TONGASS NATIONAL FOREST: UPDATED TIMBER SALE PROCEDURES

OVERVIEW

During 2000, the Forest Service Alaska Region developed procedures (Morse 2000a) to ensure Tongass National Forest annual timber sale offer levels would be consistent with legal requirements to seek to meet market demand for timber as required by the Tongass Timber Reform Act (1990). These procedures were implemented using a spreadsheet model (Morse 2000b). The model was designed to consider Southeast Alaska sawmill timber requirements at various levels of operation and under different assumptions regarding overall market conditions and technical operating capacity. The Forest Service's Pacific Northwest Research Station published new derived demand timber estimates, developed by Daniels et al. (2016), which necessitate the model (Morse 2000b) be slightly modified to accommodate new projection scenarios and associated timber demand estimates. This management bulletin summarizes updates to the Morse (2000b) spreadsheet model to reflect new information about derived demand for timber (Daniels et al., 2016) and identifies economic indicators that contribute to decision-making when planning the Tongass National Forest's annual timber sale program.

CONTEXT

Debate regarding market demand for Tongass National Forest timber, and how the Forest Service's timber sale program relates to market demand, has been ongoing for decades. Pacific Northwest Research Station economists completed their first comprehensive study of the issue during 1990. Later that year, US Congress enacted the Tongass Timber Reform Act (TTRA), which in Section 101 amended Section 705(a) of the Alaska National Interest Lands Conservation Act (ANILCA 1980):

> Subject to appropriations, other applicable law, and the requirements of the National Forest Management Act of 1976 (Public Law 94-558), except as provided in subsection (d) of this section, the Secretary shall, to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle (16 US Code 539(d)(a)).

Prolonged discussion regarding how to interpret and apply direction provided by the Tongass Timber Reform Act slowed the development of procedures to comply. However, the 1997 Record of Decision (ROD) for the *Tongass Land and Resource Management Plan* revision committed the Forest Service to develop procedures to ensure

PREPARED BY: NICOLE GREWE, PH.D., REGIONAL ECONOMIST
USDA FOREST SERVICE, ALASKA REGION (REGION 10)
MAY 8, 2017

annual timber sale offerings would be consistent with implementing TTRA's 'seek to meet market demand' language. Procedures were completed during 2000 and have become known as the 'Morse Methodology' in acknowledgement of the original designer and author – Kathleen Morse, former Forest Service Alaska Region regional economist.

TTRA directed the Forest Service to seek to provide a supply of timber to meet estimated market demand over the longer-term planning cycle and on an annual basis. Daniels et al. (2016) establishes longer-term planning cycle timber demand (2015 – 2030) – an input to determining annual timber demand. Annual demand procedures, as developed by Kathleen Morse (2000a), ensure full compliance with TTRA and were originally published in *Responding to Market Demand for Tongass Timber* (Morse, K.S.; USDA Forest Service R10-MB-413).

MORSE METHODOLOGY

The procedures developed by Morse (2000a) to estimate Tongass National Forest annual timber sale offer targets address the uncertainty associated with forecasting market conditions, considering the continuing evolution of the timber industry and the inability of the Forest Service to respond quickly to market fluctuations due to the time it takes to prepare timber for sale. The basic approach developed by Morse (2000a) is to allow the industry to accumulate an adequate timber volume under contract (i.e., a measure of inventory), then monitor industry behavior and adjust timber sale program levels to keep pace with actual harvest activity. The procedures rely on systematic monitoring of key economic indicators and stumpage market conditions to test assumptions regarding the relationships between timber industry performance, current economic conditions, and the Tongass National Forest timber sale program.

Since the method (Morse 2000a) was initially developed, inputs to the model have been adjusted to reflect new understandings and information, such as the overall share of raw material provided by the Tongass National Forest to local processors, total time between timber sale purchase and harvest, and overall sawmill capacity and utilization. The basic approach used in the procedures (Morse 2000a) adapts to current conditions in the timber industry and the Tongass National Forest timber sale program. Industry activities are monitored, including annual timber harvest levels, and timber sale program targets are developed by estimating the amount of timber needed to replace volume harvested on an annual basis.

The Morse Methodology is an example of adaptive management because it addresses uncertainty in a flexible, objective, and science-based manner. If timber harvest levels drop below expectations while other factors remain constant, future timber sales are also reduced to levels needed to maintain target level of timber under contract. Conversely, if timber harvest levels rise unexpectedly, future timber sale targets would also increase to ensure inventory of volume under contract is not exhausted.

PACIFIC NORTHWEST RESEARCH STATION

Morse (2000a) outlined a monitoring strategy with specific criteria for action that guides Tongass National Forest annual timber demand determinations. The overall approach, however, is informed by longer-term

planning-cycle market demand for Tongass National Forest timber. The Pacific Northwest Research Station has a 25-year history and tradition of conducting longer-term timber demand and price forecasting to support Tongass National Forest planning including Brooks and Haynes (1990, 1994, 1997), Brackley et al. (2006a), and Daniels et al. (2016). The procedures developed by Morse (2000a) to estimate timber sale offer target (i.e., timber supply) incorporates Pacific Northwest Research Station timber demand estimates as one of several inputs in the annual timber demand calculation. In short, the Morse Methodology relates Pacific Northwest Research Station's derived demand projections into an annual calculation of timber sale offer targets.

Pacific Northwest Research Station derived demand analyses estimate the quantity of Tongass National Forest timber required to satisfy projected demand for forest products given harvest by other regional landowners and assumptions about future market conditions and prices. Analyses and timber demand projections, completed by Pacific Northwest Research Station, ensure compliance with meeting TTRA requirements directing the national forest to "…seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand from timber from such forest and (2) meets the market demand for timber from such forest *for each planning cycle*" (emphasis added).

Substantive findings from the five-year review of the 2008 *Tongass Land and Resource Management Plan*, changes in forest policy regarding Tongass National Forest timber harvest, and changes in land ownership prompted an amendment to the 2008 *Tongass Land and Resource Management Plan.* Amending the Tongass National Forest's plan necessitated an update of planning-cycle timber demand estimates. There were also several changed circumstances that invalidated many of the assumptions noted in the prior planning-cycle timber demand analysis (Brackley et al., 2006) including developments in the timber industry, changing domestic and export forest product markets, entry of Tongass National Forest sawlogs into international export markets, escalating fuel costs, and efforts to promote biomass or alternative energy projects for heating and electrical generation.

An update of the planning-cycle timber demand assessment by Brackley et al. (2006) was requested from the Pacific Northwest Research Station to inform efforts to amend the *Tongass Land and Resource Management Plan* (2016). During 2016, Pacific Northwest Research Station published *Tongass National Forest Timber Demand: Projections for 2015 to 2030* (Daniels et al., 2016). Daniels et al. (2016) identifies a baseline deterministic model and three alternative future scenarios representing the transition to young growth, growing wood energy markets, and domestic housing market rebound.

Of noteworthy importance, new planning-cycle timber demand projections (Daniels et al., 2016) do not require changing the basic methodology for timber offer calculations in the procedure outlined by Morse (2000a). Morse 2000b, the spreadsheet model that implements the procedures (Morse 2000a), outlines how information about market demand is used to schedule timber sale offerings. New Pacific Northwest Research Station derived demand projections requires the Morse (2000b) timber offer spreadsheet model be modified slightly to reflect scenarios developed by Daniels et al. (2016). Minor modification of the timber offer calculation spreadsheet model allows the procedure outlined in Morse (2000a) to continue to be followed in developing short-term timber sale offer targets, as summarized in the *Tongass Land and Resource Management Plan*, Record of Decision (2016:27-28).

DEVELOPING TIMBER SALE REQUIREMENTS TO MEET MARKET DEMAND

The general approach of the Morse Methodology is to consider timber requirements of Southeast Alaska's sawmills at different levels of operation and under different assumptions about market conditions and technical processing capacity. These assumptions provide a basis for estimating the volume of timber likely to be processed by the industry, as a whole, in any given year. Timber inventory requirements are acknowledged and estimated in a related calculation. The volume of timber likely to be purchased is equal to the volume needed to make up any inventory shortfall in addition to the volume likely to be harvested in the coming year. Table 1 summarizes the predictive model with substantive procedural steps detailed in following subsections.

Table 1. Predicting Likely Tongass National Forest Timber Purchases and Offer Levels

Model Item	Description	Notation	Baseline[1]	Scenario 1 Young Growth Transition	Scenario 2 Wood Energy Growth	Scenario 3 Housing Market Rebound
Demand						
A	Installed and Operable Sawmill Capacity [MMBF, Log Scale]	a	114	114	114	114
B	Industry Rate of Capacity Utilization[2]	b	24%	24%	24%	24%
C	Share of Industry Raw Material Provided by Tongass National Forest	c	83%	83%	83%	83%
D	Percent of Useable Wood in Average Tongass National Forest Timber Sale	d	81%	81%	81%	81%
E	Annual Tongass National Forest Timber Consumption [MMBF, Theoretical]	e = ((a*b)*c)/d	28	28	28	28
F	Standard Deviation of Lead Time [Years]	f	1.02	1.02	1.02	1.02
G	Average Lead Time [Years]	g	1.12	1.12	1.12	1.12
H	Probability of Meeting Consumption [One-Tailed Test for 90% at Infinity]	h	1.28	1.28	1.28	1.28
I	Timber Inventory Requirements [MMBF)	i = (e*g)+((e*h)*f)	68	68	68	68
J	Volume Under Contract [MMBF]	j	74	74	74	74
K	Projected Harvest [MMBF], 2017 [per PNW]	k	42	42	43	43
L	Projected Inventory Shortfall [MMBF]	l = i-j	-6	-6	-6	-6
M	Low Range of Expected Timber Purchases [MMBF], FY17	m = if 1 < 0, k + 1, else k	37	37	38	37
N	High Range of Expected Timber Purchases [MMBF], FY17	n = if 1 < 0, else k + 1	42	42	43	43
0	Expected Timber Purchases, FY17	o = median (m:n)	39	39	41	40
Offer						
P	Fall-Down Between Volume Offered and Sold	p	33%	33%	33%	33%
Q	Offer Needed to Meet Volume Under Contract (VUC) Objectives	q = o+(p*o)	53	53	54	53

Note: Table 1 information represents fiscal year 2017 data and may not represent current fiscal year data.
[1]Baseline included for illustrative purposes only and should not be used for project planning or decision-making.
[2]Based on standard 250-day per year, two shifts per day annual operating schedule.

Volume of Timber Processed Locally

The first step in the calculations adjusts sawmill capacity estimates (Model Item A) by the utilization rate assumed for each of the three scenarios (Model Item B) and by the percent of volume expected to come from the Tongass National Forest (Model Item C). This provides an estimate of the volume of logs from the Tongass National Forest likely to be processed into lumber by Southeast Alaska sawmills under the different scenarios. These figures are then adjusted upward to account for species and grades of timber that are not processed into lumber locally (Model Item D). Given this set of assumptions, the timber supply expected to be consumed in a given fiscal year is computed (Model Item E).

Inventory Requirements

The second step provides an estimate of the volume of uncut timber inventory to carry under different demand scenarios. As described on pages 19 – 20 of Morse (2000a), target inventory levels depend on the volume expected to be processed each year (Model Item E) and the amount of time needed to replenish inventory (Model Item G). The relationship is summarized in Morse (2000a) (equation 2, page 20). Timber inventory requirements are calculated in Model Item I. Because the volume of timber expected to be processed varies by scenario, timber inventory requirements vary from one scenario to another.

Harvest Projections

The next step in the process is to incorporate the derived demand estimates developed by Daniels et al. (2016). In the original model development (Morse 2000a), Model Item K represented actual harvest needed to meet derived demand for timber from the Tongass National Forest as reported by Brooks and Haynes (1997). Timber volume in Daniels et al. (2016) demand projections in Scenario 1 (young growth transition), Scenario 2 (wood energy growth), and Scenario 3 (housing market rebound) include softwood sawlogs, utility logs, softwood lumber, sawmill residue, and other products. The volume reported in Daniels et al. (2016) is adjusted to represent sale volume needed to meet derived demand estimates for each scenario. Table 2 illustrates the inputs for Model Item K.

Table 2. Tongass National Forest, Timber Demand Projections [MMBF]

Year	Baseline[1]	Scenario 1 Young Growth Transition	Scenario 2 Wood Energy Growth	Scenario 3 Housing Market Rebound
2015	40.9	40.9	40.9	40.8
2016	41.6	41.6	41.6	41.6
2017	42.3	42.3	43.4	42.5
2018	43.1	43.1	46.3	43.3
2019	43.8	43.8	49.2	44.1
2020	44.5	44.5	52.1	45.0
2021	45.3	45.3	55.1	45.8
2022	46.0	46.0	58.0	46.7
2023	46.7	46.7	60.9	47.5
2024	47.5	47.5	63.8	48.4
2025	48.2	44.0	63.0	45.0
2026	48.9	44.5	65.7	45.6
2027	49.7	45.0	68.4	46.2
2028	50.4	45.5	71.0	46.8
2029	51.1	45.9	73.7	47.4
2030	51.9	46.4	76.4	47.9
Annual Average	**46.4**	**44.6**	**58.1**	**45.3**

Source: *Tongass National Forest Timber Demand: Projections for 2015 to 2030* (PNW GTR-934; Daniels et al., 2016)
[1]Baseline included for illustrative purposes only and should not be used for project planning or decision-making.

Range of Expected Timber Purchases

By subtracting the volume under contract at the beginning of the year (Model Item J) from the required inventory (Model Item I), the projected inventory shortfall (Model Item L) is calculated. The low range of expected timber purchases (Model Item M) is replacement for the volume harvested; the high range

(Model Item N) is the volume harvested plus the inventory shortfall to ensure the inventory requirement is met at the end of the year.

If the starting volume under contract exceeds the required inventory, there will be a negative inventory shortfall (L will be negative) – in other words, excess inventory. In this case, the low range of expected timber purchases (M) is equal to the projected harvest (K) minus the inventory excess. The resulting inventory requirement is the same as the volume under contract at the end of the year. The high range of expected timber purchases (Model Item N) is equal to the projected timber harvest if there is excess inventory (i.e., if L is negative).

TIMBER SALE OFFER OBJECTIVES

The measure of meeting the TTRA's "seek to meet" requirement is volume sold from the Tongass National Forest. To meet this objective, a sufficient amount of volume must be offered to account for any fall-down between the volume offered and the volume sold. The final step in projecting the amount of volume to be purchased is to evaluate the anticipated volume that needs to be offered.

Timber Sale Fall-Down

Historically, there has been a difference between the volume offered and the volume sold from national forest timber sales. The reluctance of purchasers to buy timber sales tends to increase as markets decrease and/or logging costs increase (Model Item P). Mason et al. (2004) examined why some offerings in Southeast Alaska go unsold and concluded the probability of a timber sale being successfully sold are tied to downstream markets that are inherently difficult to predict, rather than factors directly controlled by the Forest Service.

Projected Offer Objectives

In an effort to project the amount of volume that needs to be offered for each of the scenarios, the expected timber sale purchases (Model Item O) is increased to account for fall-down and litigation (Model Item P) to provide a rough estimate of the volume to be offered for each scenario to meet timber sale objectives (Model Item Q).

SETTING TIMBER SALE OFFER LEVEL

As illustrated in the predictive model in Table 1, different assumptions about markets and industry configuration yield different outcomes. For any given year, all values within the full range displayed in the model are not equally likely due to changing sawmill operations, economic conditions, and market variability.

During the 1990s, changes in ownership patterns, competition from production in other regions, and overall market conditions led to the closure of Southeast Alaska's two large pulp mills and numerous closures of sawmill facilities. In 2000, 22 medium- to large-scale sawmills operated across the Tongass National Forest with the greatest concentration located in southern Southeast Alaska (Table 3). Since 2000, half of these sawmills have closed and been uninstalled; no new sawmills of equal size classification have been established during the same timeframe. During 2015, nine sawmills remained active, eleven sawmills were uninstalled, and two sawmills

remained installed with significant equipment onsite, but were idle (Parrent and Grewe, 2016). Of noteworthy importance, numerous small sawmills that operate on a seasonal, part-time, or contingent basis have operated across the region, each with varying degrees of success. While these sawmills are part of the greater Southeast Alaska forest products industry, they are largely unaccounted for in timber industry research due to limited size and operations – and are subsequently excluded from Table 3.

Table 3. Southeast Alaska Sawmills, Calendar Years 2000 – 2015

Active (9)	Idle (2)	Uninstalled (11)
Viking Lumber Company Icy Straits Lumber and Milling Company Good Faith Lumber Company Western Gold Cedar Products D and L Woodworks Porter Lumber Company Thuja Plicata Lumber The Mill Falls Creek Forest Products	Northern Star Cedar Saint Nick Forest Products	Gateway Forest Products Ketchikan Renaissance Group Herring Bay Lumber Pacific Log and Lumber Annette Island Sawmill Metlakatla Forest Products Silver Bay Incorporated Alaska Fibre Kasaan Mountain Lumber and Log Chilkoot Lumber Company Thorne Bay Enterprises

Total sawmill capacity is an estimate of sawmill processing capability based on the amount of net sawlog volume that could be utilized by the sawmill, as currently configured, during a standard 250-day per year, two shifts per day annual operating schedule – and not limited by availability of workforce, raw materials, or market conditions. The eleven remaining active and idle sawmills operated at approximately 16 percent of their estimated capacity during 2015 – representing a significant underutilization of region-wide sawmill capacity (Parrent and Grewe, 2016). During 2015, the mix of species sawn in Southeast Alaska sawmills was widely distributed with western red cedar (43%) in the lead, followed by Sitka spruce (33%), western hemlock (22%), and Alaska yellow cedar (2%). The large majority of logs destined for Southeast Alaska sawmills during 2015 were sourced from the Tongass National Forest (83%) followed by State of Alaska (16%); less than one percent was sourced from private lands (Parrent and Grewe, 2016).

The University of Montana's Bureau of Business and Economic Research (UMT-BBER), in conjunction with the Pacific Northwest Research Station's Forest Inventory and Analysis Program (PNW-FIA), conducted a census of Alaska's timber processors during 2016. In contrast to Parrent and Grewe's (2016) targeted survey of sawmills of substantial size indicating 16 percent rate of capacity utilization, UMT-BBER determined statewide sawmill rate of capacity utilization approached 24 percent during the same timeframe (2015). UMT-BBER's sawmill rate of capacity utilization was used as an input for the annual demand model (Model Item B) because it accounts for sawmills of all sizes with Southeast representing the majority of statewide processing.

The primary destination for material sawn in the Tongass National Forest is Alaska and Lower 48 states. Hansen (2006) states that US companies have historically jumped into the export market when the domestic market is down, and shifted back to the US market when the domestic market improves. In recent years, the US domestic market has been improving with rebounding housing starts and strong prices in many forest product categories. Presenting a long-term perspective, Haynes et al. (2007) indicate domestic demand for

forest products is varied and large, averaging approximately 71 cubic feet per person per year – and, this per capita domestic consumption of wood products has remained relatively constant for 50 years and will likely rise in coming decades.

During 2007, the Forest Service Alaska Region adopted the *Limited Export Policy* in an effort to boost Tongass National Forest appraised timber values and provide purchasers additional options and economical sale opportunities. Since that time, export of Tongass National Forest timber has remained relatively steady and is an important component to the accelerated transition to young-growth timber harvest because it increases appraised timber values, allows greater flexibility for timber sale purchasers, and encourages sawmills to remain profitable and contributing to the local and regional economy.

On the supply side, the cost and time associated with preparing stumpage for sale and delivering it to sawmills has increased over time due to decreased size of sales, increased fuel costs, legal and procedural challenges to federal timber sales, and more constraints on harvest activity in the interest of resource protection. The uncertainty surrounding Tongass National Forest sale quantities has increased the risk faced by potential purchasers and investors in local processing capacity.

Of noteworthy importance, it is important to anticipate the consequences of a "wrong" decision in choosing the offer level. In terms of short-term economic consequences, over-supplying the market is less damaging than under-supplying it. If more timber is offered than purchased in a given year, the unsold volume is still available for purchasing off-the-shelf or re-offered at a minimal investment. In contrast, a significant shortfall in the supply of timber available for harvest in a given year can be financially devastating to the forest products industry. The consequences associated with unreliable or significant shortfall in supply of timber available for harvest may be further compounded by the challenges associated with transition the Tongass National Forest's timber sale program from predominantly old-growth to young-growth timber harvest.

CONCLUSION

As displayed in the model, planning the Tongass National Forest's annual timber program requires more than just pure economic factors. To account for delays in timber sale preparation, objections, and/or litigation, sufficient contingency volume must be included in the annual timber sale program to account for realistic fall-downs. Budget and organizational constraints limit the extent to which the Forest Service can respond to economic cycles and the associated fluctuations in timber demand. All of these factors must be considered in evaluating the annual market demand for timber and setting annual timber offerings.

In the final analysis, planning the annual timber sale program is an exercise in professional judgment. The purpose of this paper is to clearly identify the extent to which economic indicators contribute to the decision-making process. The procedures described here allow the decision-maker to make an informed decision about the volume of timber to offer based on demand projections, including additional volume to compensate for fall-down between the volume offered, but not sold and additional delays related to timber sale preparation, objections, and litigation.

Prepared by: Nicole Grewe, Ph.D., Regional Economist
USDA Forest Service, Alaska Region (Region 10)
May 8, 2017

REFERENCES

Brackley, A.M.; Rojas, T.D.; Haynes, R.W. 2006. Timber Products Output and Timber Harvests in Alaska: Projections for 2005-25. Gen. Tech. Rep. PNW-GTR-677. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p. 2

Brooks, D.J.; Haynes, R.W. 1997. Timber Products Output and Timber Harvests in Alaska: Projections for 1997-2010. Gen. Tech. Rep. PNW-GTR-409. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 p.

Daniels, J.M.; Paruszkiewicz, M.D.; Alexander, S.J. 2016. Tongass National Forest Timber Demand: Projections 2015 to 2030. Gen. Tech. Rep. PNW-GTR-934. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.

Hansen, Eric. 2006. Global Forest Products Markets: Impacts on Western Forests. Western Forester 51(3): 1-2 and 22.

Haynes, Richard W.; Adams, Darius M.; Alig, Ralph J.; Ince, Peter J.; Mills, John R.; Zhou, Xiaoping. 2007. The 2005 RPA Timber Assessment Update. Gen. Tech. Rep. PNW-GTR-699. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 212 p.

Marcille, K.C.; Berg, E.C. 2017. *Alaska's Forest Products Industry and Timber Harvest, 2015*.

Mason, C.; Margolis, M.; Tsournos, P. 2004. Southeast Alaska Timber: Why Do Some Offerings Go Unsold? Northwest Journal of Business and Economics: 33-48.

Morse, K.S. 2000a. Responding to the Market Demand for Tongass Timber: Using Adaptive Management to Implement Section 101 of the 1990 Tongass Timber Reform Act. Management Bulletin R10-MB-413. Juneau, AK: U.S. Department of Agriculture, Forest Service, Alaska Region. 43 p.

Morse, K.S. 2000b. Tongass National Forest Timber Sale Procedures: Using Information About Market Demand to Schedule FY2001 Timber Sale Offerings. October 2000. On file with: Regional Economist, Ecosystem Planning. Juneau, AK: U.S. Department of Agriculture, Forest Service, Alaska Region.

Parrent, Dan; Grewe, Nicole. 2016. Tongass National Forest: 2015 Sawmill Capacity and Production Report. Juneau, AK: U.S. Department of Agriculture, Forest Service, Alaska Region. 9 p.

van Hess, Willem W.S. 2003. Forest Resources of Southeast Alaska, 2000: Results of a Single-Phase Systematic Sample. Res. Paper PNW-RP-557. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 96 p.