AVAILABLE TIMBERED ACRES	177,815	
Timberland Area by Timber Type Size Class	***Available Timber***	***Unrestricted***
Large Sawtimber (acres)	74,191	44,444
Sawtimber (acres)	83,709	47,090
Pole timber (acres)	134,981	66,362
Saplings/Seedlings (acres)	27,880	19,919
Total Timberland Area:	320,761	177,815
Timberland Area by Timber Type Species Class	***Available Timber***	***Unrestricted***
Spruce (acres)	159,643	79,410
Hemlock (acres)	19,645	12,452
Black Spruce (acres)	5,413	2,391
Mixed Conifer (acres)	129,203	79,949
Hardwood (acres)	6,856	3,613
Total Timberland Area:	320,761	177,815
Total Net Volume	***Available Timber***	***Unrestricted***
Cubic Feet (≥ 9"DBH)	694,337,000	348,974,000
Tons (≥ 9"DBH)	10,454,366	5,150,916
Board Feet (> 9"DBH)	3,385,250,000	1,690,538,000

Table 3: Net Merchantable Volume by Region

Kenai Region	**Net CF**	**Net BF**	**Net Tons**	**Stands**	**Net Acres**
West Total	40,585,686	171,430,366	617,513	1,937	70,589
West Remote Total	27,917,406	127,398,988	418,069	701	23,922
East Total	84,083,027	402,616,106	1,268,835	762	27,716
East Remote Total	196,387,565	989,092,084	2,846,498	721	55,587
Kenai Project Total	**348,973,684**	**1,690,537,544**	**5,150,916**	**4,121**	**177,814**

Objectives

The objective of this inventory project is to enable reliable, defensible analyses and inventory reporting. To assist DOF personnel in evaluating and making informed management decisions concerning forest resources on the Kenai Peninsula. This inventory was designed to provide answers. What are the qualitative and quantitative metrics of the forest resources on this land base? What accounting is needed to satisfy internal audits? How can we meet the statistical precision and reporting accuracy to satisfy market and regulator demands? What is the additionality of available and future inventory as a result of silvicultural prescriptions? These questions are answered by accurate, reliable reports generated by analysis, planning, and projections derived from a detailed stand-based forestland inventory.

Providing an accurate representation of the subject land base, determining operability and economic feasibility of treatment or classification alternatives, sustainable yield analyses, harvest scheduling, and financial forecasting all require the best available volume data and accurate referenced spatial locations of individual forest type polygons, (stands). The 2024 Kenai Inventory provides the following integrated datasets which inform foresters in the decision-making and planning process.

- An inventory dataset in FPS v7.6, compiled and reportable
- A geographically referenced GIS dataset in ESRI ArcPRO format with one-liner summary attributes containing stand level metrics.

Key Objective: These datasets are designed to meet the analytical and reporting needs of a working forest management team.

Methodology

This inventory effort was designed as a stratified inventory. Several parameters of observed vegetative characteristics were used to group the forest lands into different classes based on species, size class, and stocking class. The stratification was applied utilizing several sources of satellite imagery to map contiguous polygons exhibiting similar homogenous characteristics. These aggregated polygons (timber types), account for variation in stand composition, species, size class, and density class. Time constraints for this project necessitated field sampling commence prior to completing the stratification process. This introduced inefficiencies, however, provided additional support for field truthing the timber type calls when field sample data was post stratified on the final mapping. Each polygon (stand) was then treated as a candidate for sample selection within the stratified population. Initially, cruise stand selection was made applying a probability proportionate to size (PPS) sample design. This approach was modified to meet logistical access and financial restrictions as well as targeting that each represented stratum contained sample points. Access to the stands was by foot, four-wheeler, pickup and boat with aerial support by float plane and helicopter. Field measurements (plots)

were completed in the selected cruise stands. This data is the basis to providing all volumetric estimates and projections.

The timber cruise of the subject property was compiled with the Forest Biometrics Research Institute (FBRI), Forest Projection and Planning (FPS) cruise compiler v7.6 utilizing the FBRI certified Alaskan Library 20. Metrics are reported at the project, strata, and stand level. A total of 3,754 sample points were installed in 435 stands on 34,792+/- GIS acres resulting in a %SE of 2.0 at 1 SD for the total timber cruise portion of this project. Refer to Table 4 below.

Table 4: Cruise Statistics

Kenai Cruise Statistics						
	# Stands Cruised	# of Plots	Net Acres Cruised	%SE MBF	%SE BA	%SE TPA
Total Project	435	3,754	34,792.10	2.0	1.7	3.7

Basemap Imagery

Numerous remote sensing platforms were utilized in the process of project mapping and refining stand polygons. ESRI Worldwide 15m imagery, Google Earth 15cm -15m imagery and Alaska 50cm high resolution imagery. DOF provided state land ownership boundaries, roads, etc. that were overlaid onto the base imagery. To assure complete coverage a detailed records search for state ownership was made by Terra Verde, increasing the accuracy and confidence of project reporting. A GIS database including these features was created and serves as the databank for the spatial representation of the stand polygons and sample point locations.

Vegetation Classification

The Forest Type Mapping System employed on this project stratifies the landbase on the basis of forest vs. non-forest, species composition, stand size class and degree of stocking. Non-forest types were subdivided into various numerous categories. Species composition was determined on the basis of the predominate species as indicated by perceived stand volume for older sawtimber stands, the greatest basal area for pole timber sized stands and stem quantity, trees per acre for seedling/sapling sized young stands. Size class is based on tree diameter class as estimated from crown diameter and height of the greatest proportion of volume or basal area of trees in the stand. Diameter thresholds reflect the estimated quadratic mean diameter (QDBH) of the total population of target trees in the stand. Stand density or stocking is determined by an ocular estimate of crown closure of the designated size class of the stand from the basemap imagery. The intent of this project is to target forest types with a focus on regionally significant, with emphasis on commercially marketable species, resulting in the strata classification codes in Figure 2 below.

Figure 2: Kenai Inventory Timber Strata Codes and Key

Position	Explanation	Code	Label	Detail
First 2 digits	Species	WS	White or Sitka Spruce	White Lutz or Sitka
		BS	Black Spruce	Dominant Black Spruce
		MH	Mountain Hemlock	Dominant Mountain Hemlock
		HW	Broadleaf Dominant	Dominant Broadleaf/Hardwood
		MC	Mixed Conifer	Mixed Conifer Dominant
		DD	Dead Conifer	Dead/Burned Conifer
3rd Digit	Tree Size	5	Large Saw	>18 inches DBH
		4	Saw	12-18 inches DBH
		3	Pole	5-11 inches DBH
		2	Saplings	2-5 inches DBH
		1	Seedling	0-1 inches DBH
4th Digit	Stocking	3	Well Stocked	70-100% Crown Closure
		2	Mostly Stocked	40-69% Crown Closure
		1	Poorly Stocked	10-39% Crown Closure
		0	Non-Forest	<10% Crown Closure

Non-Forest Codes

WN	Wind Throw
XB	Brush
XD	Slide
XG	Grass Meadow
XH	Open Water
XI	Industrial Land
XM	Muskeg
XQ	Quarry
XR	Right of Way
XS	Exposed Rock
XT	Tidelands
XW	Wetlands/Marsh
XX	Unknown

Example: WS52 White Spruce dominated Large saw size, mostly stocked

Using the basemap imagery, timber type polygons were identified, digitized and classified into like strata by species, size class and density. Each polygon/stand was assigned a unique stand number, STD_ID. Vegetation was classified to a minimum mapping unit of 10 acres, however, the variability and clumpiness exhibited by large tracts of this land base necessitated frequent departure from limiting minimum polygon size. Also, numerous very large polygons were subdivided to a more manageable size for sampling and future planning efficiencies. The GIS database of stratified forest polygons/stands was clipped to the state ownership and forms the basis of the acreage estimates used in this report.

Figure 3: Example of Kenai Forest Stratification Mapping

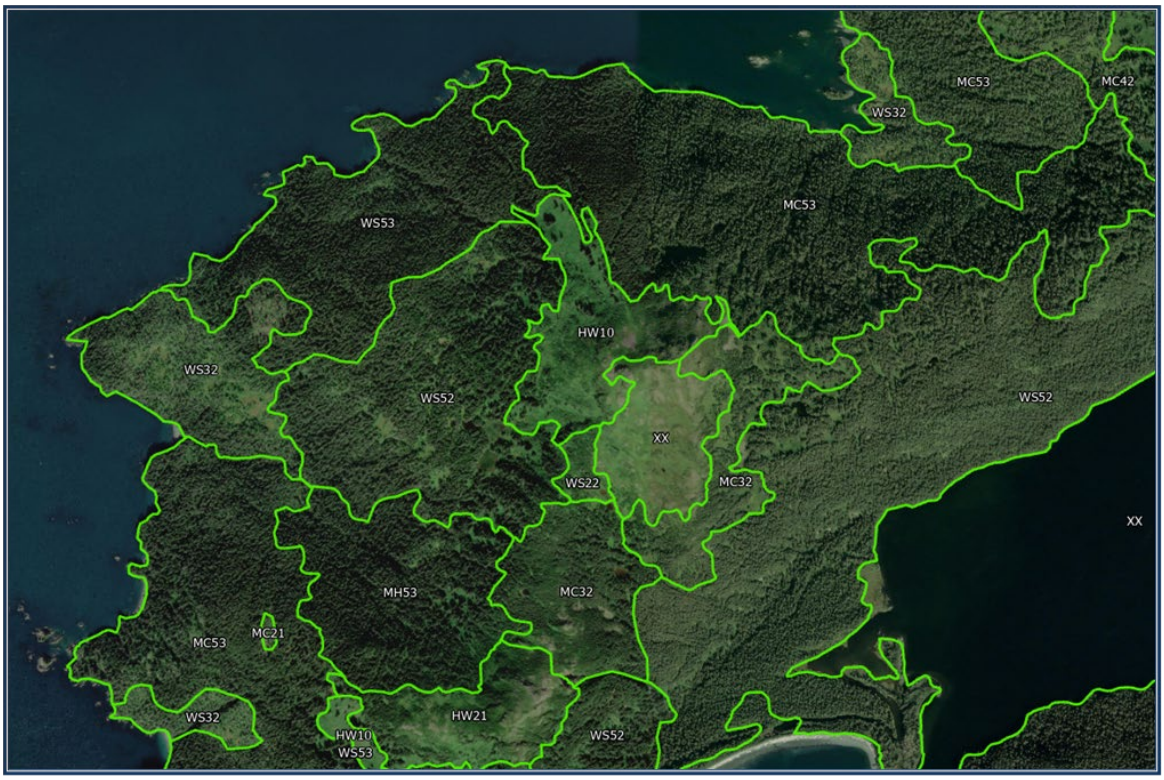


Table 5: Distribution of Unrestricted Timber Acres by Stratum

	ACRES			STANDS		% Unrestricted area Cruised	# of Plots
	Strata	**Unrestricted**	**Cruised**	**Strata**	**Cruised**		
1	*White Spruce/Sitka Spruce - Saw*						
	53,352	19,175	4,810	500	63	25%	609
2	*White Spruce/Sitka Spruce - Pole*						
	78,412	40,316	7,630	986	85	19%	973
3	*White Spruce/Sitka Spruce - Seedlings and Saplings*						
	27,880	19,919	1,026	589	31	5%	102
4	*Black Spruce - Pole Size or Larger*						
	5,413	2,390	1,695	85	18	71%	208
5	*Mountain Hemlock - Pole Size or Larger*						
	19,645	12,453	7,627	288	78	61%	698
6	*Mixed Conifer - Pole Size and Larger*						
	129,202	79,949	8,844	1,458	88	11%	826
7	*Hardwood/Broadleaf - Pole Size or Larger*						
	6,856	3,613	1,153	215	35		152
	Totals						
	320,761	**177,815**	**32,784**	**4,121**	**398**	**18%**	**3,568**

Table 5 above shows the reportable timber strata distribution by acres, stands and cruise plots. These strata are described as meeting the minimum 9" DBH merchantable size for consideration as a commercial forest product. In addition to the cruised sample points shown above, field data was collected in 37 stands on 186 points in smaller size classes. This sample provided the metrics for compilation and expansion into 172,699+/- acres of smaller size classes not stratified within the seven strata above to enable complete inventory reporting.

Field Inventory Design

Every polygon cruised had numerous cruise and stand level metrics recorded. Refer to Appendix G Cruise Specifications v06092024 for detail descriptions.

Table 6: Cruise and Stand Level Metrics

Cruise Level Metrics		**Stand Level Metrics**		
Cruiser Initials		Stand Origin	Soil Description	Topographic Position
Cruise Date		Ground Stand Call	Soil Drainage Class	Stand Condition
Basal Area Factor (BAF)		Stand Age	Soil Erosion Rating	Wind Hazard/Direction
		Non-Stocked Condition Class	Operability	

This Cruise and Stand level information as well as compiled stand level metrics are presented in the delivered Kenai 2024 Inventory datasets. Sample points (plots) were cast with a cruise intensity of one (1) plot per five (5) acres inside numerous PPS selected stands and stands selected to optimize the target of sampling all strata. The intensity was varied to accommodate a minimum five (5) plots per stand and a maximum forty (40) plots per stand. These initial selections were stands selected from publicly available generalized land classification mapping. After completion of the stand typing (polygon stratification) refinement, stand level information and the total field sample point population was post stratified. Sample points were labeled with a unique PLOT_ID. This step was strictly a data management exercise, assigning sample points to the geographically correct polygon. Sample points were geo-referenced and were located in the field with hand held GPS receivers. Field maps to aid field crews were generated. The initial cruise intensity for numerous stands was affected by the post stratification of the sample points. Field data collection utilized a variable radius plot prism sampling method for larger sapling, pole timber and sawtimber size trees greater than or equal to 4.6 inches diameter at breast (DBH), with a directive to capture 5-7 tally trees. The minimum basal area factor utilized was 10 BAF, representing ten square feet of basal area per tally tree. Every prism plot also had a 1/250th acre circular fixed area plot to sample small trees and seedlings less than 4.6 inches DBH. Tally trees were evaluated for percent volume loss by segment. Every tree was divided into three segments up to a merch DIB top and each segment defected in 5% increments of total tree volume.

Comprehensive tree level metrics to enable analyses of volumetric and biometric reports were recorded on all plots. Refer to Appendix G Cruise Specifications v06092024 for detailed descriptions.

Table 7: Tree Level Metrics

Tree Level Metrics			
Species	Diameter DBH	Status/Group	Total Height
Crown Ratio	Segment Data/Defect	Breast Height Age	Growth Increment (10 year)

Data Summary

Collected field data was collated daily and subject to a quality control review for errors and omissions to maintain data integrity. The sampled stands data was then entered into the FPS inventory software. The compiler, utilizing the FBRI certified Alaskan Library 20, calculated volume attributes for the individual sampled stands. These stands provide the basis for all the volumetric summations and projections presented. Cruised stand attributes were then expanded into the non-cruised stands with matching vegetative labels assigned by the vegetative photo stratification. Cruised stands maintain their unique tree level data and expanded stands carry and estimate generated by creating a weighted by acres average tree list using all cruised stands in the stratum. Summary attributes are reported by strata, individual stands, species, vegetative label (type call), product on a project and regional zone classification. The inventory contains seven (7) separate sample strata for which estimates of gross and net volume per acre have been calculated. Characteristics of these timber types were observed and summarized during the field work phase of the inventory. Acreage of sampled and un-sampled timber types and the corresponding stratum are shown in Appendix B. Total inventory volume was calculated by multiplying the weighted average per acre volume figures for each stratum by the number of acres each sample stratum represents. These calculations were generated in the FPS inventory suite utilizing acreage figures calculated in the GIS software.

Description of Strata

A brief description of the seven volume strata is presented below. Species composition of forested ground observed for the inventory project area predominately consists of Spruce dominated conifer stands, Hemlock dominated conifer stands, Spruce dominated conifer stands with lesser amounts of mostly Birch hardwoods, and areas of primarily Birch dominated hardwoods. Large tracts of conifer species including White Spruce, Lutz Spruce, Sitka Spruce, Mountain Hemlock, and Western Hemlock are found in the southern and eastern areas of the greater Kenai Peninsula with mixed conifer, Birch dominated hardwood and Black Spruce becoming more prevalent as you move north. Spruce dominated stands in all regions have been impacted by old beetle kill with significant mortality of the sawtimber and larger pole timber. The impact of this perturbation is difficult to quantify as many of the affected trees are now down and, in many areas, have been cut. The areas sampled can provide a reasonable estimate

of present and anticipated mortality, however, the distribution and variability of severity make extrapolation of mortality unreliable.

Stratum 1 White Spruce/Sitka Spruce – Saw

This stratum is found throughout the project area but with heavier concentrations on the southern parts of the Kenai. The prevalence of Sitka Spruce is confined to the most southerly areas. The majority of the area occupied by this stratum is White Spruce or Lutz Spruce. It is the third largest in area of all the strata and comprises 17% of the total merchantable timberland area. The standing dead trees are generally suitable for fuelwood and biomass, with little sawtimber potential.

Figure 4: White Spruce/Sitka Spruce – Saw

Beetle mortality in White Spruce

Stratum 2 White Spruce/Sitka Spruce – Pole

Predominantly prevalent across the southern portions of the greater Kenai Peninsula. This stratum is the second largest in area and makes up 24% of the total merchantable timberland area. Species composition in this stratum is primarily White Spruce pole timber often with a highly scattered mostly Birch hardwood component.

Figure 5: While Spruce/Sitka Spruce – Pole Size

Stratum 3 White Spruce/Sitka Spruce – Seedlings/Saplings

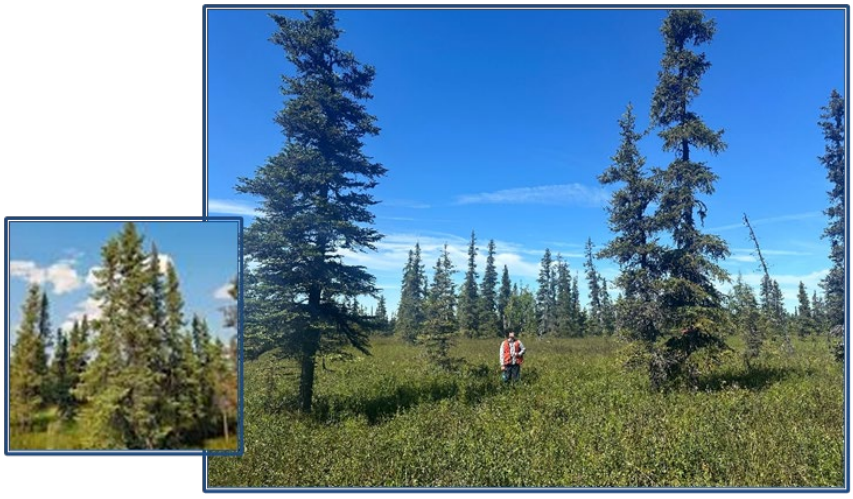
This stratum is also concentrated on the peninsula north of Homer and mostly south of the Ninilchik area and extends east beyond the Fox River flats. It is characterized by flat, often boggy terrain, poorly drained sites with a mixture of Black Spruce seedlings. White Spruce usually occurs in clumps/small scattered stands on any minimally higher ground. The Black Spruce is characteristically non-commercial and typically is not going to develop into pole timber or sawtimber. There is however, limited potential for biomass. Most trees in this stratum are less than five inches DBH and highly suppressed.

Figure 6: White Spruce/Sitka Spruce Seedling/Sapling

Stratum 4 Black Spruce – Pole/Saw

The Black Spruce – Pole/Saw stratum is found mostly on the northern Kenai Peninsula specifically north and east of the Ninilchik area. The trees in this stratum are dominated by Black Spruce and White Spruce at roughly equal amounts. White Spruce usually occurs in clumps/small scattered stands on any minimally higher ground. The stratum is characterized by flat, often boggy terrain, poorly drained sites. Typically, these stands are similar to the White Spruce seedling/sapling type with a more significant pole timber component.
Merchantable sized trees (>9 inches DBH), are usually highly scattered, with counts of 50 to 2,000 trees per acre of Black Spruce that are less than 5 inches DBH.

Figure 7: Black Spruce Pole/Saw



Stratum 5 Mountain Hemlock – Pole/Saw

This stratum is concentrated on the southern Kenai Peninsula south of Kachemak Bay, the eastern peninsula at higher elevations in proximity to the Cooper Landing area, and along the Seward Highway. Mountain Hemlock is the dominate species, however, the stratum often exits with a strong Spruce component. It is one of the highest volume-per-acre stratum in the inventory.

Figure 8: Mountain Hemlock Pole/Saw

Stratum 6 Mixed Conifer – Pole/Saw

This stratum is made up of merchantable timber stands with no single conifer species dominating the stand composition. At least 60% of the stand is conifer and often has a scattered or significant hardwood component, usually Birch. The conifer makeup varies with the stand geographic distribution across the Kenai Peninsula but is usually strong to Spruce spp. and a significant Hemlock component. This is the largest stratum by area and volume. Given the more diverse species composition and range of size/density classes the variability within this stratum is also the highest.

Figure 9: Mixed Conifer Pole/Saw

Stratum 7 Hardwood/Broadleaf – Pole/Saw

This stratum is concentrated between Ninilchik and Clam Gulch, Fox River flats, and lower elevations along the eastern side of Kachemak Bay. Birch and White Spruce comprise near equal portions of the stocking with small amounts of Black Spruce, Cottonwood and Aspen. Defect is relatively high in the Birch with most trees suitable for only fuelwood or biomass.

Figure 10: Hardwood/Broadleaf – Pole/Saw

Results

Volume Definitions

The results of volume calculations presented in this report are Cubic Feet, Board Feet, and Tons. Merchantable timber is defined as a 9" DBH tree with a minimum 12' segment to a 2" DIB top. Tons were calculated utilizing the entire merchantable bole length in merchandized logs. Puget Sound Log Scaling Bureau Rules were utilized in establishing log grades. The following Table 8 displays the merchandizing grade calls by species.

Table 8: Merchandizing Standards by Species

Species	Sort/Grade	Label	Rpt_Grp	MinDib	MinDbh	MinLen	MaxDef	MinVol
Black Cottonwood	#0	Residual	HWD1	1.00	1.00	4.00	1.00	0.00
Black Cottonwood	51	1 Saw	HWD1	10.00	9.00	16.00	0.25	0.00
Black Cottonwood	52	2 Saw	HWD1	6.00	9.00	8.00	0.66	0.00
Black Cottonwood	54	4 Saw	HWD1	5.00	9.00	8.00	0.66	10.00
Black Cottonwood	94	PULP	HWD1	2.00	9.00	8.00	1.00	0.00
Black Spruce	#0	Residual	CSPR	1.00	1.00	4.00	1.00	0.00
Black Spruce	11	1 Saw	CSPR	20.00	9.00	16.00	0.25	0.00
Black Spruce	12	2 Saw	CSPR	12.00	9.00	12.00	0.45	0.00
Black Spruce	13	3 Saw	CSPR	6.00	9.00	12.00	0.66	50.00
Black Spruce	14	4 Saw	CSPR	5.00	9.00	12.00	0.66	10.00

Species	Sort/Grade	Label	Rpt_Grp	MinDib	MinDbh	MinLen	MaxDef	MinVol
Black Spruce	94	PULP	CSPR	2.00	9.00	8.00	1.00	0.00
Kenai Birch	#0	Residual	HWD2	1.00	1.00	4.00	1.00	0.00
Kenai Birch	51	1 Saw	HWD2	16.00	9.00	16.00	0.25	0.00
Kenai Birch	52	2 Saw	HWD2	12.00	9.00	8.00	0.66	0.00
Kenai Birch	53	3 Saw	HWD2	10.00	9.00	8.00	0.66	0.00
Kenai Birch	54	4 Saw	HWD2	5.00	9.00	8.00	0.66	10.00
Kenai Birch	94	PULP	HWD2	2.00	9.00	8.00	1.00	0.00
Lutz Spruce	#0	Residual	CSPR	1.00	1.00	4.00	1.00	0.00
Lutz Spruce	11	1 Saw	CSPR	20.00	9.00	16.00	0.25	0.00
Lutz Spruce	12	2 Saw	CSPR	12.00	9.00	12.00	0.45	0.00
Lutz Spruce	13	3 Saw	CSPR	6.00	9.00	12.00	0.66	50.00
Lutz Spruce	14	4 Saw	CSPR	5.00	9.00	12.00	0.66	10.00
Lutz Spruce	94	PULP	CSPR	2.00	9.00	8.00	1.00	0.00
Mtn Hemlock	#0	Residual	CHEM	1.00	1.00	4.00	1.00	0.00
Mtn Hemlock	11	1 Saw	CHEM	20.00	9.00	16.00	0.25	0.00
Mtn Hemlock	12	2 Saw	CHEM	12.00	9.00	12.00	0.66	0.00
Mtn Hemlock	13	3 Saw	CHEM	6.00	9.00	12.00	0.66	50.00
Mtn Hemlock	14	4 Saw	CHEM	5.00	9.00	12.00	0.66	10.00
Mtn Hemlock	94	PULP	CHEM	2.00	9.00	8.00	1.00	0.00
Paper Birch	#0	Residual	HWD2	1.00	1.00	4.00	1.00	0.00
Paper Birch	51	1 Saw	HWD2	16.00	9.00	16.00	0.25	0.00
Paper Birch	52	2 Saw	HWD2	12.00	9.00	8.00	0.66	0.00
Paper Birch	53	3 Saw	HWD2	10.00	9.00	8.00	0.66	0.00
Paper Birch	54	4 Saw	HWD2	5.00	9.00	8.00	0.66	10.00
Paper Birch	94	PULP	HWD2	2.00	9.00	8.00	1.00	0.00

Inventory Volume by Species

Inventory volume is reported below in Table 9 by tree species across all strata. These figures represent the merchantable stratified acres netted down for all land use restrictions, roads and fish bearing stream buffers. Presented volumes are calculated on a stand level, weighted by stand acres, summed and averaged by total merchantable acres. When the entire volume by species is summed and divided by the merchantable "unrestricted" timberland area of 177,814+/- acres there is an average volume of 1,961+/- net cubic feet per acre. Similarly, over all there is an average of 29+/- net tons per acre and 9,506+/- net board feet per acre. The values for all volumetrics are reported for trees equal to or greater than nine inches DBH, the threshold for a merchantable tree.

Table 9: Volume per Acre Across All Strata for Unrestricted, Available Timber

SPECIES	Net CF/Acre	Net BF/Acre
Black Cottonwood	23	116
Black Spruce	8	38
Kenai/Paper Birch	70	276
Lutz/White Spruce	203	887
Mtn Hemlock	606	2,698
Quaking Aspen	16	69
Sitka Spruce	1,004	5,253
Balsam Poplar	29	159
Unknown Hardwood	2	10

Merchantable net inventory volume by species and size class across all strata is presented in Table 10 below. Size class 5, large sawtimber, comprises 47% of the total net cubic volume (NetCF) and 52% of the total net board foot volume (NetBF). The saw timber size class, size class 4, comprises 35% of the total net cubic volume and 32% of the total board foot volume. Size class 3, pole size timber comprises 18% of the total net cubic volume and 16% of the total BF volume.

Figure 11: Timber Volume by Size Class

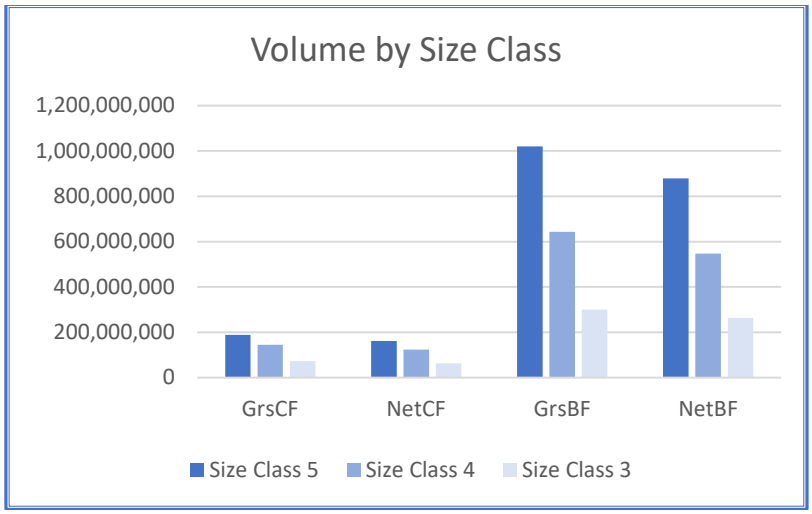


Table 10: Merchantable Volume by Species and Size Class Across All Strata

SPECIES	Grs CF	Net CF	Grs BF	Net BF	Grs Tons	Net Tons
Size Class 5 - Large Saw (>17.5" DBH)						
Black Cottonwood	2,297,929	1,806,118	11,900,026	9,458,975	65,496	25,822
Black Spruce	32,475	28,201	163,985	144,769	769	416
Kenai/Paper Birch	3,361,585	2,240,708	13,877,867	9,122,685	74,928	41,972
Lutz/White Spruce	4,198,003	3,709,675	20,570,714	18,197,844	105,786	52,414
Hemlock	42,137,431	34,519,981	208,034,942	170,517,654	1,219,910	552,416
Quaking Aspen	785,806	610,772	3,416,635	2,643,932	19,186	9,321
Sitka Spruce	129,112,802	114,468,264	723,941,615	641,437,323	3,058,901	1,612,050
Balsam Poplar	6,924,641	4,890,862	36,667,528	26,892,047	177,711	86,458
Other Hardwood	264,403	189,385	1,095,644	747,308	7,920	3,961
Total	**189,115,075**	**162,463,966**	**1,019,668,956**	**879,162,537**	**4,730,608**	**2,384,830**
Size Class 4 – Saw (>11.5" and <17.6" DBH)						
Black Cottonwood	2,293,879	1,856,774	11,001,406	8,890,641	65,074	25,777
Black Spruce	347,238	267,772	1,542,627	1,145,798	8,547	4,444
Kenai/Paper Birch	11,964,328	7,907,367	46,845,994	30,453,374	264,632	149,382
Lutz/White Spruce	13,804,364	12,367,462	60,112,686	53,870,957	366,027	172,356
Hemlock	57,969,668	48,436,915	248,900,683	207,618,531	1,729,013	759,975
Quaking Aspen	2,399,228	1,836,513	10,258,218	7,799,510	58,837	28,458
Sitka Spruce	55,880,515	50,152,871	262,175,745	235,801,091	1,413,821	697,701
Balsam Poplar	513,442	270,840	2,351,101	1,200,254	13,688	6,411
Other Hardwood	157,043	141,758	670,070	614,377	4,801	2,353
Total	**145,329,705**	**123,238,272**	**643,858,530**	**547,394,533**	**3,924,442**	**1,846,857**
Size Class 3 – Pole (>8.5" and <11.6" DBH)						
Black Cottonwood	622,613	465,760	2,919,364	2,203,618	17,536	6,996
Black Spruce	1,328,414	1,207,580	5,938,021	5,407,847	33,056	17,001
Kenai/Paper Birch	3,247,644	2,354,370	13,146,620	9,636,564	71,332	40,549
Lutz/White Spruce	22,057,446	20,011,055	94,278,979	85,649,820	606,759	275,401
Hemlock	28,404,069	24,713,512	116,970,467	101,763,511	871,288	372,374
Quaking Aspen	575,822	438,402	2,507,491	1,903,256	14,234	6,830
Sitka Spruce	15,844,004	13,937,764	63,788,083	56,804,297	428,367	197,822
Balsam Poplar	39,299	31,006	173,714	139,233	1,090	491
Other Hardwood	117880	111997	497183	472328	3734.6	1766.274
Total	**72,237,191**	**63,271,446**	**300,219,922**	**263,980,474**	**2,047,396**	**919,229**
Grand Total	**406,681,971**	**348,973,684**	**1,963,747,408**	**1,690,537,544**	**10,702,447**	**5,150,916**

To assist management teams in understanding the wide and complex distribution of volume across strata the project was further divided into four distinct reporting zones. Refer to the GIS dataset for details and spatial, representation. The four zones are Kenai West, Kenai East, which are acres that are more assessable to a harvest regime, and Kenai West Remote, Kenai East Remote, which are, as the name implies, more remotely located and present a much greater

challenge to a harvest regime. Table 3 in the Executive Summary shows the same total available non-restricted acres and volume within the four sub-reporting regional zones. Figure 12 demonstrates this same data in a graphical format. The volumes presented in Table 3 are also presented by species by size class for each regional zone in the tables and figures below.

Figure 12: Net Volume by Region

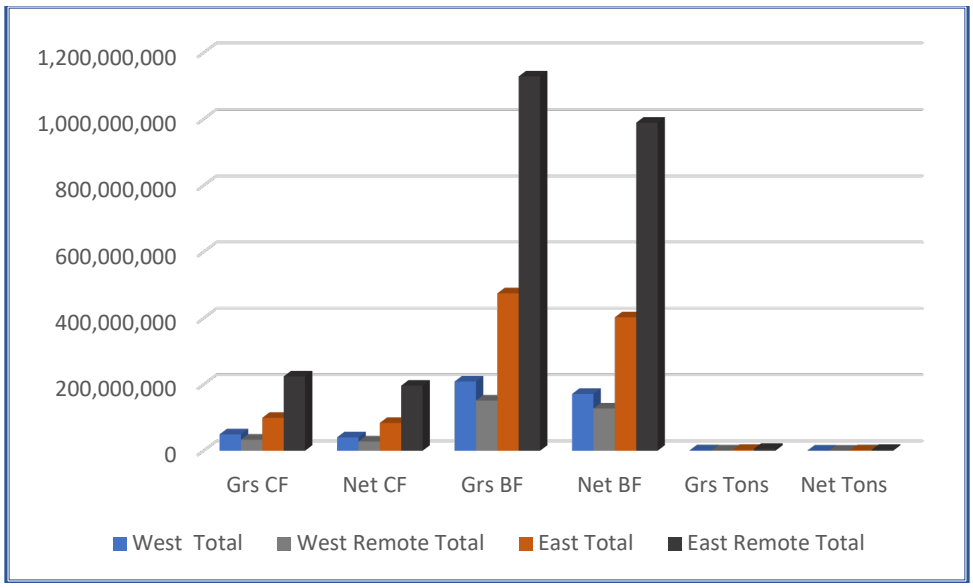


Figure 13: Example of timber type map with inventory data

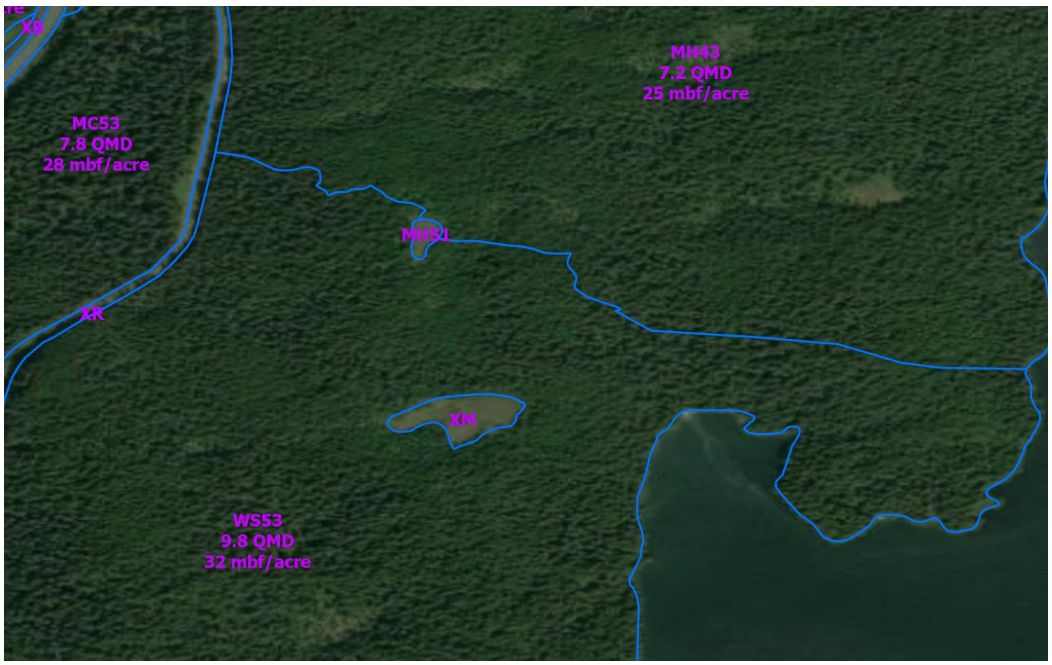


Table 11: Kenai West Region - Volume by Species by Size Class

SPECIES	Grs CF	Net CF	Grs BF	Net BF	Grs Tons	Net Tons
Size Class 5 - Large Saw						
Black Cottonwood	669,307	487,486	3,138,018	2,349,541	19,027	7,521
Black Spruce	8,676	6,046	31,458	20,738	214	111
Kenai/Paper Birch	1,787,550	1,189,908	7,504,467	4,854,635	39,848	22,319
Lutz/White Spruce	627,405	566,952	2,884,765	2,600,550	16,073	7,834
Hemlock	345,946	240,424	1,572,361	1,089,816	10,145	4,535
Quaking Aspen	414,895	337,044	1,784,620	1,445,985	10,132	4,921
Sitka Spruce	1,033,559	911,086	5,203,203	4,579,752	25,356	12,905
Balsam Poplar	1,572,779	1,069,235	8,364,802	5,964,900	40,236	19,637
Other Hardwood	219,685	157,355	910,352	620,924	6,580	3,292
Total	**6,679,802**	**4,965,536**	**31,394,046**	**23,526,841**	**167,612**	**83,074**
Size Class 4 - Saw						
Black Cottonwood	637,277	508,166	2,954,751	2,350,191	18,055	7,161
Black Spruce	243,269	180,274	1,062,284	748,216	5,994	3,113
Kenai/Paper Birch	6,673,053	4,351,135	26,462,571	16,872,751	147,649	83,317
Lutz/White Spruce	6,809,082	6,043,299	28,984,908	25,690,718	181,515	85,016
Hemlock	633,532	443,064	2,535,769	1,724,722	19,080	8,305
Quaking Aspen	1,328,107	1,035,116	5,624,079	4,356,884	32,576	15,753
Sitka Spruce	7,474,270	6,439,683	31,251,592	27,021,746	195,913	93,321
Balsam Poplar	80,585	61,770	347,303	265,866	2,172	1,006
Other Hardwood	126,108	117,786	543,682	510,473	3,851	1,890
Total	**24,005,283**	**19,180,293**	**99,766,939**	**79,541,567**	**606,807**	**298,882**
Size Class 3 - Pole						
Black Cottonwood	200,970	144,900	928,094	675,023	5,657	2,258
Black Spruce	592,850	523,151	2,609,625	2,306,871	14,855	7,587
Kenai/Paper Birch	1,333,452	1,013,682	5,388,633	4,110,786	29,283	16,649
Lutz/White Spruce	12,410,609	11,284,093	52,243,563	47,554,418	342,012	154,954
Hemlock	360,575	302,612	1,288,634	1,076,490	11,197	4,727
Quaking Aspen	253,889	201,109	1,126,992	888,441	6,270	3,012
Sitka Spruce	3,586,079	2,868,932	13,774,723	11,320,585	99,107	44,774
Balsam Poplar	7,159	5,890	31,286	25,862	199	89
Other Hardwood	100,509	95,488	424,712	403,482	3,188	1,506
Total	**18,846,092**	**16,439,857**	**77,816,262**	**68,361,958**	**511,768**	**235,557**
West Grand Total	**49,531,177**	**40,585,686**	**208,977,247**	**171,430,366**	**1,286,187**	**617,513**

Table 12: Kenai West Remote Region - Volume by Species by Size Class

SPECIES	Grs CF	Net CF	Grs BF	Net BF	Grs Tons	Net Tons
Size Class 5 - Large Saw						
Black Cottonwood	453,454	363,063	2,391,301	1,932,082	12,930	5,096
Black Spruce	432	310	1,655	1,160	11	6
Kenai/Paper Birch	413,232	278,445	1,739,166	1,187,566	9,214	5,160
Lutz/White Spruce	1,781,228	1,554,210	9,027,198	7,892,451	44,571	22,240
Hemlock	984,294	773,845	4,560,101	3,586,599	28,813	12,904
Quaking Aspen	104,087	84,725	451,961	368,736	2,542	1,235
Sitka Spruce	4,523,771	3,946,034	24,647,423	21,472,550	108,187	56,482
Balsam Poplar	2,216,732	1,540,949	11,758,515	8,518,765	56,787	27,677
Other Hardwood	9,909	7,098	41,057	28,006	297	148
Total	**10,487,139**	**8,548,679**	**54,618,377**	**44,987,915**	**263,352**	**130,947**
Size Class 4 - Saw						
Black Cottonwood	634,228	520,151	3,118,470	2,544,113	18,005	7,127
Black Spruce	16,732	14,386	72,923	61,056	413	214
Kenai/Paper Birch	1,476,104	966,486	5,825,123	3,783,503	32,654	18,430
Lutz/White Spruce	2,417,739	2,192,145	10,777,277	9,783,751	63,689	30,187
Hemlock	3,128,587	2,529,335	12,878,969	10,374,614	93,850	41,015
Quaking Aspen	246,524	192,931	1,065,057	828,165	6,043	2,924
Sitka Spruce	6,218,525	5,486,344	27,066,262	23,935,590	160,903	77,642
Balsam Poplar	163,039	116,343	731,472	516,694	4,361	2,036
Other Hardwood	8,370	5,310	32,521	23,024	258	125
Total	**14,309,848**	**12,023,431**	**61,568,074**	**51,850,510**	**380,177**	**179,700**
Size Class 3 - Pole						
Black Cottonwood	191,472	141,575	924,007	693,654	5,392	2,152
Black Spruce	24,527	21,684	102,807	91,011	616	314
Kenai/Paper Birch	730,094	496,024	2,899,370	2,041,783	16,040	9,116
Lutz/White Spruce	3,767,640	3,423,301	16,588,056	15,097,810	103,306	47,041
Hemlock	1,408,952	1,233,270	5,506,447	4,825,966	43,547	18,471
Quaking Aspen	137,146	102,909	562,513	420,787	3,393	1,627
Sitka Spruce	2,276,077	1,908,902	8,536,297	7,312,289	62,885	28,418
Balsam Poplar	16,601	12,824	72,132	56,803	462	207
Other Hardwood	5058	4807	21535	20460	161	76
Total	**8,557,567**	**7,345,296**	**35,213,164**	**30,560,563**	**235,801**	**107,422**
West Remote Grand Total	**33,354,554**	**27,917,406**	**151,399,615**	**127,398,988**	**879,330**	**418,069**

Table 13: Kenai East Region - Volume by Species by Size Class

SPECIES	Grs CF	Net CF	Grs BF	Net BF	Grs Tons	Net Tons
Size Class 5 - Large Saw						
Black Cottonwood	952,835	776,214	5,272,671	4,291,366	27,212	10,707
Black Spruce	20,253	19,162	115,322	109,243	471	259
Kenai/Paper Birch	323,417	200,409	1,262,737	827,293	7,200	4,038
Lutz/White Spruce	1,076,725	952,603	5,299,371	4,699,069	27,092	13,443
Hemlock	15,212,359	12,347,654	74,900,023	60,962,853	440,527	199,432
Quaking Aspen	115,133	71,178	540,087	336,140	2,806	1,366
Sitka Spruce	26,220,825	23,001,709	145,528,732	127,677,734	622,975	327,383
Balsam Poplar	1,488,758	1,066,198	7,870,776	5,833,440	38,259	18,588
Other Hardwood	7,384	5,289	30,598	20,869	221	111
Total	**45,417,689**	**38,440,416**	**240,820,317**	**204,758,007**	**1,166,764**	**575,326**
Size Class 4 - Saw						
Black Cottonwood	835,106	685,639	4,114,626	3,371,208	23,716	9,384
Black Spruce	20,713	15,971	91,880	70,365	509	265
Kenai/Paper Birch	1,163,190	783,915	4,395,784	2,986,396	25,705	14,523
Lutz/White Spruce	2,153,656	1,950,854	9,644,425	8,753,424	56,643	26,890
Hemlock	20,977,605	17,074,571	88,730,699	72,048,723	626,923	275,014
Quaking Aspen	287,151	192,089	1,258,028	838,106	7,033	3,406
Sitka Spruce	11,756,117	10,448,264	55,730,130	49,586,675	296,366	146,782
Balsam Poplar	108,431	43,885	505,338	195,409	2,880	1,354
Other Hardwood	6,060	3,959	23,719	17,158	187	91
Total	**37,308,029**	**31,199,147**	**164,494,629**	**137,867,464**	**1,039,961**	**477,709**
Size Class 3 - Pole						
Black Cottonwood	202,326	157,948	952,482	747,389	5,703	2,274
Black Spruce	103,134	94,820	460,112	423,645	2,555	1,320
Kenai/Paper Birch	568,821	409,677	2,360,258	1,730,550	12,501	7,102
Lutz/White Spruce	2,381,850	2,140,834	10,414,759	9,391,293	65,330	29,739
Hemlock	10,450,663	8,852,009	42,166,194	35,714,830	321,457	137,007
Quaking Aspen	102,744	67,748	471,289	311,808	2,542	1,219
Sitka Spruce	2,965,458	2,713,353	12,680,477	11,640,359	79,033	37,025
Balsam Poplar	5,667	4,311	24,675	19,215	158	71
Other Hardwood	2909	2764	12156	11546	91.6705	43.6095
Total	**16,783,572**	**14,443,464**	**69,542,402**	**59,990,635**	**489,369**	**215,800**
East Total	**99,509,290**	**84,083,027**	**474,857,348**	**402,616,106**	**2,696,094**	**1,268,835**

Table 14: Kenai East Remote Region - Volume by Species by Size Class

SPECIES	Grs CF	Net CF	Grs BF	Net BF	Grs Tons	Net Tons
Size Class 5 - Large Saw						
Black Cottonwood	222,333	179,355	1,098,036	885,986	6,326	2,498
Black Spruce	3,114	2,683	15,550	13,628	74	40
Kenai/Paper Birch	837,386	571,946	3,371,497	2,253,191	18,666	10,455
Lutz/White Spruce	712,645	635,910	3,359,380	3,005,774	18,050	8,898
Hemlock	25,594,832	21,158,058	127,002,457	104,878,386	740,424	335,545
Quaking Aspen	151,691	117,825	639,967	493,071	3,706	1,799
Sitka Spruce	97,334,647	86,609,435	548,562,257	487,707,287	2,302,383	1,215,281
Balsam Poplar	1,646,372	1,214,480	8,673,435	6,574,942	42,430	20,556
Other Hardwood	27,425	19,643	113,637	77,509	821	411
Total	**126,530,445**	**110,509,335**	**692,836,216**	**605,889,774**	**3,132,880**	**1,595,483**
Size Class 4 - Saw						
Black Cottonwood	187,268	142,818	813,559	625,129	5,298	2,104
Black Spruce	66,524	57,141	315,540	266,161	1,631	851
Kenai/Paper Birch	2,651,981	1,805,831	10,162,516	6,810,724	58,624	33,112
Lutz/White Spruce	2,423,887	2,181,164	10,706,076	9,643,064	64,180	30,264
Hemlock	33,229,944	28,389,945	144,755,246	123,470,472	989,161	435,640
Quaking Aspen	537,446	416,377	2,311,054	1,776,355	13,185	6,375
Sitka Spruce	30,431,603	27,778,580	148,127,761	135,257,080	760,639	379,957
Balsam Poplar	161,387	48,842	766,988	222,285	4,274	2,015
Other Hardwood	16,505	14,703	70,148	63,722	505	247
Total	**69,706,545**	**60,835,401**	**318,028,888**	**278,134,992**	**1,897,497**	**890,565**
Size Class 3 - Pole						
Black Cottonwood	27,845	21,337	114,781	87,552	784	313
Black Spruce	607,903	567,925	2,765,477	2,586,320	15,029	7,780
Kenai/Paper Birch	615,277	434,987	2,498,359	1,753,445	13,509	7,682
Lutz/White Spruce	3,497,347	3,162,827	15,032,601	13,606,299	96,112	43,667
Hemlock	16,183,879	14,325,621	68,009,192	60,146,225	495,088	212,168
Quaking Aspen	82,043	66,636	346,697	282,220	2,030	973
Sitka Spruce	7,016,390	6,446,577	28,796,586	26,531,064	187,342	87,604
Balsam Poplar	9,872	7,981	45,621	37,353	272	123
Other Hardwood	9,404	8,938	38,780	36,840	294	141
Total	**28,049,960**	**25,042,829**	**117,648,094**	**105,067,318**	**810,459**	**360,451**
East Remote Total	**224,286,950**	**196,387,565**	**1,128,513,198**	**989,092,084**	**5,840,836**	**2,846,498**

Table 15: Kenai West Region - Volume by Species by Size Class

SIZE CLASS	GrsCF	NetCF	GrsBF	NetBF	GrsTons	NetTons
Size Class 5	6,679,802	4,965,536	31,394,046	23,526,841	167,612	83,074
Size Class 4	24,005,283	19,180,293	99,766,939	79,541,567	606,807	298,882
Size Class 3	18,846,092	16,439,857	77,816,262	68,361,958	511,768	235,557

Figure 14: Kenai West Region - Volume by Species by Size Class

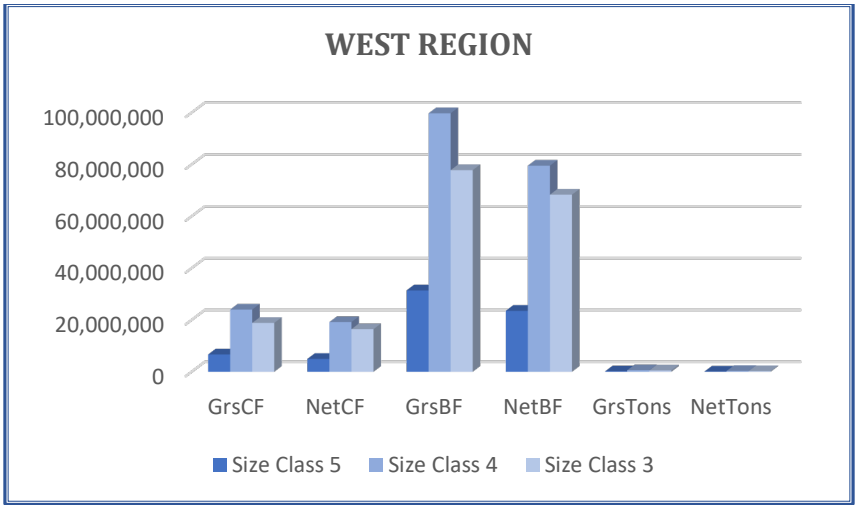


Table 16: Kenai West Remote Region - Volume by Species by Size Class

SIZE CLASS	GrsCF	NetCF	GrsBF	NetBF	GrsTons	NetTons
Size Class 5	10,487,139	8,548,679	54,618,377	44,987,915	263,352	130,947
Size Class 4	14,309,848	12,023,431	61,568,074	51,850,510	380,177	179,700
Size Class 3	8,557,567	7,345,296	35,213,164	30,560,563	235,801	107,422

Figure 15: Kenai West Remote Region - Volume by Species by Size Class

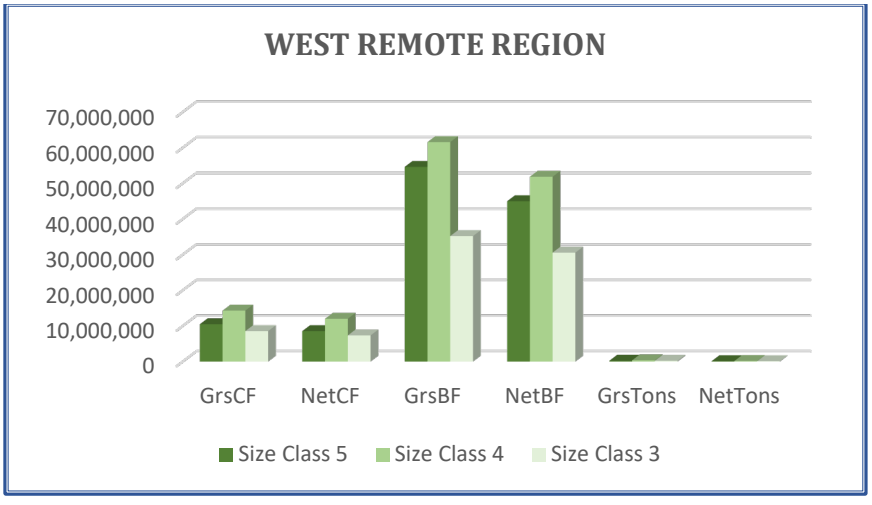


Table 17: Kenai East Region - Volume by Species by Size Class

SIZE CLASS	GrsCF	NetCF	GrsBF	NetBF	GrsTons	NetTons
Size Class 5	45,417,689	38,440,416	240,820,317	204,758,007	1,166,764	575,326
Size Class 4	37,308,029	31,199,147	164,494,629	137,867,464	1,039,961	477,709
Size Class 3	16,783,572	14,443,464	69,542,402	59,990,635	489,369	215,800

Figure 16: Kenai East Region - Volume by Species by Size Class

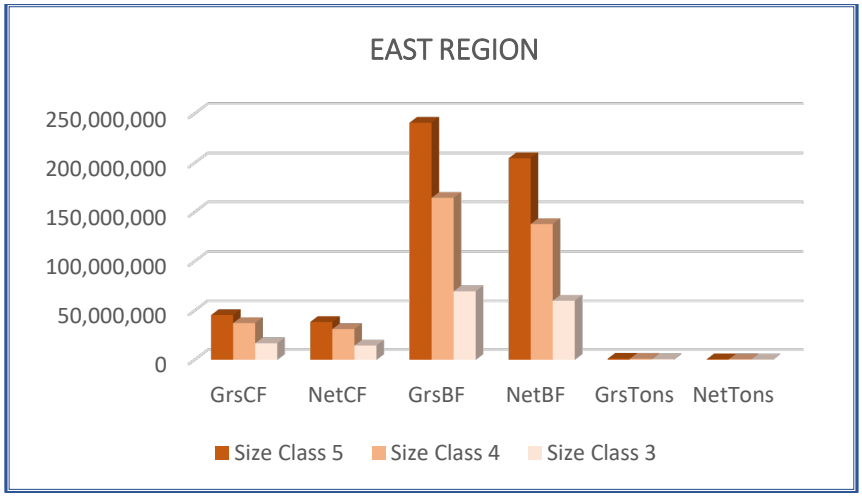


Table 18: Kenai East Remote Region - Volume by Species by Size Class

SIZE CLASS	GrsCF	NetCF	GrsBF	NetBF	GrsTons	NetTons
Size Class 5	126,530,445	110,509,335	692,836,216	605,889,774	3,132,880	1,595,483
Size Class 4	69,706,545	60,835,401	318,028,888	278,134,992	1,897,497	890,565
Size Class 3	28,049,960	25,042,829	117,648,094	105,067,318	810,459	360,451

Figure 17: Kenai East Remote Region - Volume by Species by Size Class

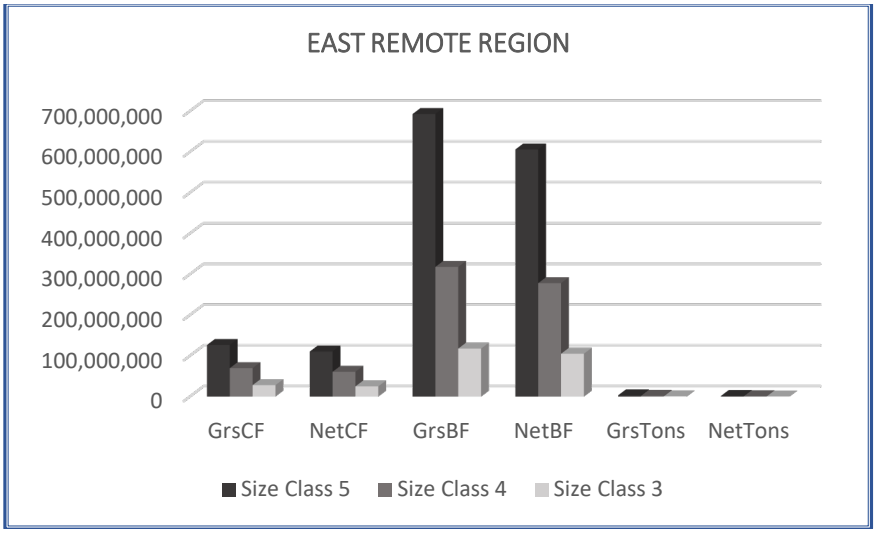


Table 19: Gross to Net Volume per acre by Species

SPECIES	Grs CF/Ac	Net CF/Ac	Grs BF/Ac	Net BF/Ac	CF %Defect	BF %Defect
Black Cottonwood	29	23	145	116	21%	20%
Black Spruce	10	8	43	38	20%	12%
Kenai/Paper Birch	104	70	415	276	33%	33%
Lutz/White Spruce	225	203	984	887	10%	10%
Hemlock	723	606	3,228	2,698	16%	16%
Quaking Aspen	21	16	91	69	24%	24%
Sitka Spruce	1,129	1,004	5,905	5,253	11%	11%
Balsam Poplar	42	29	220	159	31%	28%
Other Hardwood	3	2	13	10	33%	23%

Sampling Error by Stratum

Sample error was calculated for the net board foot, basal area, and trees per acre estimate by project and strata. The percent sample error (SE%) is given within one standard deviation (SD) of the mean. This means that there is a 68% chance (one standard deviation) that the measured components presented are within plus or minus the error percentage indicated.

Table 20: Inventory Sampling Error Total and by Strata

		Stands	# of Plots	%SE MBF	%SE BA	%SE TPA
	Project Total	435	3,754	2	1.7	3.7
1	White Spruce/Sitka Spruce - Saw	63	609	3.2	3	11
2	White Spruce/Sitka Spruce - Pole	85	973	3.7	1.9	5.1
3	White Spruce/Sitka Spruce - Seedlings and Saplings	31	102	3.2	1.7	5.1
4	Black Spruce - Pole Size or Larger	18	208	7.8	3.6	7
5	Mountain Hemlock - Pole Size or Larger	78	698	3	3.1	7.3
6	Mixed Conifer - Pole Size and Larger	88	826	4.5	3.5	8.1
7	Hardwood/Broadleaf - Pole Size or Larger	35	152	5.6	3.7	11.7

NOTE: An additional 37 stands containing 186 plots were sampled in the smaller, non-merchantable size classes.

Log Grades

Tree merchandizing and log grading estimates were calculated during the data compilation exercise within the FPS software suite. Log grades were computed for all merchantable trees (>9 inches DBH). Due to aggregating and computational differences between the compiler and merchandising utilities insignificant differences are observed. Log grades use Puget Sound grading rules, Refer to Appendix D, which contain specifications for various species. Puget Sound Sitka Spruce rules were applied to White Spruce, Sitka Spruce, Mountain Hemlock and Black Spruce. Red Alder rules were applied to Aspen and Birch. Refer to Table 8 for merchandizing specifications utilized by species.

Site Index

Site index is a common method of estimating site quality as it reflects the combined effect of all environmental factors and is therefore a good measure of stand and forest productivity. Site trees selected were dominant and or co-dominant trees with no major insect, disease or apparent injury problems. Site trees were selected in the field as ones displaying vigorous health and continued height growth. It was common, however; to find no suitable site tree candidates and some selected trees were far less than ideal. The FPS software package contains a site index calculator that it solves using its own internal (unpublished) site curves and functions. The results are presented in Table 21 below. The authors tested a handful of published site curves including Farr 1984[1] and Payandeh 1974[2]. Farr proved completely unsuitable for use on the Kenai (not surprising given that the curves were developed for second growth Spruce and Hemlock in Southeast Alaska). Payandeh, whose curves were developed on natural Canadian trees, produced values slightly lower than FPS but confirmed the reasonableness of using the FPS methods. All estimates use base age 50 years for Spruce/Hemlock and 50 years for hardwoods.

Table 21: Average Site Index by Strata

Strata #	Description	Average Site Index
1	White Spruce/Sitka Spruce - Saw	43
2	White Spruce/Sitka Spruce - Pole	43
3	White Spruce/Sitka Spruce - Seedlings and Saplings	38
4	Black Spruce - Pole Size or Larger	49
5	Mountain Hemlock - Pole Size or Larger	44
6	Mixed Conifer - Pole Size and Larger	52
7	Hardwood/Broadleaf - Pole Size or Larger	52
	Average Site Index for Cruised All Stands	**46**

[1] Farr, Wilbur A. Site index and height growth curves for unmanaged even-aged stands of western hemlock and Sitka spruce in southeast Alaska. Res. Pap. PNW-326. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; 1984. 26 p

[2] Payandeh, B. Nonlinear site index equations for several major Canadian timber species. For. Chron. 50: 194-196; 1974.

Regeneration

Presence and abundance of seedling/sapling sized trees is another indicator of productivity. A nested 1/250th acre fixed radius plot designed to sample this parameter was installed on every sample point. Analysis of these data provides evidence of whether individual timber stands are being renewed by new growing stock. On-site field observations and data review indicates there is definitely regeneration of targeted merchantable trees across the presented strata; however, a large percentage of tallied stems are deformed, highly suppressed or defective. The majority of these stress-impacted trees will not grow into a merchantable stem. This is generally the case across the strata. In the Spruce and much of the smaller size class mixed conifer stratum, grass competition presents a significant detrimental impact on natural reforestation. Table 22 gives numbers of trees per acre less than 5 inches by species and stratum.

Table 22: Trees per Acre <5 inches DBH by Species and Strata

Strata #	BC	BS	KB/PB	LS/WS	MH/WH	QA	SS	BP	XX	Total
1	0	2	37	229	74	0	52	8	1	403
2	4	39	417	307	39	93	76	4	1	979
3	7	449	922	887	79	189	183	8	3	2,727
4	0	1,432	1	0	0	83	0	0	0	1,516
5	10	1	17	21	398	10	20	0	0	477
6	1	18	84	46	250	42	45	3	0	489
7	39	1	634	24	10	11	31	2	0	752

Current Timber Market Assessment

Part of this project was the development of a stumpage calculator tool to establish timber values on State of Alaska lands on the Kenai Peninsula. The current timber market consists primarily of small local mills operating on approximately 250mbf Scribner scale annually. These operations serve specialty markets, producing products such as cants for cabin walls, wide face 8/4 lumber for counter and table-tops, and timber-frame beams. To assist the Department of Forestry (DOF) Foresters with project and unit-level evaluations, a stumpage calculator was created based on information gathered from local logging and milling operators.

Several core market assumptions were identified during the assessment process. Material unable to produce a 6-inch cant in the first 16'6" log is generally undesirable to local markets. Firewood typically does not add extra value to timber sales as its value rarely exceeds logging and hauling costs; it is recommended to be purchaser optional. Higher volume per acre generates higher stumpage values due to increased production per machine hour. Road building costs vary significantly based on terrain and construction requirements, with three primary categories identified: Low Cost ($20,000/mile) for light construction such as brushing existing roads or light grading; Medium Cost ($40,000/mile) for light to medium cut and fill construction with some stump removal; and High Cost ($200,000/mile) for major investment roads including

drill and shoot (rock) roads, end-hauling, and major bridges. These high-cost roads should be individually engineered and evaluated for feasibility.

Operating costs were analyzed as part of the market assessment. Hauling costs are calculated as a function of daily truck cost divided by the number of loads per day (per mbf). The cost per mile estimate assumes an average road speed of 15mph, set low to account for loading and unloading times. Logging costs vary based on equipment used and production rates, which depend on volume per acre and stand operability. Steeper terrain with longer skid distances significantly reduces production compared to flat, short skid areas with similar volume per acre.

Under average conditions modeling flat ground with low road construction costs, low volume (5mbf/ac), 3 loads/day trucking, and feller buncher-shovel ground, logging costs were calculated at $485.75/mbf or $3,182/acre. This scenario represents marginally economically viable ground due to low volume per acre and small piece size. Hauling costs were determined to be $141.84/mbf or $12.34/mile, assuming short hauls with a high percentage of time on low-speed forest roads and landings. These costs would increase significantly with longer hauls at highway speeds. Despite the high operating costs, the analysis yielded positive stumpage values of $113.57/mbf for Hemlock and $170.51/mbf for Spruce. Firewood values were insufficient to cover logging and hauling costs, resulting in negative returns, supporting the recommendation that firewood be offered as operator optional rather than required removal to maximize economic returns.

Table 23: Kenai Peninsula Timber Market Assessment - Summary of Financial Findings

CATEGORY	ITEM	VALUE	NOTES
MARKET INFORMATION	Current Market Size	250 mbf annually	Small local mills serving specialty markets
	Minimum Viable Product	6-inch cant in first 16'6" log	
ROAD BUILDING	Low Cost	$20,000/mile	Light construction (brushing, grading)
	Medium Cost	$40,000/mile	Light to medium cut and fill
	High Cost	$200,000/mile	Major roads (rock, bridges)
OPERATING COSTS	Logging	$485.75/mbf	$3,182/acre (at 5 mbf/acre)
	Hauling	$141.84/mbf	$12.34/mile, 3 loads/day
	Total Operating	$627.59/mbf	Flat ground, low road construction
STUMPAGE VALUES	Hemlock	$113.57/mbf	Positive return
	Spruce	$170.51/mbf	Higher value than Hemlock
	Firewood	Negative return	Recommended as purchaser optional

The unique land management conditions of the Kenai Peninsula required a customized approach for establishing fair stumpage values. This method converts fair market selling prices of highest-value products (sold by lumber scale) to Scribner scale values by setting the overrun rate on the appraisal form to reflect actual recoveries. This approach provides the most accurate values back to the stump. The remainder of the valuation uses standard logging and hauling cost reductions from these gross values to calculate net stumpage values. This system requires open communication between the DOF, log buyers, and loggers on typically confidential topics. During periods of economic change, these variables may need to be addressed and modified on a sale-by-sale basis; in more stable times, bi-annual or annual reviews may suffice.

Stakeholders were consulted to establish initial values used in the appraisal. While they understood the importance of transparent communication about costs and production data to ensure fair pricing and maximum value to the stump, many private stakeholders were hesitant to provide detailed information, expressing unease about discussing their log supply requirements with a DOF consultant.

Based on the market assessment, it is recommended that a minimum 5-year harvest plan be developed in conjunction with the new inventory data. The initial years should focus on harvest inventory, appraisal, layout, advertisement, and harvest administration. As units progress through this process, comparing actual outcomes to projections will refine the system to accurately predict financial performance, with several years of units planned and ready for implementation as opportunities arise.

Sustainable Annual Harvest Levels

Annual allowable cut (AAC), sustained yield estimates, have been projected for the inventory project area and by specific regional areas within the Kenai Project area by strata. Each stand in the inventory is assigned to a stratum. Spruce and mixed timber types use a rotation age of 120 years which includes 10 years for establishment. Hardwood timber types use a rotation age of 80 years which includes 10 years for establishment. The sustainable annual allowable cut has been calculated using area control, which divides the acreage of each stratum by the rotation age. Refer to the tables below for sustainable harvest level results for project and each of the four regional areas. This expanded forest inventory analysis of the Kenai Peninsula reveals significant regional variations in timber resources and sustainable harvest potential. In the more accessible regions, the East area encompasses 27,716 acres of timberland with a potential annual allowable cut of 3,398 MBF. This area demonstrates higher productivity, particularly in the Mountain Hemlock stratum yielding 1,301 MBF annually and Mixed Conifer stratum producing 1,535 MBF annually. The West region contains 70,589 acres with a sustainable annual harvest of 1,441 MBFs. While these regions are in proximity to existing public transportation infrastructure, they are largely not adjacent to existing roads, necessitating moderate investment in new road infrastructure development to facilitate timber extraction operations. The remote regions present substantially different operational challenges despite their significant timber resources. The East Remote region encompasses 55,587 acres with an annual

allowable cut potential of 8,243 MBF, primarily driven by extensive Mixed Conifer stratum (46,219 acres) that alone account for 7,793 MBF annually. The West Remote region contains 23,922 acres with a potential annual harvest of 1,090 MBF, with White Spruce/Sitka Spruce sawtimber contributing 388 MBF annually. These remote areas are almost completely undeveloped, lacking essential transportation infrastructure. Timber harvesting in these regions would only be economically viable with significant capital investment in road development or operations of substantial scale.

Compared to Hanson's 2012[3] forest inventory, this analysis presents two significant methodological differences. First, the current study omits the separation of beetle-killed timber, which Hanson (2012) explicitly quantified as comprising 43% of total board foot volume, reflecting the ecological reality that the bark beetle epidemic has largely run its course on these lands and recent beetle mortality is occurring at higher elevations. More importantly, this analysis undertook a comprehensive land records review, resulting in the identification of substantially more State of Alaska owned lands with potential for timber development. While Hanson (2012) calculated a total annual allowable cut of 832 MBF from 46,780 acres within the original study area, this expanded analysis identifies 70,589 acres in the equivalent "West" region with a potential annual allowable cut of 1,441 MBF, representing a 73% increase in potential sustainable harvest volume for the comparable geographic area alone.

[3] Hanson, D. (2012). Forest Resources on State Lands in the Kenai Peninsula 2012. State of Alaska, Department of Natural Resources, Division of Forestry Northern Region, Fairbanks, Alaska.

Table 24: Annual Sustainable Harvest Levels by Strata and Region

East

Description	Acres	Rotation	Acres/Yr	CF/Acre	CF/Yr	BF/Acre	BF/Yr
White Spruce/Sitka Spruce - Saw	2,980	120	25	3,048	75,683	15,308	380,095
White Spruce/Sitka Spruce - Pole	1,808	120	15	792	11,937	3,416	51,466
White Spruce/Sitka Spruce - Seedlings and Saplings	278	120	2	107	249	394	913
Black Spruce - Pole Size or Larger	0	120	0	0	0	0	0
Mountain Hemlock - Pole Size or Larger	10,120	120	84	3,350	282,517	15,428	1,301,167
Mixed Conifer - Pole Size and Larger	11,362	120	95	3,304	312,816	16,211	1,534,942
Hardwood/Broadleaf - Pole Size or Larger	1,168	80	15	1,797	26,234	8,895	129,828
Total	**27,716**	**-**	**236**	**-**	**709,437**	**-**	**3,398,411**

West

Description	Acres	Rotation	Acres/Yr	CF/Acre	CF/Yr	BF/Acre	BF/Yr
White Spruce/Sitka Spruce - Saw	6,459	120	54	634	34,114	2,721	146,469
White Spruce/Sitka Spruce - Pole	27,657	120	230	675	155,556	2,797	644,531
White Spruce/Sitka Spruce - Seedlings and Saplings	17,079	120	142	76	10,796	288	41,043
Black Spruce - Pole Size or Larger	2,391	120	20	248	4,932	1,082	21,569
Mountain Hemlock - Pole Size or Larger	0	120	0	0	0	0	0
Mixed Conifer - Pole Size and Larger	16,141	120	135	949	127,632	4,092	550,470
Hardwood/Broadleaf - Pole Size or Larger	862	80	11	722	7,777	3,413	36,757
Total	**70,589**	**-**	**592**	**-**	**340,808**	**-**	**1,440,839**

East Remote

Description	Acres	Rotation	Acres/Yr	CF/Acre	CF/Yr	BF/Acre	BF/Yr
White Spruce/Sitka Spruce - Saw	2,867	120	24	1,287	30,744	5,687	135,865
White Spruce/Sitka Spruce - Pole	4,185	120	35	702	24,473	2,929	102,137
White Spruce/Sitka Spruce - Seedlings and Saplings	488	120	4	97	393	357	1,451
Black Spruce - Pole Size or Larger	0	120	0	0	0	0	0
Mountain Hemlock - Pole Size or Larger	1,777	120	15	3,077	45,559	14,067	208,310
Mixed Conifer - Pole Size and Larger	46,219	120	385	3,985	1,534,977	20,233	7,792,878
Hardwood/Broadleaf - Pole Size or Larger	52	80	1	709	458	3,045	1,967
Total	**55,587**	**-**	**463**	**-**	**1,636,604**	**-**	**8,242,608**

West Remote

Description	Acres	Rotation	Acres/Yr	CF/Acre	CF/Yr	BF/Acre	BF/Yr
White Spruce/Sitka Spruce - Saw	6,870	120	57	1,426	81,654	6,770	387,588
White Spruce/Sitka Spruce - Pole	6,665	120	56	962	53,410	4,220	234,398
White Spruce/Sitka Spruce - Seedlings and Saplings	2,074	120	17	59	1,027	207	3,574
Black Spruce - Pole Size or Larger	0	120	0	0	0	0	0
Mountain Hemlock - Pole Size or Larger	554	120	5	2,685	12,403	11,459	52,937
Mixed Conifer - Pole Size and Larger	6,226	120	52	1,392	72,245	6,274	325,527
Hardwood/Broadleaf - Pole Size or Larger	1,532	80	19	933	17,859	4,514	86,452
Total	**23,922**	**-**	**206**	**-**	**238,598**	**-**	**1,090,476**

Growth Estimates

Gross growth estimates have been determined by using the sub-sample of 1,294 trees that were measured for DBH, Height, total age and 10-year growth increment. Net growth (gross growth minus mortality), was not estimated. Although the Kenai Peninsula (especially the West side) experienced high insect related mortality in the early 2000's there have not been notable mortality events on State lands to the same scale in recent years. Anecdotally, foresters noted recent mortality on higher elevations on the Chugach National Forest, which were not part of this project. Growth rates indicate that trees that survived the bark beetle outbreak might be in the process of recovery.

This analysis was designed to quantify volumetric growth rates. Current tree dimensions, including diameter at breast height (DBH) and total height, were utilized. Past DBH and Height estimates were developed. Utilizing these paired dimensional datasets, tree volumes were calculated for both time periods using the standard volumetric formula ($V = \pi \times (DBH/2)^2 \times$ Height × Form Factor), with placeholder form factors applied based on species. It should be noted that the application of a simple form factor represents a simplification adopted for initial analysis efficiency. This approach introduces potential imprecisions by not accounting for variations in stem taper. Future refinements to the analysis could incorporate more sophisticated volume estimation techniques, such as taper functions, to enhance accuracy in volumetric determinations. The differential between current and past volumes, expressed as a percentage of the past volume, provides a comprehensive growth metric which give an indication of tree growth conditions over the past 10 years.

Estimating Past Diameter (10-year pre-measurement)

Dendrochronological techniques were used to establish historical diameter measurements for the trees that were measured for growth increment. Annual growth rings extracted via increment borers provided quantifiable data on radial growth patterns. Technicians measured the cumulative width of the ten most recent annual rings to determine the precise radial increment during the decade under investigation. Past diameter at breast height (DBH) was subsequently calculated by subtracting twice the measured ten-year radial increment from the current DBH measurement, accounting for the diameter-radius relationship.

This methodological approach offers certain advantages over generalized growth models by incorporating tree-specific growth histories. The technique captures individual growth responses to environmental conditions, competitive pressures, and management interventions during the study period. These diameter reconstruction procedures established the foundation for subsequent volumetric analyses and percent growth calculations utilized throughout the study.

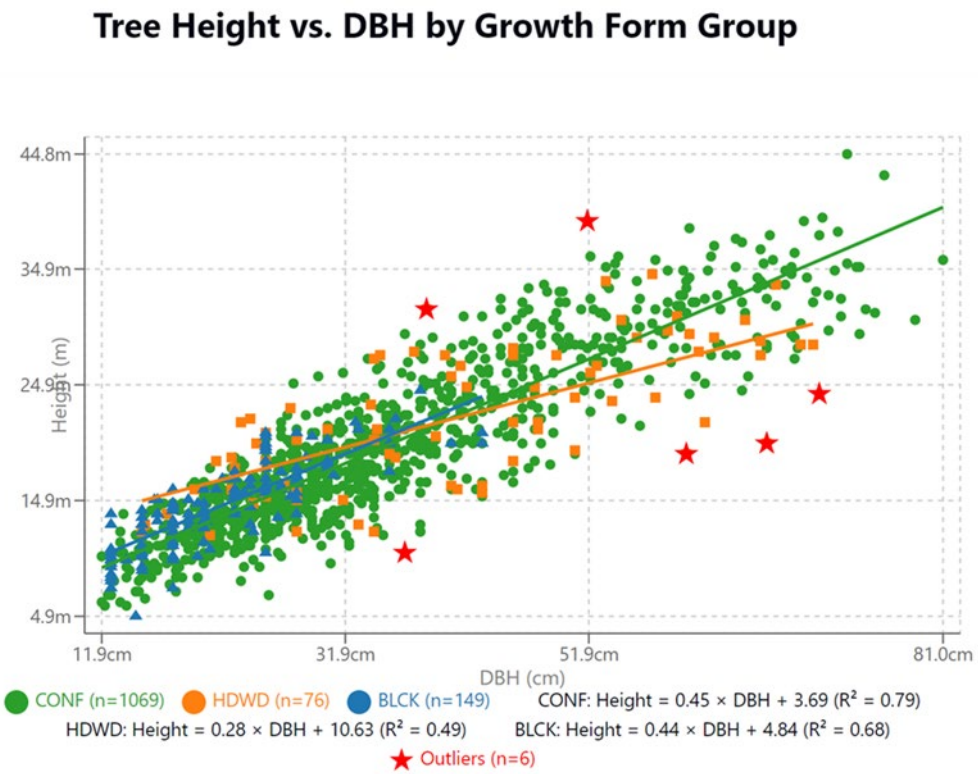
Estimating past Height (10-year pre-measurement)

In order to predict past height based on past diameter, the tree measurements were analyzed to develop accurate height prediction models based on diameter at breast height (DBH). By categorizing the trees into three growth form groups (conifers, black spruce, and hardwoods), group-specific regression equations were created that significantly improved prediction accuracy

using a generalized diameter of height ratio. The conifer group showed the strongest relationship between diameter and height ($R^2 = 0.79$), while hardwoods exhibited a distinctly different growth pattern. The dataset consisted of 1,294 trees that were measured for DBH, Height, total age and 10-year growth increment and representing 10 different species measured across four areas of the Kenai Peninsula.

The most prevalent species were Sitka Spruce (29.8%), White Spruce (24.7%), and Lutz Spruce (18.3%), with the majority of trees classified as conifers (82.6%). Black Spruce constituted a distinct group (11.5%), while hardwoods including Cottonwood, Balsam Poplar, and Kenai Birch made up a smaller portion (5.9%) of the sample. Tree diameters ranged from 4.7 to 31.9 inches (11.94 to 81.03 cm), with heights varying from 16 to 147 feet (4.88 to 44.81 meters).

Figure 18: Diameter Height Relationships for Dominant Trees



The regression analysis employed a simple linear model relating tree height to DBH for each growth form group separately. This approach recognizes the inherent biological differences between species groups and their distinct allometric relationships. For conifers, which typically grow taller relative to their diameter, the equation Height = 0.4508 × DBH + 3.6859 was derived, while hardwoods followed a different pattern with Height = 0.2774 × DBH + 10.6262, reflecting their tendency to be broader relative to height. Black Spruce, adapted to poorer growing conditions, showed its own unique relationship with Height = 0.4404 × DBH + 4.8438. These group-specific models explained significantly more variation in tree height (R^2 values ranging from 0.49 to 0.79) than could be achieved with a single equation across all species.

Analysis of tree growth rates across the study region revealed an overall weighted average annual growth of 4.7% among the 1,294 trees sampled. Commercial conifers, comprising the majority of samples (n=1,069), demonstrated marginally higher growth rates (4.8%) than Black Spruce (4.4%) and Hardwoods (4.4%). Geographic location emerged as a significant factor influencing growth performance, with western areas exhibiting the highest rates (5.96%), followed by restricted areas (5.7%), remote western locations (5.4%), and eastern sites showing substantially lower performance (3.7%). Among individual species, White Spruce demonstrated superior growth at 6.0% annually (n=320), while Cottonwood exhibited the lowest rate at 3.3% (n=22), and Sitka Spruce showed relatively modest performance (3.6%) despite its prevalence in the dataset (n=385).

Table 25: Average Gross Growth Rates by Species Group and Reporting Region

Commercial Conifer

	Lutz Spruce		Mtn Hemlock		Sika Spruce		White Spruce		Total %Growth	Total n
	%Growth	n	%Growth	n	%Growth	n	%Growth	n		
East	4.4%	90	4.1%	103	2.8%	294	6.1%	80	3.7%	567
Restricted	6.9%	61	3.5%	24	4.6%	52	6.2%	118	5.8%	255
W_Remote					6.4%	7	5.8%	1	6.3%	8
West	5.6%	86			8.9%	32	5.7%	121	6.1%	239
Total	**5.5%**	**237**	**4.0%**	**127**	**3.6%**	**385**	**6.0%**	**320**	**4.8%**	**1069**

Black Spruce

	Black Spruce		Total %Growth	Total n
	%Growth	n		
Restricted	3.4%	84	3.4%	84
West	5.7%	65	5.7%	65
Total	**4.4%**	**149**	**4.4%**	**149**

Hardwood

	Cottonwood		Kenai Birch		Paper Birch		Aspen		Poplar		Total %Growth	Total n
	%Growth	n	%Growth	n	%Growth	n	%Growth	n	%Growth	n		
East	2.3%	9	6.5%	1			3.2%	1			2.8%	11
Restricted	4.3%	7	3.8%	17	3.6%	4	13.8%	3	7.1%	8	5.3%	39
W_Remote									4.8%	14	4.8%	14
West	3.5%	6	1.6%	6							2.6%	12
Total	**3.3%**	**22**	**3.4%**	**24**	**3.6%**	**4**	**11.1%**	**4**	**5.7%**	**22**	**4.4%**	**76**

Timber Inventory Information

The project results are delivered in a comprehensive Forest Projection and Planning System (FPS) database in Microsoft Access format. This relational database structure contains the complete raw plot data collected during field inventory, alongside detailed stand level metrics and compiled stand stock tables for the entire project area. The FPS database enables sophisticated reporting, analysis, and growth projections through its integrated modeling capabilities and provides the foundation for ongoing forest management planning.

For greater accessibility, key stand-level metrics have also been incorporated into the GIS deliverable as attribute data in a streamlined flat table format. This approach allows foresters to quickly access critical stand information directly through GIS applications without requiring familiarity with database queries. The integration of both formats provides flexibility, allowing detailed analysis through the FPS database when needed, while supporting rapid operational decision-making through the more accessible GIS attribute data during routine management activities.

Table 26: Kenai Timber Inventory Type Map GIS Field Key

Field Name	Description
STD_ID	Unique identifier for each forest stand
VEG_LBL	Vegetation label code (abbreviated timber type classification)
VEGLABEL	Full vegetation label description
TWN	Township location identifier
RGE	Range location identifier
SEC	Section number within Township and Range
ACRES	Total area of the stand in acres
REGION	Report area within the Kenai Peninsula (East, West, East Remote, West Remote)
SOA_MGMT_A	State of Alaska Management Agreement acres within the stand
SOA_ASR_AC	State of Alaska Agreement, Settlement, Reconveyance acres within the stand
SOA_CONV_D	State of Alaska Conveyed land acres within the stand
SOA_AVAIL_	State of Alaska Available land acres within the stand
SOA_LEGIS_	State of Alaska Legislatively Designated Areas acres within the stand
SOA_MUNIC_	State of Alaska Municipal Entitlement acres within the stand
SOA_OTHER_	State of Alaska Other/Acquired acres within the stand
SOA_INTER_	State of Alaska Interest Native Allotment acres within the stand
SOA_ASR_MI	State of Alaska ASR Mineral acres within the stand
SOA_OTHER1	State of Alaska Other category 1 acres within the stand
SOA_PRO_AL	State of Alaska Protected/Restricted acres within the stand
UNRESTRICT	Unrestricted acres available for timber management
TIMBER_AVA	Timber availability status (Yes/No)
AREA_RPT	Reporting area code

Field Name	Description
SpruceTPA	Spruce trees per acre
SpruceBA	Spruce basal area (square feet per acre)
SpruceQMD	Spruce quadratic mean diameter (inches)
SpruceGBFP	Spruce gross board feet per acre
SpruceNBFP	Spruce net board feet per acre
HemlockTPA	Hemlock trees per acre
HemlockBA	Hemlock basal area (square feet per acre)
HemlockQMD	Hemlock quadratic mean diameter (inches)
HemlockGBF	Hemlock gross board feet per acre
HemlockNBF	Hemlock net board feet per acre
BirchTPA	Birch trees per acre
BirchBA	Birch basal area (square feet per acre)
BirchQMD	Birch quadratic mean diameter (inches)
BirchGBFPA	Birch gross board feet per acre
BirchNBFPA	Birch net board feet per acre
HardwoodTP	Hardwood trees per acre (excluding Birch)
HardwoodBA	Hardwood basal area (square feet per acre, excluding Birch)
HardwoodQM	Hardwood quadratic mean diameter (inches, excluding Birch)
HardwoodGB	Hardwood gross board feet per acre (excluding Birch)
HardwoodNB	Hardwood net board feet per acre (excluding Birch)
BspruceTPA	Black Spruce trees per acre
BspruceBA	Black Spruce basal area (square feet per acre)
BspruceQMD	Black Spruce quadratic mean diameter (inches)
BspruceGBF	Black Spruce gross board feet per acre
BspruceNBF	Black Spruce net board feet per acre
TotalTPA	Total trees per acre (all species)
TotalBA	Total basal area (square feet per acre, all species)
TotalQMD	Total quadratic mean diameter (inches, all species)
TotalGBFPA	Total gross board feet per acre (all species)
TotalNBFPA	Total net board feet per acre (all species)
NetMBF_tot	Total net thousand board feet in stand (all species)
Area_code	Numeric code for area classification

Discussion and Recommendations

Timber Map and Field Inventory

The comprehensive field inventory conducted for this report faced several practical challenges that influenced sampling distribution. While every effort was made to achieve representative sample distribution across the entire project area, access limitations significantly impacted this objective. Sampling in the most remote areas would have required either extensive overnight hiking expeditions or prohibitively expensive helicopter operations, neither of which were feasible within project constraints. However, this sampling approach aligns with practical forest management realities, as areas closer to existing road infrastructure naturally present the most viable opportunities for timber development and harvesting operations. Field observations revealed considerable variability within all strata, both in terms of species composition and merchantable volume. This heterogeneity presents both challenges and opportunities for forest managers, requiring site-specific pre-harvest cruising prior to harvest planning even within the same stratum designation.

Natural regeneration was observed throughout the project area and appears abundant in many locations. However, detailed seedling/sapling assessments revealed a high percentage of defective or suppressed stems, raising concerns about the long-term quality of naturally developing stands. This situation presents a significant opportunity for active forest restoration interventions, particularly in areas previously impacted by spruce beetle mortality or wildfire events. Strategic silvicultural treatments could substantially improve forest health, timber quality, and growth rates across large portions of the project area.

Timber type classification presented notable challenges due to limitations in available remote sensing imagery. Despite rigorous methodologies, DOF foresters will likely encounter inconsistencies between mapped timber types and on-the-ground observations during operational planning. Such discrepancies are inherent in stratified inventory approaches at this scale and should be viewed as opportunities for ongoing improvement rather than fundamental flaws. As additional field data is collected during pre-harvest cruising and newer, higher-resolution imagery becomes available, these classifications can and should be iteratively refined to enhance the inventory's precision and utility.

Working with the Products

The integrated datasets produced through this inventory provide DOF staff with powerful tools for operational planning and strategic decision-making. By combining the FPS inventory database with the spatially referenced GIS components, managers can efficiently identify, assess, and prioritize potential harvest areas based on multiple criteria including volume, species composition, and accessibility.
The custom stumpage calculator developed alongside this inventory offers a practical mechanism for determining fair timber values that reflect both market realities and operational

constraints specific to the Kenai Peninsula. Regular calibration of this tool using actual harvest results will further enhance its accuracy and usefulness over time.

Overall Assessment of Timber Development Opportunity

The comprehensive inventory reveals significant timber resources across state lands on the Kenai Peninsula, with particularly promising development opportunities in areas accessible from existing transportation infrastructure. The identified annual allowable harvest levels are much higher than current use and could support expanded forest products industries while maintaining sustainable forest management principles.

The West region encompasses major population centers including Soldotna, Kenai, and Homer, as well as many of Alaska's most popular recreation areas. This proximity to communities presents a unique opportunity for responsible timber management that serves multiple public interests. Strategically planned timber sales in this region can facilitate the development of access roads that not only support harvest operations but also improve public access to state lands for recreational purposes. Beyond timber production, forest management activities offer significant opportunities for habitat enhancement. Silvicultural prescriptions can be designed to shift species composition toward high value conifer species while simultaneously creating early successional forest stages that benefit wildlife, particularly improving moose habitat. This integrated approach to forest management aligns timber harvest with broader ecological and recreational benefits valued by local communities.

The East region (in the area of Seward) presents a different set of opportunities and challenges. This area generally contains superior timber quality and significantly higher volume per acre, as evidenced by the inventory data. However, these valuable timber resources exist in a complex operational environment characterized by steep terrain, limited existing road networks, and substantially more challenging conditions for new road construction. Additionally, many areas are bisected by the Alaska Railroad and high-use recreational trails, including the historic Iditarod Trail. Operationalizing this timber resource will require particularly careful planning to balance economic, environmental, and recreational considerations while managing the higher development costs associated with this terrain.

Successful timber development across the Kenai Peninsula will require strategic investments in road infrastructure. Given current market conditions and operating costs, a phased approach focusing initially on the most accessible high-volume stands is recommended to establish operational efficiencies and build industry capacity before expanding into more challenging areas. The extensive GIS database and detailed stand-level information provided through this inventory offer an unprecedented foundation for developing a comprehensive 5-year harvest plan that balances economic viability with sustainable forest management objectives. By leveraging these resources, DOF can confidently pursue timber sales that will provide reliable supply to existing industry stakeholders while potentially attracting new forest products investments to the region.