Assessment

Forest Plan Revision

Final Timber Report

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for:
Custer Gallatin National Forest

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Contents

Introduction 1
Scale 1
Existing Information Sources 1
Current Forest Plan Direction 1
Existing Conditions, Trends and Drivers 3
Suitable Timber Lands 3
Timber Products 7
Non-Timber Products: Fuelwood and Christmas Trees 10
Trends Driving the Supply and Demand for Timber 12
Forest Service Management Actions Influencing Timber Production 13
Timber Harvest 13
Stand Improvement and Reforestation 15
Fire and Fuel Treatments 15
Vegetation Management Footprint 16
Stability or Resiliency of Ecosystems that Currently Maintain Timber Production 17
Influence of Other Lands or Other Conditions 18
Importance of Timber to People in the Broader Landscape 19
Information Needs 19
Key Findings 19
References 21

Tables

Table 1. Counties affected by Custer Gallatin National Forest timber projection 3
Table 2. Suitable acres by landscape area 4
Table 3. Average volume timber products sold per year (MMBF) by decade, excluding fuelwood 9
Table 4. Custer Gallatin National Forest 1987 forest plans allowable sale quantity and average volume per year (MMBF) sold timber products and fuelwood (1980-2015) 9
Table 5. Average volume fuelwood sold per year (MMBF) by decade 11
Table 6. Harvest occurring on lands tentatively suitable for timber production in current forest plans since 1940 13
Table 7. Custer Gallatin National Forest harvest acres by harvest type and geographic location since 1940 14
Table 8. Harvest acres by type and decade for the Custer Gallatin National Forest (1940-2015) 14
Table 9. Custer Gallatin National Forest stand improvement and reforestation activities by decade (1940-2013) 15
Table 10. Acres of fuels treatments by decade on the Custer Gallatin National Forest (1940-2015) 16
Table 11. Custer Gallatin National Forest acres burned within geographic areas from wildfires 1980-2015 17

Figures

Figure 1. Custer Gallatin National Forest total forest acres, tentatively suitable acres and suitable acres 3
Figure 2. Custer Gallatin National Forest tentatively suitable lands Ashland and Sioux Ranger Districts 5
Figure 3. Custer Gallatin National Forest tentatively suitable lands in the Madison, Gallatin, Beartooth, Bridger, Bangtail, Crazy, Absaroka, Beartooth and Pryor Mountains 6

Figure 4. Total volume sold by national forest, 1987-2015 (excluding fuelwood) 8
Figure 5. Volume (MBF) of forest products sold by type on the Custer Gallatin National Forest (1987-2015) 10
Figure 6. Sawtimber volume sold 1980-2015 by species on the Custer Gallatin National Forest 10
Figure 7. Volume MBF Fuelwood Sold by Forest 1987-2015 11
Figure 8. Number of Christmas trees sold by national forest (1980-2015) 12
Figure 9. Footprint of acres of vegetation management activities by geographic location (1940-2015).....16
Figure 10. Acres impacted by mountain pine beetle, pine engraver, Doug-fir Beetle and spruce budworm by geographic area (2001-2014) 18

Introduction

A draft of this report was released for public review on November 30, 2016 and feedback was requested by January 6, 2017. Changes made to the final report based on public feedback were to 1) explain that the term "tentatively" suitable lands for timber production was language from the 1987 era forest plans; and 2) provide an overview of the process to determine lands suitable for timber production under the 2012 planning rule.

Use and development of natural resources on the Custer Gallatin National Forest and surrounding lands played an essential role in the economy and growth of the area since the turn of the century. The lands of the Custer Gallatin National Forest lie within 11 counties in Montana and South Dakota.

The Custer Gallatin National Forest has a long history of supplying timber products for local uses. The harvest of trees from these forests provided wood materials for a variety of uses such as, fuelwood, sawlogs, house logs, posts and poles and fencing materials. Mining for gold and other minerals boomed in the late 1800s, and associated tree cutting on both national forests occurred for fuelwood, mine timbers, and railways was extensive. During the time period of approximately 1920-1950, timber harvest took place on the Sioux and Ashland Districts of the Custer National Forest primarily to supply railroad ties for the building of railroads and a considerable number of accessible drainages and draws contained a small saw mill. A viable forest industry also provides capacity to undertake forest restoration activities that require a trained workforce and mills to process resulting wood products (Smith et al. 2011).

Scale

The Custer Gallatin National Forest plan area includes the entire Custer National Forest and Gallatin National Forest. The Custer Gallatin National Forest is located across 10 primary counties in Montana and one primary county in South Dakota. In addition, another 4 counties are considered secondary plan areas which contain infrastructure and/or communities that utilize timber coming off of the national forest. These secondary counties include Powell and Broadwater counties in Montana, Crook County in Wyoming and Lawrence County in South Dakota. Many of these counties contain tentatively suitable or suitable timber lands and/or receive timber products from other national forests or private lands. Lands tentatively suitable or suitable for timber production from the Custer and Gallatin forest plans represent a small proportion of the county land base, as displayed in Table 1.

Existing Information Sources

- Forest Service Cut and Sold reports from the Timber Sale Accountability (TSA) database
- Management activity data queried from the FACTS database

Current Forest Plan Direction

Custer forest plan goals and objectives for timberland management are to harvest timber within the sustained-yield capability to help maintain timber dependent communities, maintain forest health, vigor and productivity, provide vegetative diversity for wildlife, eliminate tree encroachment on selected livestock grazing area, salvage dead timber, control insects and disease, reduce natural fuel loading and provide for scenic openings. The plan regulates timber harvest activities such as silviculture systems, timber stand improvement and reforestation, and opening size.

Gallatin forest plan goals and objectives for timberland management are to provide a sustained yield of timber products and improve the productivity of timber growing lands, salvage dead timber, harvest in areas with insects, distribute vegetation management activities over the entire suitable timber base, and experiment with new techniques in certain areas. The plan regulates timber harvest activities such as silviculture systems, site preparation and debris disposal, tree improvement and regeneration, opening size, and number of snags.

Lands available for timber production for the Custer National Forest were determined through a Stage I, II, and III process. Information used for the Stage I, II, and III assessment was derived from: The Interpretation and Definition of Timberland Suitability for the Custer forest plan (USDA Forest Service 1986, established in preparation of the Custer forest plan), Beartooth Face Planning Unit Final Environmental Statement, Beartooth Face Planning Unit Background Report, Sioux Planning Unit Background Report, Final Environmental Statement Sioux Planning Unit, and Ashland Plan Final Environmental Statement.

Stage I of the process identified tentative suitable lands. These can be defined as the forested lands that are "biologically capable, administratively available and technically suitable" for timber production. Stage II consists of an economic analysis of costs and benefits of timber management on lands identified in Stage I. Stage III provides the final assignment of suitable lands based on Forest objectives and economic efficiency.

The Custer National Forest plan identified approximately 156,731 acres of tentatively suitable forest lands and 77,400 acres, 49 percent of the tentatively suitable base as suitable for timber production. The Gallatin National Forest plan identified 440,000 acres as tentatively suitable forest lands and 305,000 acres, 69 percent of the tentatively suitable base as suitable for timber production. The Custer plan provided for an annual harvest of 3.0 million board feet (MMBF) and the Gallatin 21 MMBF.

Figure 1 displays the Custer Gallatin National Forest's 1987 forest plans total forest acres, tentatively suitable acres for timber production, and suitable acres for timber production.

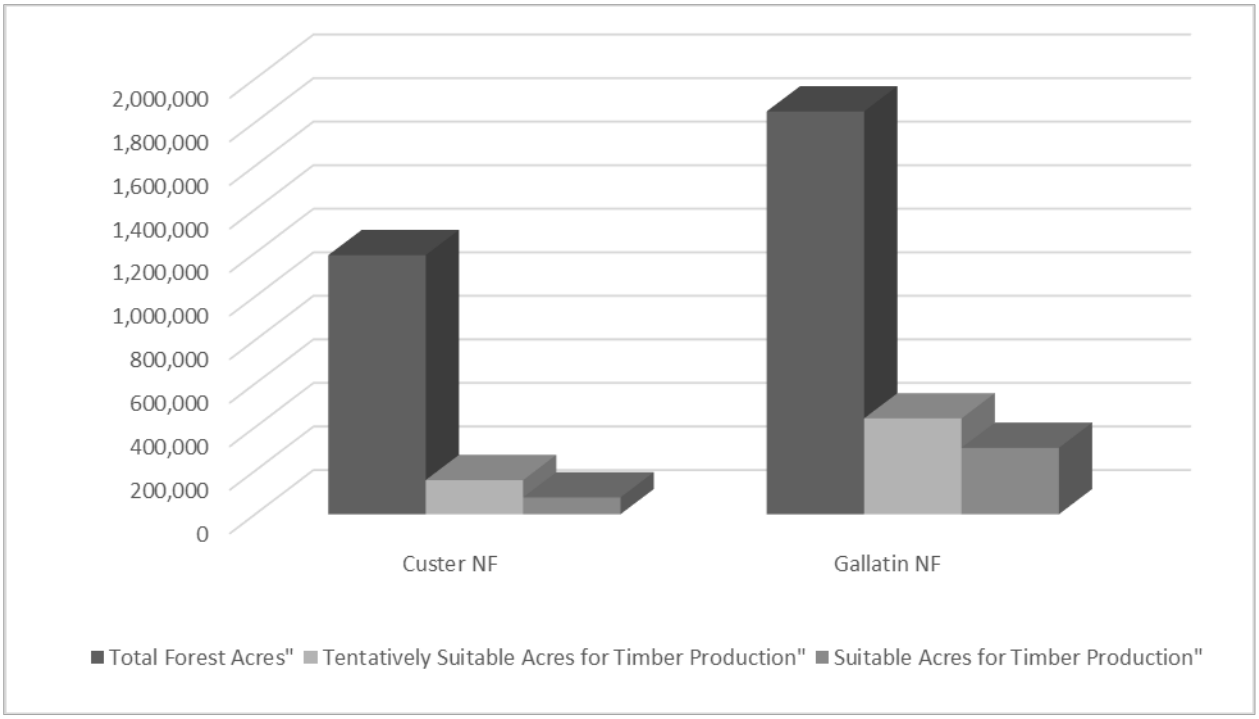

Figure 1. Custer Gallatin National Forest total forest acres, tentatively suitable acres and suitable acres

Existing Conditions, Trends and Drivers

Existing Suitable Timber Lands

The Custer Gallatin National Forest is divided into five landscape areas ranging from approximately 75,000 acres to 2.15 million acres, excluding lands outside the National Forest System. Analysis for the timber products assessment report is summarized at the Custer Gallatin National Forest scale to provide context and show current representative trends. Section 219.14 of the 1982 Planning Rule provided criteria for identifying tentatively suitable land for timber production. The tentatively suitable lands for timber production, based on the 1987 Forest Plans, are displayed at the large, Custer Gallatin National Forest scale and also at the landscape area scale.

Table 1. Counties affected by Custer Gallatin National Forest timber projection

County	Total Approximate County Acres	Approximate Tentatively Suitable Custer Gallatin Acres	Percent of County in Tentatively Suitable Custer Gallatin Lands
State of Montana Counties			
Carbon	1,318,819	33,617	2.55%
Carter	2,141,719	47,868	2.24%
Park	1,705,296	83,522	4.90%
Powder River	2,110,369	123,116	5.83%
Rosebud	3,213,147	22,984	0.72%
Stillwater	1,155,050	18,985	1.64%
Sweet Grass	1,190,997	45,120	3.79%
Gallatin	1,620,151	221,300	13.66%

County	Total Approximate County Acres	Approximate Tentatively Suitable Custer Gallatin Acres	Percent of County in Tentatively Suitable Custer Gallatin Lands
Madison	2,305,499	13,374	0.58%
Meagher	1,530,868	7,273	0.48%
State of South Dakota Counties			
Harding	1,713,983	10,655	0.62%

* Suitable acres differ from original forest plan estimates of suitable acres in 1987

Table 2 displays the acres of tentatively suitable land base from the 1987 Forest Plans by geographic location. Figure 2 and Figure 3 display forest plan tentatively suitable lands identified in the 1987 Forest Plans.

Table 2. Suitable acres by landscape area

Landscape Area	Landscape Area Total Acres on the Custer Gallatin	Approximate Tentatively Suitable Custer Gallatin Acres	% Geographic Area in Tentatively Suitable Custer Gallatin Lands
Ashland District	436,133	146,101	34%
Bridgers, Bangtails, Crazy Mountains	205,025	54,315	27%
Madison, Gallatin, Beartooth Mountains	2,158,640	343,980	16%
Pryor Mountains	75,067	24,897	33%
Sioux District	164,460	58,523	36%
Totals	3,039,325	627,816	21%

* Suitable acres differ from forest plan estimates of suitable acres in 1987

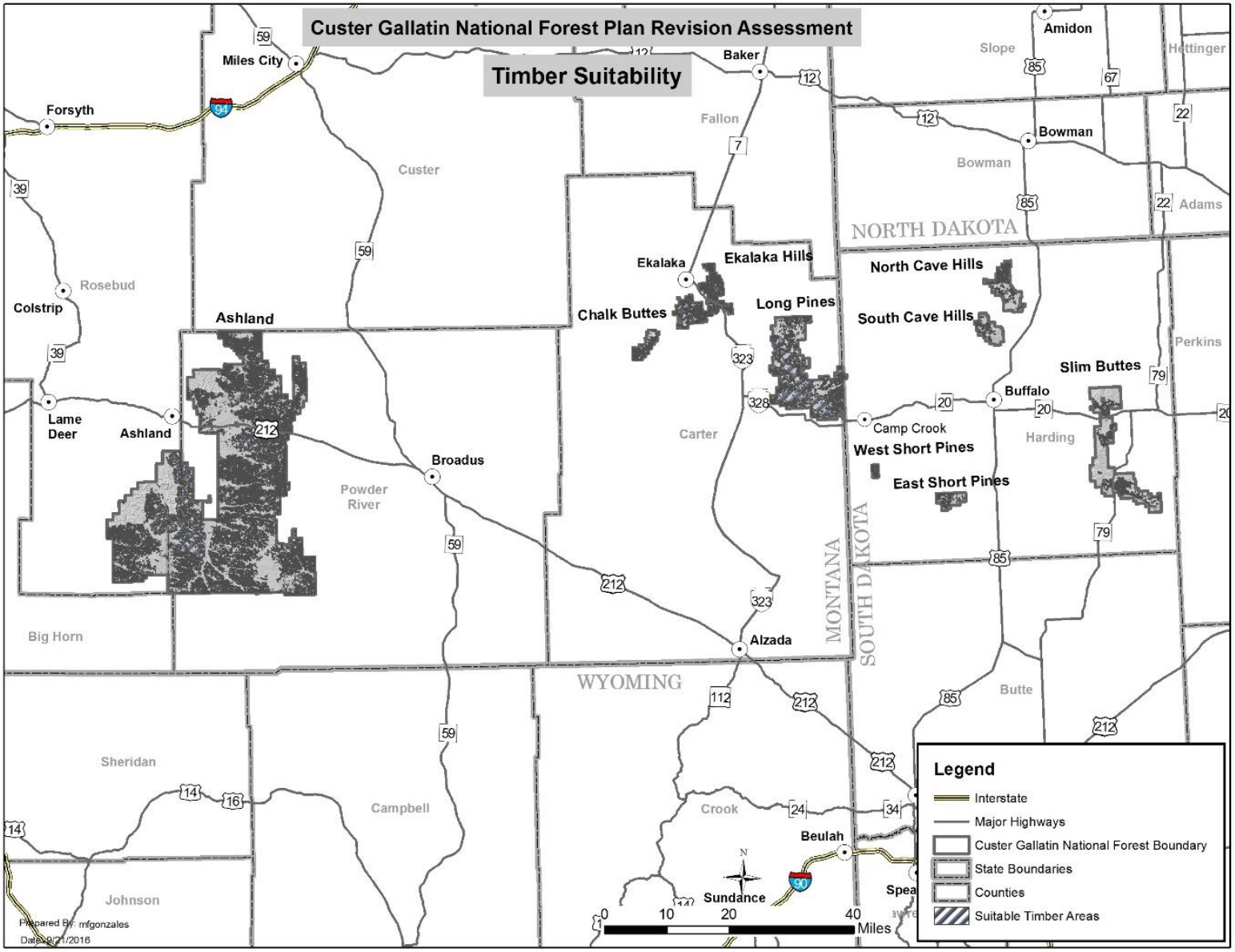

Figure 2. Custer Gallatin National Forest tentatively suitable lands Ashland and Sioux Ranger Districts

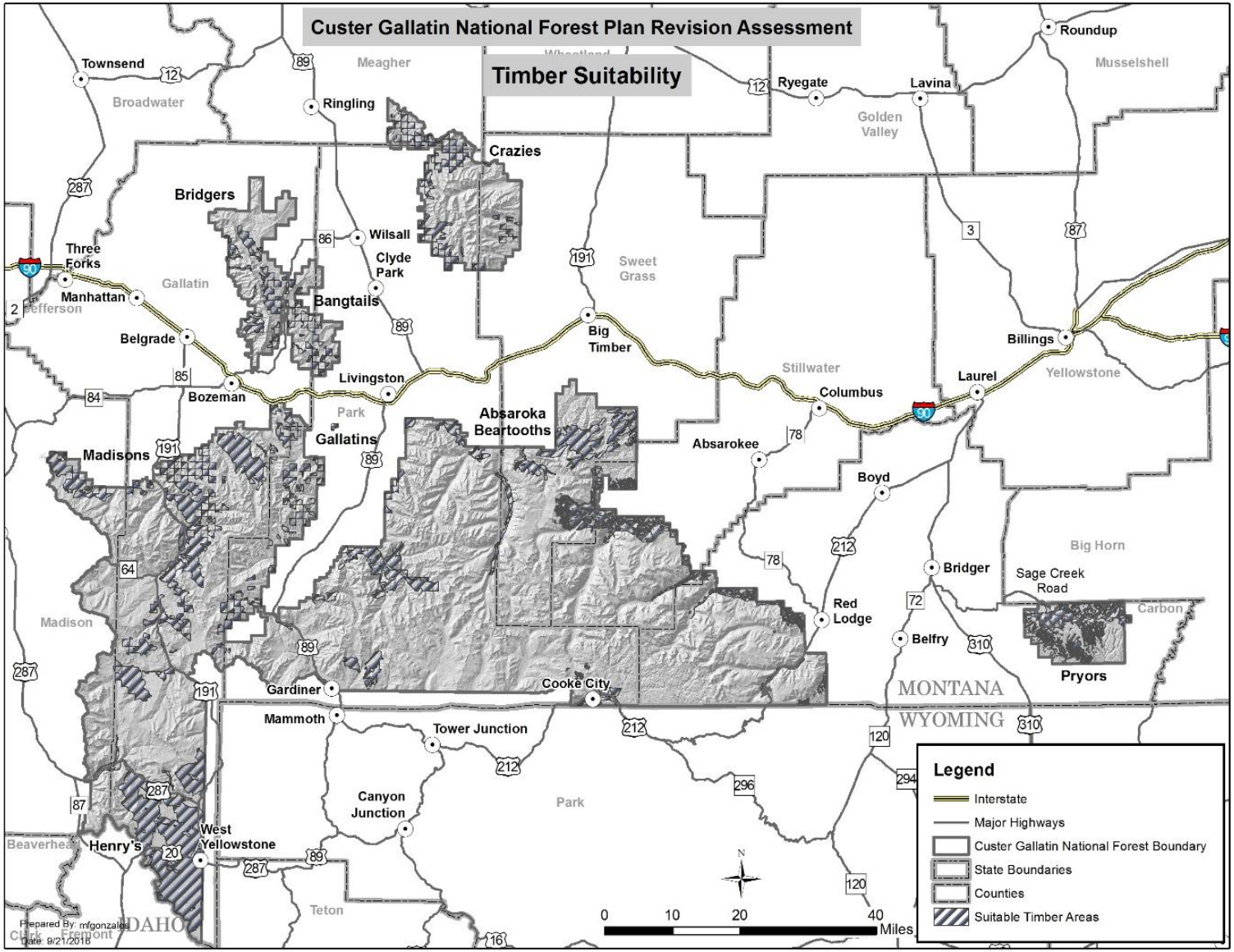

Figure 3. Custer Gallatin National Forest tentatively suitable lands in the Madison, Gallatin, Beartooth, Bridger, Bangtail, Crazy, Absaroka, Beartooth and Pryor Mountains

The 1987 Custer forest plan estimated that 239,231 acres or about 20 percent of the total forest acres as tentatively suitable for timber production, and the Gallatin forest plan estimated that approximately 440,000 acres or about 23 percent of the total forest acres as tentatively suitable for timber production. Tentatively suitable lands recorded in the current database for the Custer National Forest show approximately 268,321 acres or approximately 22 percent of the forested acres as tentatively suitable for timber production and the Gallatin National Forest current database records show approximately 359,494 acres or approximately 19 percent of the forested acres as tentatively suitable for timber production. The differences between 1987 tentatively suitable acres and what is currently recorded in the database as tentatively suitable lands for the Custer National Forest is explained below.

On the Ashland Ranger District, the suitability analysis indicated that approximately 128,571 acres were identified as non-commercial forest (dry slope ponderosa pine), therefore those acres were removed from the suitable base under the current forest plan. Dry slope pine ecosystems are variable in stocking and generally have yield capabilities of 10 to 30 cubic feet per acre per year. During implementation of the forest plan, a majority of these acres meet the minimum standard of producing 20 cubic feet per acre per year and are currently recorded as tentatively suitable lands.

On the Sioux Ranger District, the suitability analysis for the 1987 forest plan indicated that approximately 27,553 acres were tentatively suitable for timber production. Approximately 3,525 acres of tentatively suitable lands in South Dakota and 2,028 acres of tentatively suitable lands that contained inclusions of less capable habitat types were not included as tentatively suitable acres for timber production. Some of these acres are currently recorded as tentatively suitable.

The 1987 Gallatin National Forest identified approximately 440,000 acres as tentatively suitable for timber production. However, approximately 135,000 acres of these tentatively suitable lands were removed. Lands were removed from the timber base for the following reasons; (1) lack of economic efficiency at the time of the forest plan due to insect and disease activity, and (2) other resource values. Since 1987 the Gallatin National Forest timber suitability analysis, some of these lands are recorded in the existing database as tentatively suitable for timber production. Lands that were acquired through land exchanges during the 1990s, approximately 72,721 acres, are not included in the timber suitability analysis.

As part of revising the land management plan, the planning team will review land in the plan area and identify lands that will be suitable for timber production in the new plan. The first step of this process will be to remove land from consideration that is not suited due to technical factors such as lands are withdrawn from timber production, or land that is not forested. After subtracting the lands that are not suited from the total of National Forest System lands, the remaining lands are lands that *may be* suited for timber production, and are considered in step 2. Land removed in step 2 will based on the compatibility of timber production with the desired conditions and objectives for those. This second step process is done in the EIS for each alternative considered, as the desired conditions, objectives, management areas and other plan components will vary among alternatives. See FSH 1909.12 Sec 61 for a detailed description of the process and consideration that will be used to identify lands suitable for timber production in the revised plan.

Timber Products

The outputs of treatments for timber production are summarized by estimating the volume of wood products sold. The current 1987 Custer forest plan estimated the long-term sustained yield capacity (LTSYC) to be 6.4 million board feet (MMBF) per average annual year and the Gallatin forest plan estimated the long-term sustained yield capacity to be 27.0 MMBF per average annual year. Long-term

sustained yield capacity is based on the assumptions that suitable timber lands are maximized for timber production. The Custer forest plan identified an allowable sale quantity (ASQ) to be 3.0 MMBF per year plus an additional 0.5 MMBF as a non-interchangeable component of firewood and other miscellaneous products which would remain static for the next 7 decades. The Gallatin forest plan estimated the allowable sale quantity to be 21.0 MMBF per year, which included 5.0 MMBF of non-interchangeable firewood and miscellaneous products. The allowable sale quantity was expected to increase to 24.0 MMBF by decade 4 and 27 MMBF by decade 5. Allowable sale quantity is the total output of timber and other wood products anticipated in the plan periods and takes into account the fiscal capability of the national forest and consistency with land management goals and objectives.

The Periodic Timber Sale Accomplishment Reports (PTSAR) provide summaries of the timber products sold each year since 1980, in thousand board feet (MBF). Figure 4 displays the total volume of timber products sold on each national forest from 1980 to 2015. "Timber products" include sawtimber, pulp, poles, posts, and nonsaw material. The largest combined volumes sold occurred in 1980 at over 30 million board feet (MMBF). Beginning in the early 1990s, combined volume sold began a general downward trend, with pulses ranging from less than 1 MMBF to over 19 MMBF per year. Volume from the Gallatin National Forest has sharply declined from the 1980s and volume from the Custer National Forest has remained relatively stable with periods of no volume sold followed by periods of volume exceeding the yearly allowable sale quantity throughout the forest plan period.

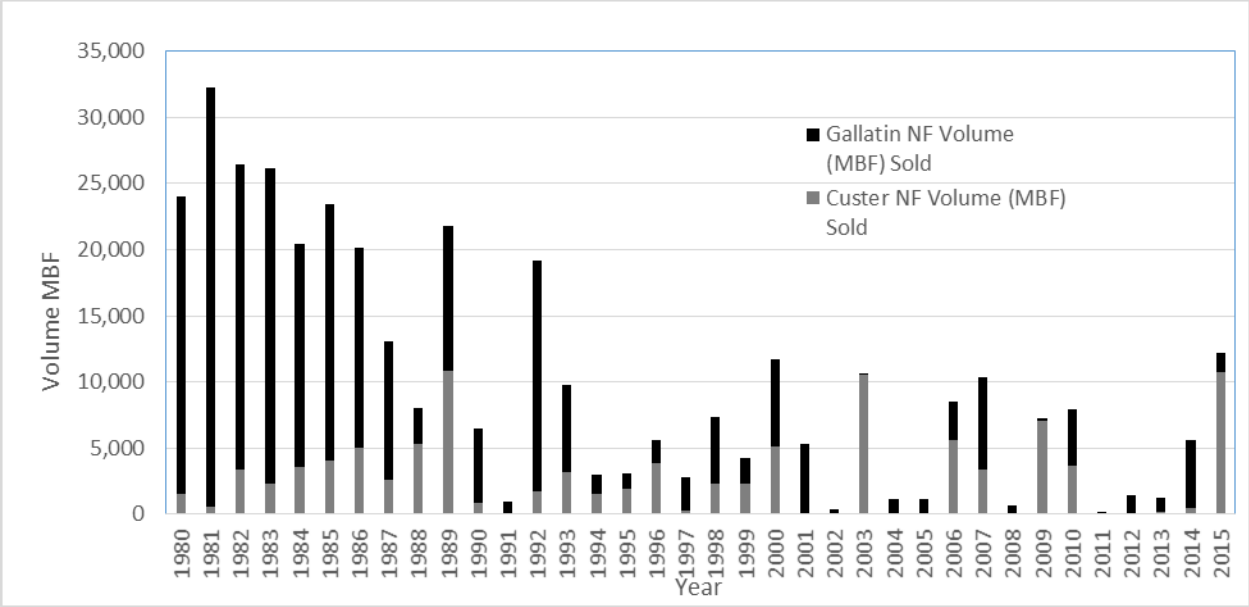

Figure 4. Total volume sold by national forest, 1987-2015 (excluding fuelwood)

Trends in average yearly timber product volume sold on the Custer Gallatin National Forest has generally declined by decade (Table 3). The Custer National Forest has experienced a decline in timber products sold since the 1980s, but the overall yearly average has remained somewhat consistent from 1980-2015. The Gallatin National Forest experienced sharp declines in average yearly volume since the 1980s through the 2000s. During the 1990s, the average volume of timber products sold yearly from the Custer National Forest declined by approximately 54 percent but rebounded during the 2000s as compared to the 1980s. During the decades of 1990 and 2000, the Gallatin National Forest average yearly timber products volume declined by 63 percent and 87 percent as compared to the 1980s.

Table 3. Average volume timber products sold per year (MMBF) by decade, excluding fuelwood

Decade	Custer National Forest Average	Gallatin National Forest Average	Custer Gallatin National Forest Total Average
1980-1989	3.9	16.5	20.4
1990-1999	1.8	6.2	8.0
2000-2009	3.2	2.0	5.2
2010-2015*	2.5	2.3	4.8

* 6 years included in the average as 4 years remain for this period

Over the 29-year period since the existing forest plans were signed (1987 to 2015), an average of 10.5 MMBF of timber products was sold per year across the Custer Gallatin National Forest (Table 4). The highest volume of timber products sold in a single year on the Custer National Forest after 1987 occurred in 1989, 2003, and 2015 (over 10 MMBF), while the highest volume of timber products sold in a single year on the Gallatin National Forest occurred in 1992 (over 17 MMBF).

The average timber product volume sold per year on the combined Custer Gallatin National Forest has been less than the allowable sale quantity provided in the 1987 forest plans. Fuelwood is not included in Table 3, but is included in Table 4 to account for the overall volume produced. Overall the Custer Gallatin National Forest has produced on average of about 13.5 MMBF per year less than the combined allowable sale quantities for the Custer and Gallatin forest plans.

Table 4. Custer Gallatin National Forest 1987 forest plans allowable sale quantity and average volume per year (MMBF) sold timber products and fuelwood (1980-2015)

Forest	ASQ (1987 Plans) (MMBF)	Average Volume Sold 1987-2015 (MMBF)	Difference
Custer	3.0	4.0	+1.0
Gallatin	21.0	6.5	-14.5
Both Overall	24.5	10.5	-13.5

* Allowable sale quantity (ASQ) is assigned by each national forest; the ASQs for the Custer and Gallatin are added together for this summary.

Figure 5 shows the volume sold by type from 1980-2015, Sawtimber encompasses the major portion of volume over the span of the current forest plan. Starting in 2004, nonsaw material has become a component of wood products sold on the Custer Gallatin National Forest. Much of the nonsaw materials sold on both national forests is made up of fire-killed trees from wildfires and mountain pine beetle-killed trees. Post and pole materials have been a small and minor component of volume sold on the national forests. Sales of post and pole materials have gone down since the early 1980s and is a very small component of volume sold on the Custer Gallatin National Forest.

Figure 6 displays the sawtimber volume sold by tree species on the Custer Gallatin National Forest. The primary species utilized for sawtimber on the combined Custer Gallatin National Forest is Lodgepole Pine (36 percent). Ponderosa pine and lodgepole pine are the most common species on the Custer Gallatin National Forest and they dominate the most productive and accessible landscapes. For multiple reporting years a significant amount of volume was categorized as “combined softwood”; this is likely to have been a combination of Engelmann spruce, subalpine fir or any combination of the tree species displayed in Figure 3. Both lodgepole pine and ponderosa pine are valuable for manufacturing a variety of wood products that consumers use. Douglas-fir is the third most prevalent sawtimber species sold (10 percent) followed by subalpine fir and Engelmann spruce at (3 percent).

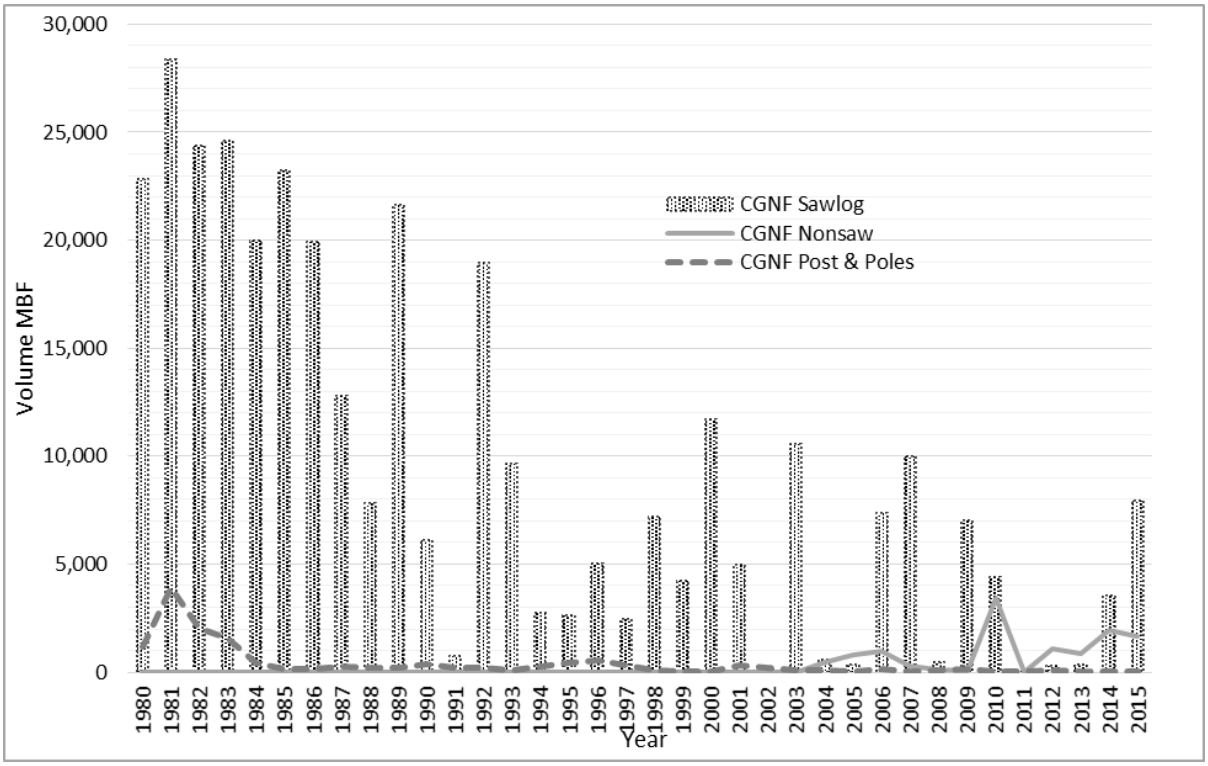

Figure 5. Volume (MBF) of forest products sold by type on the Custer Gallatin National Forest (1987-2015)

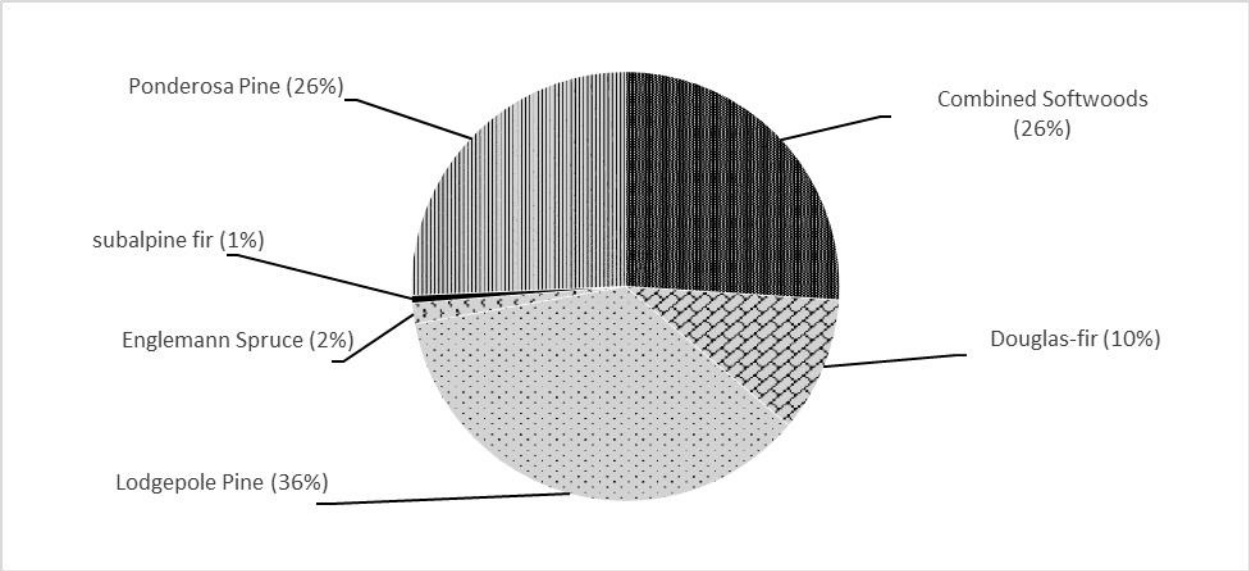

Figure 6. Sawtimber volume sold 1980-2015 by species on the Custer Gallatin National Forest

Non-Timber Products: Fuelwood and Christmas Trees

The primary non-timber products sold on the Custer Gallatin National Forest include personal use firewood and Christmas trees. Other products, such as mushrooms, boughs, transplants have been permitted in small quantities and are not a significant portion of the forest products sold on the national forest.

Figure 7 displays the volume of fuelwood sold from 1980-2015, and Table 1 Table 5 shows the average volume in MMBF per year by decade. Fuelwood is primarily sold for personnel use. From 1980-2015, fuelwood demand per year averages approximately 4.4 MMBF on the Custer Gallatin National Forest; individually the Custer National Forest averaged 1.2 MMBF per year and the Gallatin National Forest averaged about 3.2 MMBF per year. During the years of 1984-1987 and 1989 fuelwood use averaged approximately 9.5 MMBF. Fuelwood gathering involves the cutting and removing of dead trees for firewood and has been a consistent use by the public of the timber resource on the Custer Gallatin National Forest. Average volumes by decade where higher in the mid to late 1980s, decreasing significantly in the 1990s through early 2000s. During the time period of 2008-2015, demand for firewood has steadily increased and is approaching the average levels set in the mid-1980s. The rise in firewood demand since 2007 could be attributed to the increased number of dead trees available for harvesting following wildfire events, insect or disease outbreaks and the economic downturn that occurred in 2008.

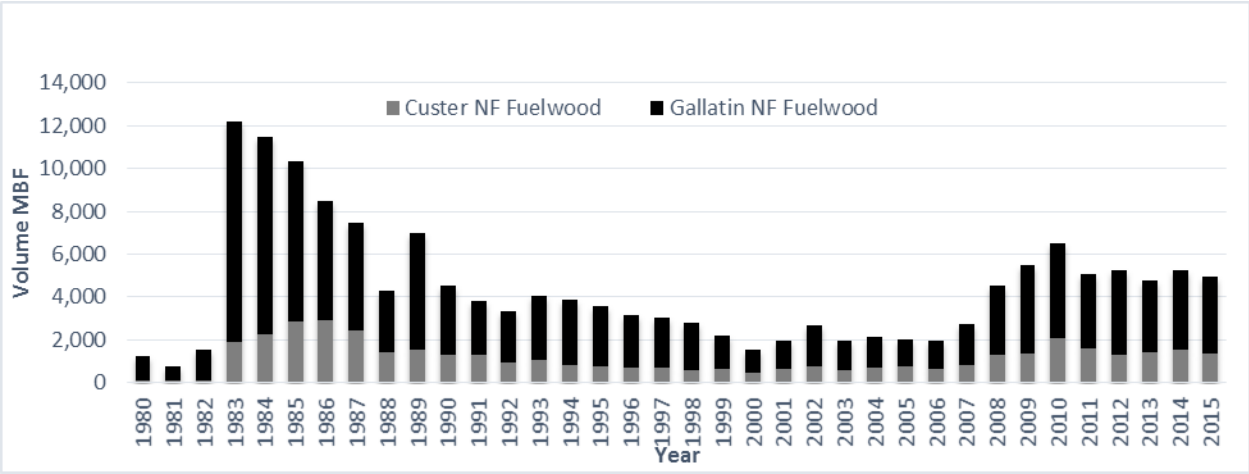

Figure 7. Volume (MBF) fuelwood sold by each national forest 1987-2015

Table 5. Average volume fuelwood sold per year (MMBF) by decade

Decade	Custer National Forest	Gallatin National Forest	Custer Gallatin National Forest
1980-1989*	1.6	4.9	6.5
1990-1999	0.9	2.6	3.4
2000-2009	0.8	1.9	2.7
2010-2015**	1.5	3.8	5.3

*6 years included in the average

Christmas trees are also a consistent and popular personal use product sold by the Custer Gallatin National Forest. The product sold is tracked by quantity rather than volume. Figure 8 displays the quantity of Christmas trees sold on the Custer Gallatin National Forest for the period of 1980-2015. On average, the Custer Gallatin National Forest sells approximately 5,518 trees with the Custer National Forest selling approximately 1,600 tree per year and the Gallatin National Forest selling approximately 3,916 trees per year. Prior to 1994, the Custer National Forest sold fewer than 1,000 trees per year but in subsequent years the Custer National Forest has increased to over 2,000 trees per year. The Gallatin National Forest has maintained selling a consistent stable quantity of approximately 4,000 trees per

year. Since 1988 both national forests have been relatively stable in the quantity sold, combined to be between 6,000 and 7,000 trees per year.

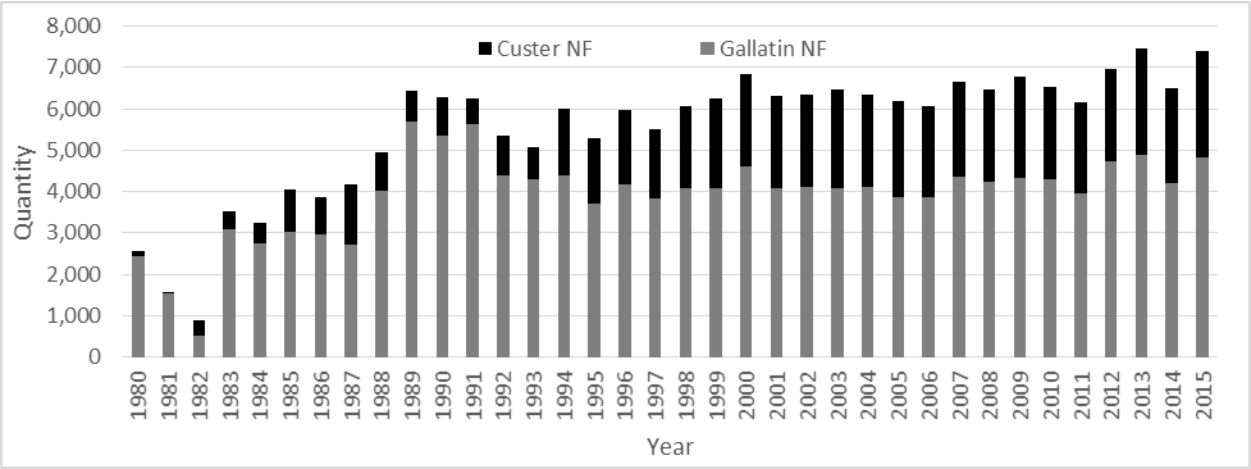

Figure 8. Number of Christmas trees sold by national forest (1980-2015)

Trends Driving the Supply and Demand for Timber

The period of 2007 to 2011 represents the worst operating environment experienced by the North American and Montana forest products industry since the Great Depression. It involved a two-year recession from 2007 to 2009, the related financial crisis, and a housing collapse with the lowest levels of new home construction since the Second World War (Keegan et al. 2012). Low prices for lumber and other wood products have accompanied this broad economic downturn. As of August 2012, there has been only a small increase in U.S. housing construction. Modest upticks are expected in domestic lumber markets if U.S. home building recovers and global demand continues to increase. Given continued difficult conditions, additional mill closures are possible. However, with slightly over half of capacity utilized in recent years—versus a historic level of over 80 percent during good markets—the industry would be expected to process substantially more timber when markets improve, provided adequate timber supply is available.

Consumption of manufactured wood products is projected to show only modest growth through 2060, while the consumption of wood for fuel is expected to increase substantially. How this trend affects the area surrounding the Custer Gallatin National Forest depends on factors such as the price difference between wood fuel and fossil fuels; technological changes; and changes in regulations or incentives (Skog 2012).

The current forest plans allowable sale quantity (ASQ) is 3.0 and 21.0 MMBF average annual timber harvest for the Custer National Forest and Gallatin National Forest respectively. The ASQ is the *maximum* level of harvest consistent with the current forest plan's standards and guidelines. The annual timber volume offered per year averaged 4.0 and 6.4 MMBF respectively over the period 1987 through 2015 and has declined over time. This actual amount of timber offered is influenced by a variety of factors, including site-specific environmental analyses, public involvement on project proposals, choice of harvest methods, fire, and effects of administrative objections and appeals, as well as litigation. In addition, actual levels are limited by the budget the Custer Gallatin National Forest receive for that purpose, and workforce capacity needed to prepare sales and the associated environmental analyses.

Forest Service funding and workforce capacity to support the timber sale program is expected to remain static in the immediate future.

Forest Service Management Actions Influencing Timber Production

Under the current forest plans (1987), roughly 21 percent of the approximately 3.04 million acres of National Forest System lands in the Custer Gallatin National Forest are considered tentatively suitable for timber production. The Custer National Forest has a higher proportion of suitable acres relative to its overall land base. The larger Gallatin National Forest contains slightly more suitable acres, but these represent only about 19 percent of the land base in large part due to the amount of wilderness and wilderness study areas on the national forest. Areas considered tentatively suitable for timber management in the current Forest Plans are those lands where management of forest stands for timber products is legally and technically feasible, will not cause irreversible damage to other resources, and is compatible with the area's desired conditions and objectives.

The Custer Gallatin National Forest non-wilderness land base is approximately 2,372,073 acres, while wilderness, wilderness study areas, and proposed wilderness encompass approximately 667,280 acres of the national forest land base.

Management activities have been recorded in activity tracking databases, currently known as the Forest Activity Tracking System (FACTS), as early as the 1940s and 1950s when harvesting on National Forest System lands became more prevalent and accurate record keeping began. Treatment types are grouped into three categories: harvest, stand improvement and reforestation, and fire/fuels.

The majority of harvest has occurred on lands currently identified as tentatively suitable for timber production, as shown in Table 6. Other lands and management areas allow timber harvest for reasons such as salvage or wildlife habitat improvement provided resource values associated with the lands are not detrimentally affected.

Table 6. Harvest occurring on lands tentatively suitable for timber production in current forest plans since 1940

Tentatively Suitable Acres	Acres of Harvest (Since 1940)	Percent of Tentatively Suitable Acres Harvested Since 1940
627,815	155,503	25%

Treatment types are interrelated and multiple activities occur on the same acre. For example, a harvest is often followed by prescribed burning and planting. Therefore, acres reported are greater than the footprint of managed area. Total acres are reported for each activity, followed by an assessment of the management footprint.

Timber Harvest

Timber harvest is a tool used not only to provide timber products and contribute to the local economy but also to achieve multiple resource objectives. These include reducing insect or disease impacts, improving wildlife habitat, increasing tree growth, improving timber productivity, lowering fuels and fire risk, and altering vegetation conditions to enhance forest resilience. Three main types of timber harvest are displayed: even-aged regeneration harvest (such as clearcutting, shelterwood, and seed-tree cuts); uneven-aged regeneration harvest (such as group selection and single-tree selection); and intermediate harvest (such as commercial thins and improvement cutting). Table 7 displays the harvest activities by

harvest type and geographic location from the 1940s to 2015. Harvest activities have occurred on approximately 7 percent of the nonwilderness land base on the Custer Gallatin National Forest.

Table 7. Custer Gallatin National Forest harvest acres by harvest type and geographic location since 1940

Landscape Area	Regeneration Harvest	Uneven-aged Harvest	Intermediate Harvest	Total Harvest Acres
Ashland	1,978	2,465	6,035	10,478
Bridgers, Bangtails, Crazy Mountains	20,483	1,372	2,846	24,701
Madison, Gallatin, Beartooth Mountains	69,311	7,143	25,966	102,420
Pryor Mountains	625	0	276	901
Sioux Unit	4,932	2,515	9,556	17,003
Total	97,329	13,495	44,679	155,503

Table 8 displays the trend of harvest type by decade across the Custer Gallatin National Forest. The greatest amount of harvest occurred in the 1960s and 1980s; over 37,000 acres were harvested in each of these periods. Regeneration harvests were the most common, representing over 65% of harvest type prior to 2010. Nevertheless, there has been a shift proportionately to more intermediate harvests recently, trending toward 40% in the 1980s and 1990s, and 70% since the 2000s. Regeneration harvests that have occurred since 2000 have been largely related to post-fire and insect salvage projects that removed dead trees. Total harvest acres have declined sharply since the 1990s.

Table 8. Harvest acres by type and decade for the Custer Gallatin National Forest (1940-2015)

Year Decade	Acres of Regeneration Harvest	Acres of Uneven-aged Harvest	Acres of Intermediate Harvest	Totals
1940-1949	193	1,260	0	1,453
1950-1959	7,327	3,041	265	10,633
1960-1969	31,490	1,973	3,856	37,319
1970-1979	18,328	3,396	3,065	24,789
1980-1989	19,787	2,714	14,888	37,389
1990-1999	16,554	665	12,165	29,384
2000-2009	3,650	212	5,794	9,656
2010-2015	0	234	4,646	4,880
Totals	97,329	13,495	44,679	155,053

Economic conditions and changing timber market values are partially responsible for the lows and highs in timber harvest levels, insect and disease epidemics and wildfires are ecological factors that also influence harvest levels and trends. Salvage of fire-killed trees on the Custer Gallatin National Forest following stand-replacement fires in the late 1980s and early 2000s helped increase the regeneration harvest levels.

Stand Improvement and Reforestation

Stand improvement refers to intermediate treatments of trees generally not past the sapling stage to improve the composition, structure, condition, health, and growth of even or uneven-aged stands. Reforestation is the reestablishment of forest cover either naturally (natural seeding) or artificially (by direct seeding or planting). A variety of site preparation activities to prepare the seedbed or planting site has been associated with reforestation on the Custer Gallatin National Forest, including burning, slashing, and hand or machine scarification. While in the past these treatments were primarily tied to harvesting, reforestation and timber stand improvement activities are increasingly conducted in areas impacted by large wildfires to meet an array of resource objectives. Table 9 displays the stand improvement and reforestation activities by decade on the Custer Gallatin National Forest.

As displayed in Table 9, stand improvement and reforestation acres exceed the amount of harvested acres displayed in Table 8. This is due in large part to reforestation efforts in recent decades have been conducted on suitable sites impacted by natural disturbance activities such as wildfires and insect and disease where no harvest was conducted. Reforestation occurs on these sites because the National Forest Management Act states that reforestation is required within five years following natural disturbance events as well as final regeneration harvest. The success of the Custer Gallatin National Forest reforestation efforts over the last 10 years is tracked and accounted for in the reforestation indices reports derived from the FACTS database. For planting success in the last 10 years, FACTS indicates the Custer National Forest at 83 percent and the Gallatin National Forest at 76 percent success rate (Sandbak 2017).

Table 9. Custer Gallatin National Forest stand improvement and reforestation activities by decade (1940-2013)

Decade	Acres of Stand Improvement	Acres of Reforestation	Total Acres
1940-1949	17	90	107
1950-1959	12	1,249	1,261
1960-1969	1,496	11,027	12,523
1970-1979	7,221	11,958	19,179
1980-1989	11,801	32,267	44,068
1990-1999	9,287	29,687	38,974
2000-2010	4,116	26,242	30,357
2010-2015	1,849	27,185	29,035
Totals	35,799	139,705	175,504

Fire and Fuel Treatments

Fire and fuels treatments, such as prescribed burning, slashing and piling of fuels are also methods that the Forest Service uses to manipulate forest vegetative conditions. Generally, these activities occurred in association with timber harvest and these treatments were done to reduce activity fuels and prepare sites for planting. Table 10 displays the acres of fuel treatments by decade on the Custer Gallatin National Forest from 1940-2015.

Table 10. Acres of fuels treatments by decade on the Custer Gallatin National Forest (1940-2015)

Decade	Prescribed Burn Acres	Fuels Reduction Acres	Total Acres
1940-1949	0	142	142
1950-1959	463	2,482	2,945
1960-1969	2,850	27,249	30,099
1970-1979	4,301	27,391	31,692
1980-1989	4,266	53,978	58,244
1990-1999	36,401	37,772	74,173
2000-2010	23,545	26,593	50,138
2010-2015	17,164	18,163	35,327
Totals	88,990	193,770	282,760

The trend of fire and fuels treatments were increasing from the 1940s to 1990s and since have decreased. Approximately 74,000 acres for fuel reduction purposes were treated in the 1990s. Fire and fuel treatments used in combination with timber harvest treatments can alter forest composition, increase forest resiliency and improve wildlife habitat. Fuels activities conducted on lands suitable for timber production include objectives to provide for appropriate timber stocking levels and timber production.

Vegetation Management Footprint

Figure 9 displays the footprint of vegetation management by geographic area, 1940-2015. Vegetation management activities include completed acres of timber harvest, fuels (including prescribed fire) and timber stand improvement treatments.

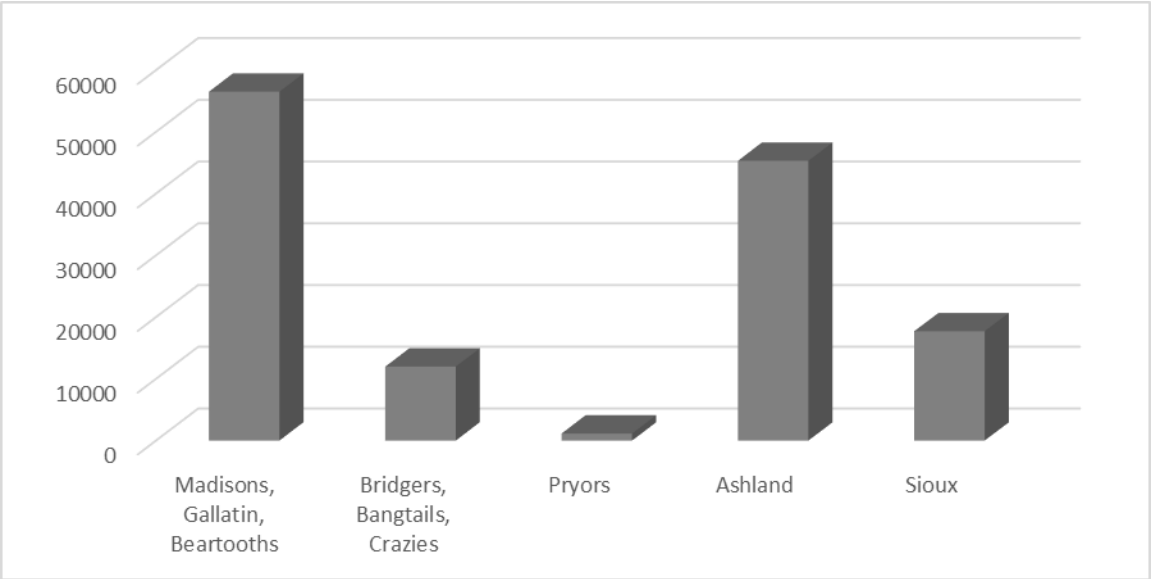

Figure 9. Footprint of acres of vegetation management activities by geographic location (1940-2015)

The footprint of vegetation management activities was queried out of FACTS and is less than the total acres harvested by geographic location because multiple activities may be reported on the same acre. Wildfires and reforestation activities were not included. As displayed on Figure 9, the Madison's,

Gallatin and Beartooth geographic area have had more activities followed closely by the Ashland area. These two areas also contain the largest areas that are tentatively suitable for timber production.

Stability or Resiliency of Ecosystems that Currently Maintain Timber Production

The ecosystems that provide forest products are subject to an array of natural and human-induced influences. Natural disturbances such as wildfire, windthrow, insects, and disease function across the landscape to kill trees and regenerate new age classes. Climate conditions greatly affect forest growth, establishment, and resiliency to those natural disturbances. Human interventions, most notably fire suppression and forest management such as timber harvest and planting, have also altered forest conditions. Table 11 displays wildfire acres burned by geographic area, within tentatively suitable lands and percent of tentatively suitable lands impacted on the Custer Gallatin National Forest.

Table 11. Custer Gallatin National Forest acres burned within geographic areas from wildfires 1980-2015

Geographic Area	Acres Burned in Wildfire 1980-2015	Tentatively Suitable Acres Burned	Approximate Tentatively Suitable Acres	Percent of Tentatively Suitable Acres Burned
Ashland	300,914	102,763	146,101	70%
Bridgers, Bangtails, Crazies	3,386	1,107	54,315	2%
Madisons, Gallatin, Beartooths	425,594	51,385	343,980	15%
Pryors	5,737	868	24,897	3%
Sioux Unit	74,128	39,277	58,523	67%
Totals	809,759	195,399	627,816	31%

As Table 11 displays, since 1980 approximately 809,759 acres (or about 26%) of the Custer Gallatin National Forest land base has been burned by wildfire. Of this, about 195,399 acres burned in areas considered tentatively suitable for timber production in the 1987 forest plans, representing about 31% of the tentatively suitable base. Wildfires impacted the Ashland and the Sioux unit the most, affecting 70% and 67% of the tentatively suitable land base. While most wildfires have occurred in unsuitable areas, timber production has been affected to an extent. The effects of fires vary widely, and data to summarize severity are not readily available for all past fires. Where stand-replacing effects occurred, forests were returned to an early successional seedling stage of development, and it will be at least 50 to 60 years before the trees reach a size where commercial timber harvest may be feasible. Salvage of fire-killed trees occurred within a few years of some fires to remove trees before they lost economic value, representing a small percentage of each fire area. Over time, promoting the development of a more diverse mosaic of forest conditions may lead to increased resiliency and a more stable timber product output capability.

Mountain pine beetle, pine engraver, Douglas-fir beetle and western spruce budworm have recently impacted the Custer Gallatin National Forest. Figure 10 displays the acres impacted by geographic across the national forest as reported from the 2001 to 2014, Northern Region Forest Health Protection Aerial Detection Surveys.

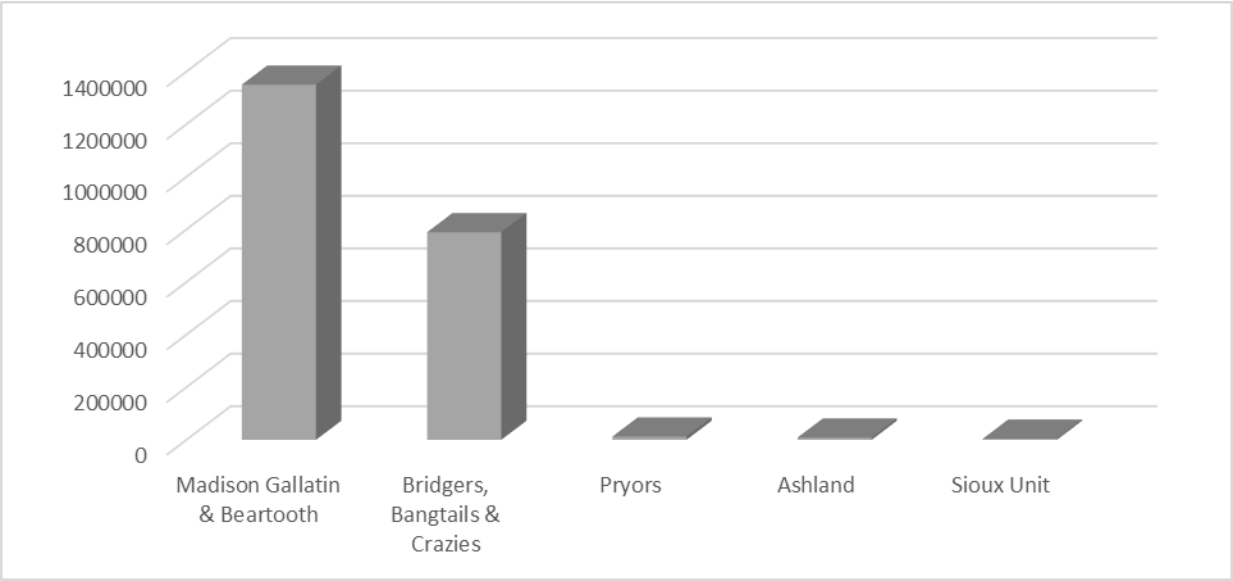

Figure 10. Acres impacted by mountain pine beetle, pine engraver, Doug-fir beetle and spruce budworm by geographic area (2001-2014)

Across the Custer Gallatin National Forest, approximately 2,165,809 acres have been impacted by disturbance agents. The Pryors, Ashland and Sioux geographic areas have been far less impacted by these disturbance agents as compared to the other two geographic areas. It is important to note that the aerial detection surveys upon which infested acres are estimated are not flown on all areas, and tend to be more focused in managed areas than in non-managed areas such as wilderness. Further, the level of mortality can vary widely on any given acre. Regardless of these uncertainties, it is clear that a substantial amount of the national forest has been impacted by these disturbance agents. Mountain pine beetle had the greatest impact and affected approximately 1,103,428 acres, while spruce budworm had the second greatest impact and affected approximately 1,023,232 acres. In areas where the sawtimber component was substantially impacted, the availability of timber products will be greatly reduced for the next few decades once the short window of opportunity for salvage has passed until new forests grow to a merchantable size.

Influence of Other Lands or Other Conditions

In addition to the impacts of natural conditions such as disturbance regimes and climate, other factors impact timber production on the Custer Gallatin National Forest.

Forest growth rates directly influence potential timber production over time, as well as the value of the timber as influenced by tree size. Site productivity is generally considered fixed, and is based upon biophysical site attributes such as topography, soil type, and climate. On the Custer Gallatin National Forest, site productivity in terms of tree growth is estimated to be between 20 and 50 cubic feet per acre per year on suitable lands with average rotation ages ranging from 90 to 120, depending on the species and site (Custer and Gallatin forest plans).

The potential impact of wildland fire to or from adjacent lands has been a driver of treatments to reduce hazardous fuels particularly in wildland-urban interface areas. The National Wildfire Coordinating Group defines hazardous fuel as a fuel complex defined by kind, arrangement, volume, condition, and location that presents a threat of ignition and resistance to control. In some cases, hazardous fuel reduction treatments are not designed to enhance or maximize timber productivity even in suitable areas.

Forest conditions on adjacent lands can limit harvesting opportunities on National Forest System lands. Harvest activities on BLM, State, or private ownership are taken cumulatively into account when assessing the environmental impacts of treatments on nearby National Forest System lands. In some cases, harvest may be limited on National Forest System lands to provide for multiple resource requirements such as watershed health or wildlife habitat.

Other regulatory agencies, such as the U.S. Fish and Wildlife Service, may also provide direction that limits management activities to protect threatened and endangered species, meeting their responsibility under the Endangered Species Act. Similarly, additional resource regulations and policies influence treatments to improve timber production or provide timber products from suitable lands.

Importance of Timber to People in the Broader Landscape

The Custer Gallatin Assessment Plan Specialist Report - Social, Cultural, and Economic Conditions (Larson and Rasch 2017) provides a great deal of information on the economic importance of the timber sector to the analysis area including sections on the timber sector, wildland dependence, Federal land payments to states, assessing the economic contribution of major industries in the Custer Gallatin National Forest plan area, and Custer Gallatin National Forest contributions to the plan area economy.

Trends from past and potential future timber products shows a decrease in timber outputs. Timber harvest and construction of the needed roads to access harvest areas is challenged by segments of the public at both the local and national level, with concerns primarily focused on endangered species (such as grizzly bear and lynx) and other wildlife habitat needs. The protracted debate over designation of roadless areas has also substantially limited timber harvest opportunities. It is likely that this intense interest in timber management will continue into the future, if not increase, and will impact level of harvest and supply of commercial forest products.

Timber harvest is a tool that is used to achieve other resource objectives, beyond providing a commercial forest product. Reduced opportunities to use timber harvest would limit the ability to change vegetation structure, species compositions, landscape patterns, and other conditions for the purpose of improving forest resilience, creating desired wildlife habitat conditions, reducing forest fuels, or other purposes.

Information Needs

The following information should be considered during forest plan analysis.

Mill processing facilities have drastically changed across the Custer Gallatin National Forest planning area. To better understand the demand and capacity for timber products from the Custer Gallatin National Forest, analysis may need to consider assessing the Custer Gallatin National Forest Timber Processing Area (TPA).

Key Findings

Timber outputs for the Gallatin National Forest have decreased since the mid-1980s and significantly under the projected outputs in the 1987 forest plan.

- Wildfire has impacted 31 percent of the total tentatively suitable land base on the Custer Gallatin National Forest, however on the Ashland and Sioux units, 70 percent of the tentatively suitable land base has been impacted.

- Across the Custer Gallatin National Forest, approximately 2,165,809 acres have been impacted by disturbance agents. In particular, the Madison's, Gallatin and Beartooth along with the Bridger's, Bangtails and Crazies geographic landscapes have the greatest impact from disturbance agents other than wildfires.
- Forests within the geographic landscapes are showing decreased resiliency to natural disturbance events, such as insects and disease and wildfires (see Forested Vegetation Specialist Report, Sandbak 2017).
- Acres of timber stand improvement, fuels treatments, and reforestation have been decreasing since the 1980s when the current forest plans were written.
- As part of revising the land management plan, the planning team will review land in the plan area and identify lands that will be suitable for timber production in the new plan. See FSH 1909.12 Sec 61 for a detailed description of the process and consideration that will be used to identify lands suitable for timber production in the revised plan.

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