APPENDIX A – SUPPLY AND DEMAND

Introduction

According to 36 CFR 219.12(e), the forest plan shall contain the following:
"(3) Projections of demand using best available techniques, with both price and nonprice information. "

Range Supply and Demand

The range program on the George Washington NF is so small in scope that supply and demand conditions were not considered necessary.

Timber Supply and Demand

The timber supply and demand analysis should answer the following questions about the timber resource on the George Washington National Forest (GWNF):

- How much timber, by product groups, does industry need and how much would local industry desire from the GWNF?
- How much timber, by product groups, is available from all ownerships and how much timber could the GWNF produce under various policy, legal and social limitations?
- What niche in the timber economy could the GWNF fill?

Answers to these questions will provide guidance in identifying alternatives, desired conditions, and objectives during the plan revision.

Definitions

Definition and context for supply: Timber supply is estimated as the current standing volume of timber plus annual net growth within the given analysis area(s). While a baseline estimate considers only standing volume, ultimately factors such as harvesting economics, resource quality, and landowner attitudes should be considered. Timber supply in the South is strong and appears to have expanded throughout the 1990's in spite of competing land use pressures (Wear et al., 2007). In the Commonwealth of Virginia, for every unit of hardwood removed, 1.3 units have grown to replace it (Department of Forestry, 2008). Given the reduction of timber removals on the George Washington National Forest (GWNF), coupled with continued growth, baseline timber supply has increased greatly in the past decade.

Definition and context for demand: Timber demand is estimated as the current consumption by primary processing mills within the given analysis area. Concentration yards are not included as primary producers since most of the concentration yards serve primary producers in the various market areas.
Timber production in the Southeastern United States has grown both in absolute terms and relative to that in other regions of the country since the 1970's. However, recent changes in domestic consumption patterns, coupled with shifts in international trade, has shifted timber demands. Depreciation and closure of older mills, especially in the paper industry has accentuated these factors and changed the spatial distribution of timber markets. This leads many in the forestry community to conclude that timber markets in the South are expected to decline (Wear et al., 2007)

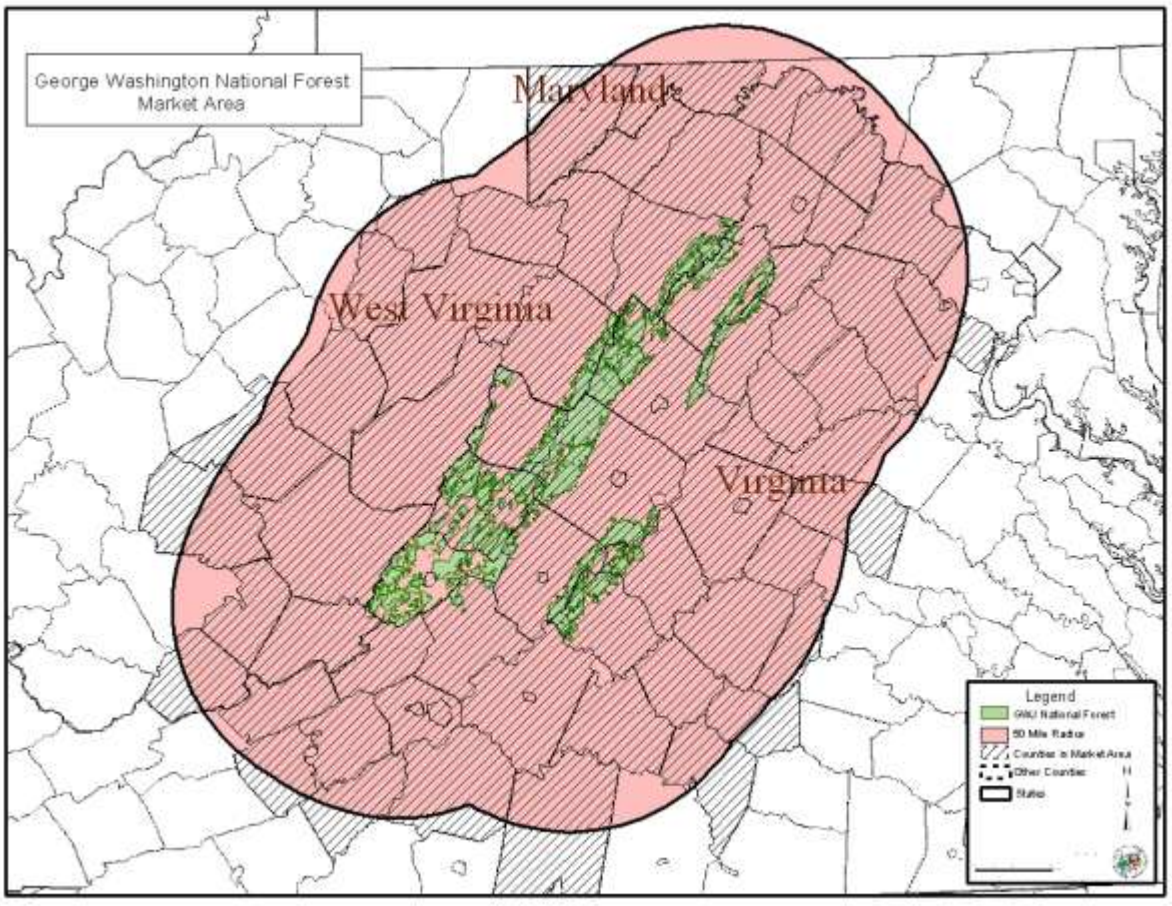
On the other hand, production of newer engineered wood products continues to grow. The potential use of wood products as biomass energy may develop in the near future. Indeed, long run forecasts of timber market activity predict an expanding domestic demand over the coming decades and this increasing production is expected to be concentrated in the South (Wear et al., 2007).

Market Area

Two factors were considered in determining the market area for the GWNF. First, through personal communication with local paper mills we understand that a 60 mile haul for pulpwood is considered standard. Long haul adjustments for haul distances in excess of 60 miles are often offered by the mills. These long haul adjustments are designed to compensate for the extra transportation cost involved and make wood beyond 60 miles competitive with wood less than 60 miles from the mill. We also examined historical timber sale appraisal information. The average appraised haul distance for hardwood pulp was 41 miles. Sawtimber haul distances were somewhat less. However, since pulpwood is a product on nearly every timber sale, it seems reasonable to consider the longer distance of the two products.

Considering these two factors, we believe that a 50 mile radius around the GWNF is a very reasonable market area. To simplify the analysis of FIA data used, only whole counties whose midpoint fell approximately within the 50 mile radius were included.

Figure 1. Market area for George Washington National Forest timber.

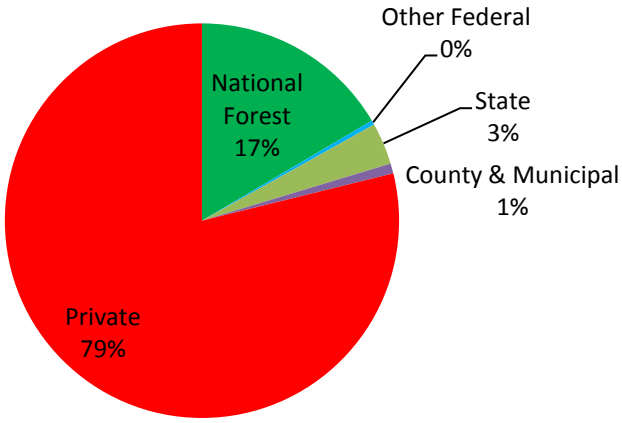


This market area includes a total of 64 counties in 3 States (2 counties in Maryland, 41 counties in Virginia, and 21 counties in West Virginia). A total of 19.2 million acres are contained within this market area (.7 million acres in Maryland, 11.5 million acres in Virginia, and 7 million acres in West Virginia).

Timber Resources (Supply)

Information regarding the supply of timber was compiled using the most recent available Forest Inventory and Analysis (FIA) data. The FIA Database Version 4 was used to query and compile this information. Of the 19.2 million acres in the market area, 12.5 million acres are inventoried as timberland. Timberland is defined as forested land capable of growing at least 20 cubic feet of industrial wood per acre per year. Figure 2 provides the percentage of area of timberland within broad ownership classes. The two largest categories include privately held and National Forest Service (NFS) lands accounting for 96% of the timberland in this market area. The GWNF comprises approximately 5.5% of the land within the market area.

Figure 2: Percent Ownership of Timberland in the George Washington N.F. Market Area



We know that non-industrial private forest (NIPF) lands are an important component of ownership in this market area. Unfortunately, the FIA data used for this analysis did not differentiate between industrial and NIPF lands. However, Worthington et al. found that 80% of the timberland in this same general area was NIPF land. This figure is also consistent with the Virginia Department of Forestry findings (2008 State of the Forest). The Southern Appalachian Assessment report identifies anywhere between 69% and 73% of the area in the Northern Ridge and Valley and Blue Ridge sub-regions as NIPF lands. For the purposes of this analysis, we will consider all of those lands identified as private to mean NIPF lands.

There are approximately 26.7 Billion Cubic Feet (bcf) of live volume on these timberlands. Some 13 bcf, or about half of the total live volume, is found in fully stocked or overstocked stands while only 3 bcf (11%) occurs within poorly stocked or non-stocked stands. Approximately 82% of this volume is found in large diameter stands (>19”), indicating that a vast majority of the live volume in the market area is mature. Sawtimber volume accounts for about 9.1 bcf or about 35% of the total live volume. The distribution of live volume across various ownerships is very similar to that discussed for area of timberland above (e.g. 19% on NFS lands and 77% on privately held lands). Net growth, that is growth minus mortality and/or removals, in the market area of live trees on timberland equates to 1.9 bcf per year.

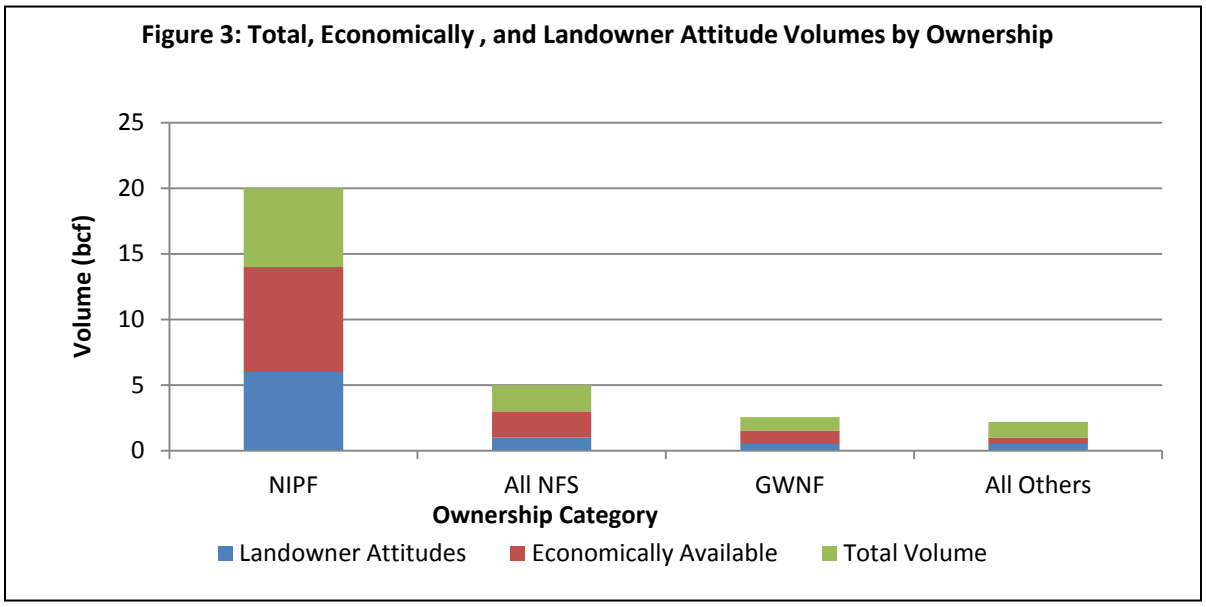
In summary, there is a baseline supply of approximately 27 bcf, with about 9 bcf occurring as sawtimber in the market area. Roughly three-quarters of that volume occurs on private lands while another 20% occurs on National Forest Lands. Assuming current growth, mortality, and removals rates do not change dramatically over the next decade or so, we can expect to gain another 1.9 bcf in live volume per year.

However, not all of this 27 bcf is available as a supply of wood products. Worthington et al. examined several factors which result in changes to availability of this standing volume; primarily economic consideration and landowner attitudes.

Worthington et al. concluded that approximately 67% of the standing volume was economically available based on exhaustive modeling and analysis given market conditions in 1996. Of course markets have changed since that time, so an adjustment to this figure should be attempted. Data published by the Appalachian Hardwood Center, an affiliate of West Virginia University, indicates that Red Oak stumpage prices have fallen by 165% since 1996 (red oak is a major component of the hardwood products in this market area and is used as a proxy for all sawtimber for this purpose). Hardwood pulp stumpage increased by 250%, since 1996. When we consider that 35% of the standing volume in the market area is sawtimber and 65% is pulp (a vast majority of which is hardwood pulp), these decreases and increases over time balance each other. We find that overall stumpage prices in this market area are about 104% of the 1996 stumpage prices. Thus, the findings in Worthington et al. can still be used to approximate current market conditions for this broad scale analysis. Therefore we estimate that a total of approximately 18 bcf is economically available in the market area; 14 bcf on privately held lands, 3 bcf on NFS lands, 1.5 bcf of that on the GWNF, and 1 bcf on other public lands.

Landowner attitudes are a large influence in wood product availability, especially on the NIPF lands that compose a vast majority of this market area. For the purposes of this discussion, we will term this consideration of landowner attitudes "social availability" for harvest. Worthington et al. estimated that about 14% of NIPF landowners reflect a "never harvest" segment of the market. Within the remaining segment, dollar returned was considered the primary factor in wood availability. They further estimated that an additional 41% of the standing volume would not be available because the value returned would not be high enough for the NIPF owner to sell. Thus, a combined reduction of 55% of the volume could be considered unavailable on privately held lands. This means that in general 45% of the economically available volume on NIPF lands would actually be available considering landowner attitudes, equating to approximately 6.3 bcf of total standing volume.

This concept of landowner attitudes can also be extended to public lands. Much of the Other Federal lands identified by FIA data include reserved lands administered by the National Park Service and Fish and Wildlife Service, meaning this volume would also fall into the "never harvest" segment of the market. Similarly, about 32% of the current GWNF is considered suitable for timber production. The availability of volume on State and Municipal lands varies widely, but this area is such a very small component of the market area (about 4%), that those lands do not figure heavily in wood product availability in the market area as a whole. For the purposes of this analysis we will estimate that 1 bcf would be available on NFS lands and .51 bcf of that on the GWNF after considering lands unsuitable for timber production. From 0 to 1 bcf is available on all other lands. Figure 3 summarizes the volumes available by ownership category and availability.



Thus, it is estimated that a total standing volume of approximately 7 to 8 bcf would be available as a timber supply on all lands in the market area, equating to a 70% reduction of the total standing live volume in the market area. Applying this same percentage to growth, we estimate, we expect to gain a net increase of 0.57 bcf each year on economically and "socially" available lands due to growth minus removals and mortality.

Biomass fuels for the generation of energy is gaining interest and support in many parts of the south. Biomass fuels are viewed by many to be one way to decrease dependence on fossil fuels. Biomass is also considered by some to be carbon neutral, meaning that over its life cycle, a product or process that does not add more carbon dioxide to the atmosphere. For instance, a tree consumes carbon dioxide while it grows, then when transformed into and used as fuel it releases an equivalent amount of carbon dioxide back into the atmosphere.

The potential to supply biomass fuels from the GWNF is included in the afore-mentioned estimates. Of the .51 bcf available as supply, anywhere from 0 to .25 bcf could potentially be utilized as biomass fuel, or a maximum of 8.75 million tons forestwide. The upper bound of this estimate is the small roundwood component plus the traditionally non-merchantable material in branches and tops; we presume that no sawtimber would be utilized as biomass fuels. However, it is important to note that under current management the entire Forest only produces about 70,000 tons of wood, including sawtimber. This puts the almost 9 million ton figure identified as a maximum into perspective; it is probably not realistic.

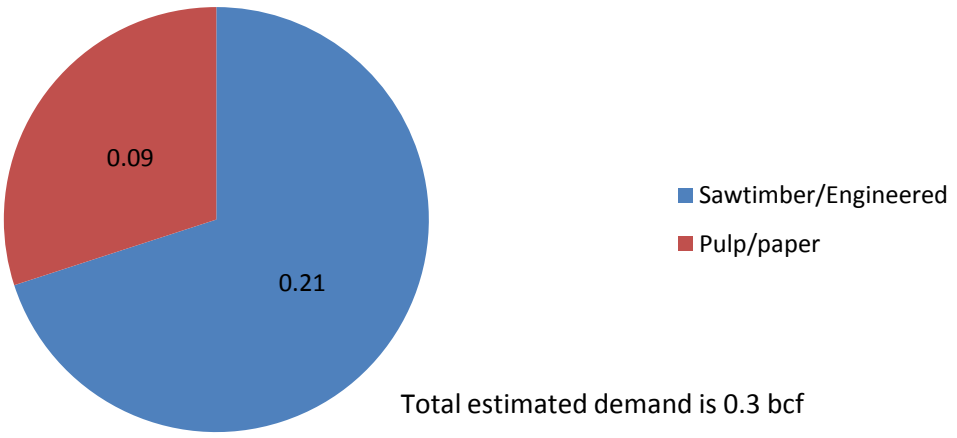
It is also important to note that the use of the raw wood product is beyond the control of the Forest Service and is ultimately dictated by local market factors. Depending upon the amount of competition and demand for wood chips, the amount of product that may be utilized as biomass fuels could be none, just the tops and branches, or anything up to sawtimber size. We do not envision supplying biomass fuel specifically (other than personal use firewood, which is a form of biomass fuel). We do envision supplying wood products in the course of achieving Forest goals and objectives and the use of that raw product will be at the purchaser's discretion.

Primary Processor Capabilities (Demand)

Information on demand was compiled from Forest Product Directories for the counties included in the market area and the George Washington and Jefferson National Forests Appraisal Schedule. This

information identified 217 sawmills, 3 paper/pulp mills, and 3 engineered wood product manufacturers in the area. We used mill capacity as an indicator of demand. Unfortunately, mill capacity information in these directories was only available for West Virginia, which occupies 33% of the total number of sawmills or engineered wood product mills (and 0 paper/pulp mills). We assumed that mill capacities in West Virginia are indicative of the market area as a whole and extrapolated the West Virginia information to estimate mill capacity, a proxy for demand for wood products, for the entire market area. Mill capacity in the West Virginia portion of the market area total approximately .07 bcf. This results in an estimate of demand at 0.21 bcf per year for sawtimber and engineered wood product primary producers in the entire market area. The capacity of the 3 pulp/paper mills within this market area is estimated at .09 bcf per year. Thus, the total demand for wood products by primary producers within this market area is estimated at 0.3 bcf per year. Figure 4 summarizes the total demand for wood products per year in the market area.

Figure 4: Estimated Annual Demand of Wood Products by Product based on Mill Capacities (bcf)



As Worthington et al. points out, timber supply and demand in the Appalachian hardwood region is not homogenous. There is a wide variation in species, size, and quality that equates to similar variation in value. Likewise, primary producers range in their need or desire for various qualities of wood materials; a segment of sawmills demand high quality raw material, while other sawmills specialize in extracting products from various lower quality material (e.g. ties and posts), while fibermills and paper mills can utilize low quality products so long as they are sound and the chips are mixed in proper proportions to achieve a quality final product.

Although Worthington et al.'s in-depth analysis targeted the Jefferson National Forest, their market area included about half of the market area defined for the GWNF analysis. Indeed the resource itself, ownership patterns, and mix of primary producers are quite similar throughout the Appalachian Mountains, Blue Ridge and Plateau of Virginia and West Virginia, which form the heart of both market areas. Thus Worthington et al.'s conclusions regarding segmented demand are also quite applicable to the GWNF.

Worthington et al.'s segmented market analysis found that when we look at the proportion of high, medium, and low quality standing timber we find that NFS lands contain a slightly higher percentage of high quality timber than the average for all ownerships (23% on NFS lands vs. 21% on all lands). Certainly there is more high quality timber on NIPF lands (78%), but this is simply a function of the distribution of ownership overall. NIPF lands comprise some 75%-80% of the market area, so it is not surprising that they contain the most high quality timber over the entire market area. We believe what is more important is that NFS lands have slightly more high quality timber in terms of the percentage found within a given ownership than the average of all ownerships. Worthington also found that the demand for high quality timber constituted 51% of the overall demand for sawtimber in the market area, which equates to .15 bcf per year in this market area.

Worthington performs an in-depth analysis of the effects of a "restricted supply" scenario on segmented supply and demand. They required that like quality timber would only be transported to the nearest like quality mill and examined the economic availability of each segment of supply. The ultimate conclusion of this analysis was that while there is an excess of medium and low quality supply of timber to meet that medium and low quality demand, there is increasing economic pressure on high quality raw material. When we consider the restricted timber availability on NIPF lands discussed previously as landowner attitudes, we can expect even more pressure on high quality timberland equating to increased demand.

Currently, the demand for biomass fuels on the GWNF, other than traditional firewood, is negligible. There are 2 electrical cogeneration plants of any size within the market area; one located in Pittsylvania County and the other in Campbell County. Combined, these plants have the capacity to utilize approximately 1.25 million tons per year. There is an indication that one of these plants will soon be taken off-line, reducing the potential capacity to about 1 million tons per year. There no plants that produce fuel pellets from raw wood products. We do not have the technology at this time to economically produce bio-fuels (e.g. ethanol) from wood, although those processes are being researched and perfected. While we foresee an increase in demand for biomass fuels over the life of this analysis, it appears that there may actually be a decrease in such demand in the near future. We cannot reliably predict or quantify that demand at this time.

Supply and Demand – GWNF Niche

In summary, we estimate 8 bcf of timber supply on economically available timberland and considering landowner attitudes. More importantly, we can expect this to grow by about 0.57 bcf per year. Thus, .57 bcf per year represents the maximum sustainable supply of wood products given the previous assumptions regarding economic and social availability in the market area.

We estimate total demand for timber to be 0.3 bcf per year, or approximately 4% of the estimated total supply of standing volume. This estimated annual demand is less than annual net growth, indicating a sustainable resource. Bear in mind that these numbers consider economic availability and landowner attitudes, which are subject to change as markets and landowners change. Figure 5 displays a comparison of the estimated demand within the market area to the total available volume and annual growth.

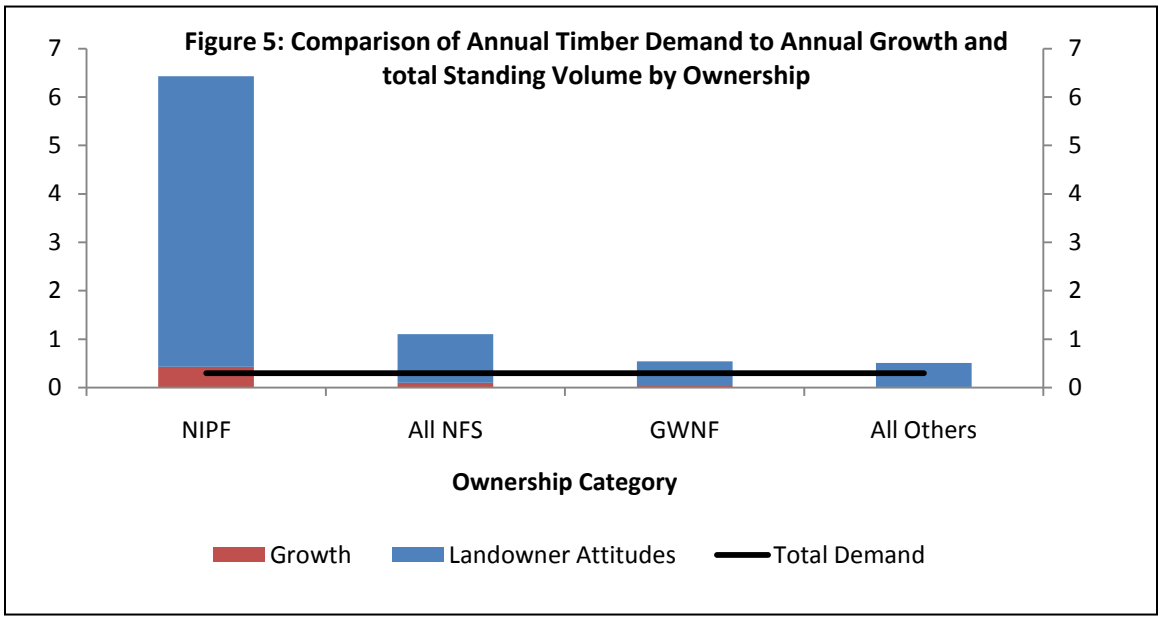


Table A-1 provides a similar comparison in table form.

Table A-1: Comparison of bcf volumes of annual demand for timber (bcf), annual growth, total standing available by land ownership class.

	NIPF	All NFS	GWNF	All Others
Total Demand	0.3	0.3	0.3	0.3
Annual Growth (i.e. Maximum Sustainable Production)	0.43	0.1	0.03	0.01
% of Demand	143%	33%	10%	3%
Available Standing Volume	6	1	0.5	0.5

The GWNF comprises a very small market share within this market area. Total standing volume is estimated at about .5 bcf and growth is estimated at .03 bcf per year. We estimate that we could only sustainably provide about .03 bcf per year, or approximately 10% of the annual demand. For comparison, NIPF lands could supply about 140% percent of the estimated demand. However, when we consider the variation in quality of supply and the demand for quality timber, the GWNF may have a slightly more significant role to play. Demand for high quality products is greater, we expect increased pressure on high quality timber, and the GWNF has a proportionally higher percentage of high quality timber on NFS lands as compared to all lands (albeit only slightly higher). So, while the primary producers of the timber industry within this market area do not depend on the timber from the GWNF to any large extent, the GWJ can play a more significant role in the supply of high quality sawtimber to the sawtimber segment that demands high quality timber.

In terms of biomass fuels, the GWNF would likely comprise an even smaller share of the market, if such a market were to develop. Typically, energy production mills that utilize wood in part or in whole require a million or more of tons of fiber annually. Realistic estimates, under current management, indicate that the GWNF could produce perhaps 30,000 tons annually within any given 50 mile radius around a mill location. Although the scope of this analysis is very broad, encompassing some 64 counties in 3 States, we believe it is also important to consider the role of NFS lands on a more local level. NFS lands occupy more than 50% of 5 of these counties and many more counties contain 30-40% NFS lands. Certainly the role that the timber supply from NFS lands play in these local economies is quite important and should not be lost or discounted when taking a larger view.

Finally, we should also consider that the production of wood and fiber for society is not the only, or even the most important, purpose of commercial harvesting on all NFS lands. Managing habitat for various wildlife species and/or ecosystem restoration can be of equal or more value in driving the commercial timber sale program on the GWNF. From that viewpoint, it is perhaps less important to focus on the role of the GWNF in the overall market area and more important to focus on the role of the timber market in facilitating our use of a commercial timber sale program to achieve other ecosystem and ecological service objectives. Or, put more bluntly, can we sell the relatively small amount of timber we need to harvest to achieve the overall objectives of the GWNF? Historically, the answer has been yes. In the last decade the George Washington and Jefferson National Forests combined only experienced 4 years with no-bid sales averaging just over one no-bid sale per year for the decade. These incidents appear to be episodic in nature and relate to downturns in the hardwood market resulting in purchaser uncertainty. During the most recent downturn in prices, once the initial drop had occurred and the market prices steadied at a lower rate, we experience more interest in NFS commercial harvests. We conjecture that lower market prices resulted in very little availability on NIPF lands and increased the pressure on public lands to

provide timber. Despite episodic market changes, we believe we will be able to market a large majority of our timber products through commercial timber harvests and facilitate implementing our other ecological objectives.

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Worthingon, Virginia, Chris B. LeDoux, William H. McWilliams, Hank Sloan, Toni Jones. Methodology for Assessing Current Timber Supplies and Product Demands. 1996. Northeastern Forest Experiment Station GTR NE-226. 25p.

Developed and Dispersed Recreation Supply and Demand

Affected Environment

National Forests provide over 191 million acres of public land within the United States. National Forests in the Southern Appalachian region contribute approximately 4 million acres to the national total and provide unique settings for a variety of outdoor recreation activities such as primitive and developed camping, hunting, fishing, hiking, backpacking, horseback riding and OHV driving, canoeing/kayaking and whitewater rafting as well as picnicking, sightseeing, nature watching, walking for pleasure and driving for pleasure.

Market Area

Market areas have been established for different national forests to better evaluate public demand for recreation opportunities. Past research has demonstrated that most national forest visits originate from within a 75-mile (1 ½ hour driving time) radius. Variation in preferences varies surprisingly little for broad population groups (i.e., age strata) across geographic areas. Therefore, the use of market area provides a reasonable basis for assessment of recreation demand. (*George Washington National Forest Recreation Realignment Report* Overdest and Cordell, 2001). For this analysis, the market area has been defined as all counties that fall within a 75-mile straight-line radius from the national forest border. For the George Washington National Forest, the market area entails portions of Virginia, West Virginia, Pennsylvania, Maryland and North Carolina. The population living within the market area is about 9,200,204 (Source: U. S. Census Bureau. July 1, 2004 estimate). Table A-2 provides a summary of the cities, counties and population within the market area for the George Washington and Jefferson National Forests.

Table A-2 Summary of States, Counties, Cities and Population Within the Market Area

DC and States	Number of Counties & Cities	Sum of Population
DC	1	553,523
MD	9	2,794,633
PA	6	523,223
VA	83	4,351,587
WV	32	977,238
TOTAL	**131**	**9,200,204**

Source: National Survey on Recreation and the Environment, Southern Research Station, Last Updated August 2010

The most populated counties in the market area are Fairfax, Virginia, and Montgomery and Prince George's Counties, Maryland, followed by Washington, DC. Other large municipalities within the market area include Alexandria, Arlington, Blacksburg, Charlottesville, Fredericksburg, Harrisonburg, Lynchburg, Manassas, Staunton, Vienna, and Winchester, Virginia; Beckley, Bluefield, Elkins, Martinsburg and Princeton, West Virginia; and Frederick and Silver Spring, Maryland.

Opportunities for outdoor recreation within the market area are not limited to the George Washington National Forest. Within the market area, the U.S. Forest Service offers additional opportunities on the Jefferson and Monongahela National Forests. The National Park Service offers opportunities in Shenandoah National Park, Blue Ridge Parkway, Harpers Ferry National Historic Park, C&O Canal National Historic Park, multiple historic sites, and the National Capital Region (mall, memorials and historic sites in

Washington, DC). All of these areas connect and expand opportunities for recreation on federally managed public lands. The Appalachian National Scenic Trail also provides a unique long distance hiking opportunity north to south across the entire length of the market area. It connects multiple National Forests and Parks as well as State Forests and Parks from northwest Georgia to northwest Maine, with approximately one-fourth of its length being in Virginia.

A key finding of the Southern Forest Resource Assessment is that "of public ownerships, Federal tracts typically are large and mostly undeveloped. They fill a niche of providing back-country recreation. State parks and forests are usually smaller and more developed." (Southern Forest Resource Assessment, Chapter 11: Forest-Based Outdoor Recreation, H. Ken Cordell and Michael A. Tarrant, 2002.) Within the Commonwealth of Virginia, many state parks are located within a 75-mile radius of the George Washington National Forest border. These state parks such as Claytor Lake, Douthat, Fairystone, James River, Lake Ana, Shenandoah, Sky Meadows and Smith Mountain Lake provide higher levels of development including overnight lodging. Smith Mountain Lake and Claytor Lake provide water-based recreation opportunities within the Market Area. West Virginia State Parks and Forests within the GWNF market area include Cacapon Resort, Lost River, Cass Scenic Railroad, Seneca, Watoga, Beartown, Greenbrier, Moncove Lake, Babcock, Bluestone and Pipestem. Likewise, a majority of these West Virginia State Parks and Forests offer highly developed recreation facilities.

The George Washington National Forest provides approximately 1,065,918 acres of public land in the Valley and Ridge and Blue Ridge physiographic regions of western Virginia and eastern West Virginia. The Shenandoah Valley divides the George Washington National Forest into two separate sections. Each section provides a variety of unique recreation opportunities.

Recreation Demand & Trends

Recreation demand is a complex mix of people's desires and preferences, availability of time, range of price, and offering of facilities. The evaluation of current and future demand for recreation on the George Washington National Forest is based on recent surveys that identify and quantify:

- Estimated number of current recreation visits to the George Washington National Forest;
- Participation rates for recreation activities within the forest market area;
- Future activity demand based on projected population growth; and
- Activity demand by demographic strata.

The National Visitor Use Monitoring (NVUM) effort by the Forest Service has provided baselines for estimating current use of recreation sites. The 2001 and 2006 NVUM surveys data is not specific to each national forest, but rather the survey findings combined recreation use and activities for both the George Washington and Jefferson National Forests. These numbers only account for people engaging in recreation activities; they do not include the millions of people that drive through the national forest without stopping to recreate, unless they did so for the purpose of viewing scenery. Table A-3 provides a summary of estimated national forest visits by site type for 2006.

Table A-3 Fiscal Year 2006 Estimated Recreation Use on the George Washington and Jefferson National Forests

Type of Recreation Sites	2006 Total Annual Estimated National Forests Site Visits*	2006 Percentage of Total Estimated National Forests Site Visits*
Day-Use Developed Sites	399,800	24%
Overnight-Use Developed Sites	212,800	13%
Wilderness	47,100	3%

Type of Recreation Sites	2006 Total Annual Estimated National Forests Site Visits*	2006 Percentage of Total Estimated National Forests Site Visits*
General Forest Areas	1,010,300	60%
Special Events and Organizational Camp Use	4,200	>1%
Total Estimated Site Visits	1,674,200	100.0%
Source: National Visitor Use Monitoring Results, Data Collected Fiscal Year 2006, Report Last Updated March 2009.		
*Site Visit is defined as the entry of one person onto a National Forest site or area to participate in recreation activities for an unspecified period of time.		

Based on this NVUM data, the "developed recreation" day and overnight use areas combined makes up just over one-third of the estimated recreation site visits. Almost two-thirds of recreation site visits can be defined as "dispersed recreation" that occurs away from developed sites in general forest areas and designated Wilderness. About one-third of 1% of recreation site visits are attributed to organized special use events and camps that occur in both developed and dispersed recreation settings.

People within the defined market area for the George Washington National Forest engage in a variety of recreation activities. Table A-4 lists the types of activities ranked in order from highest to lowest participation rates based on the 2000-2004 National Survey on Recreation and the Environment (NRSE), an on-going national telephone survey sponsored by the U.S. Forest Service. The data here is specific to participation in activities in which the market area population engaged, although the activities may or may not have occurred on the George Washington National Forest.

Table A-4 Types of Activities In Which The Market Area Population Engages (On and Off National Forest System Lands)

RECREATIONAL ACTIVITY	Market Area Survey	
	Percent	# of People*
Walk for pleasure	87.7%	6,303,054
Family gathering	75.2%	5,405,870
Visit historic sites	64.0%	4,602,377
Visit nature centers, etc.	63.7%	4,581,037
Picnicking	63.3%	4,551,409
View/photograph natural scenery	63.2%	4,545,428
Driving for pleasure	61.3%	4,406,426
Sightseeing	60.3%	4,332,833
View/photograph other wildlife	48.8%	3,510,264
Swimming in an outdoor pool	48.6%	3,489,977
View/photograph wildflowers, trees, etc.	48.3%	3,471,564
Visit a beach	47.5%	3,416,639
Swimming in lakes, streams, etc.	45.4%	3,260,576
Bicycling (any type)	42.9%	3,083,258
Boating (any type)	38.8%	2,789,632
Day hiking	38.3%	2,751,542
Visit a wilderness or primitive area	35.2%	2,532,350
View/photograph birds	33.3%	2,392,019

RECREATIONAL ACTIVITY	Market Area Survey	
	Percent	# of People*
Snow/ice activities (any type)	32.1%	2,307,625
Visit a farm or agricultural setting	30.5%	2,194,107
Gather mushrooms, berries, etc.	29.9%	2,150,416
Visit other waterside (besides beach)	29.1%	2,092,235
Freshwater fishing	25.2%	1,809,067
Visit prehistoric/archeological sites	25.2%	1,810,139
Mountain biking	25.1%	1,800,834
Motorboating	22.2%	1,592,503
View/photograph fish	22.1%	1,591,664
Developed camping	21.9%	1,571,514
Warmwater fishing	19.5%	1,399,697
Drive off-road	19.2%	1,379,365
Coldwater fishing	14.1%	1,009,775
Primitive camping	13.3%	959,277
Saltwater fishing	11.6%	831,240
Hunting (any type)	11.5%	827,106
Canoeing	11.3%	809,605
Backpacking	10.9%	781,897
Downhill skiing	10.5%	754,489
Rafting	10.3%	743,500
Big game hunting	10.1%	728,982
Horseback riding (any type)	9.5%	682,560
Sailing	8.5%	609,380
Use personal watercraft	8.1%	584,063
Horseback riding on trails	7.9%	569,578
Small game hunting	7.8%	561,735
Waterskiing	6.7%	481,981
Snorkeling	5.7%	412,772
Kayaking	5.2%	371,519
Snowboarding	4.8%	346,660
Rowing	4.7%	336,069
Cross country skiing	4.1%	293,023
Snowmobiling	3.7%	268,327
Anadromous fishing	3.4%	241,287
Surfing	1.8%	129,616
Scuba diving	1.7%	119,137
Migratory bird hunting	1.4%	102,656
Windsurfing	0.9%	63,568

Source: 2000-2004 National Survey on Recreation and the Environment. USDA Forest Service. Southern Research Station. Athens, Georgia.

**George Washington NF local area: 131 counties, 16 and older population (2004 Census estimate). Percentages were rounded after the number of participants was derived.*

The Virginia Department of Conservation and Recreation has been sampling participation rates in outdoor recreation since 1965. According to the *2007 Virginia Outdoors Plan*, the two highest needs for outdoor recreation in the next five years are access to recreational waters of the state and trails close to home. Table A-5 shows the results of the *2006 Virginia Outdoors Survey* (Virginia Outdoors Plan, 2007) with the most popular outdoor recreation activities in Virginia.

Table A-5. Ranking of Outdoor Recreation Activities Based on Percent of Households Participating (Source: 2007 Virginia Outdoors Plan)

Activity	Percent of Population, 2006	Percent of Population, 2002	Percent of Population, 1996
Walking for pleasure	72	67	65
Visiting historic sites	56	40	35
Driving for pleasure	55	62	60
Swimming	44	52	53
Visiting nat. areas, parks	44	27	24
Sunbathing on beach	36	39	42
Fishing	26	42	29
Picnicking	26	29	31
Using a playground	25	24	24
Boating	24	34	31
Jogging	24	22	20
Visiting gardens, arboretums	21	22	20
Bicycling	21	40	31
Camping	18	28	26
Hiking, backpacking	16	18	15
Golf	14	25	20
Basketball	12	15	12
Fitness trail	10	7	6
Soccer	9	9	6
Snow skiing, boarding	9	12	13
Tennis	8	16	20
Hunting	7	14	17

The West Virginia Development Office produced a 2009 Statewide Comprehensive Outdoor Recreation Plan (SCORP) that included a 2008 recreation survey of state residents. Walking, birdwatching, fishing, and hunting activities all ranked above 35%, followed by camping and canoeing at 7%. The SCORP reports that hunting levels and economic returns have remained high compared to other states and national trends.

However, in Virginia, a significant trend in outdoor recreation activities indicated in the *2006 Virginia Outdoor Survey* is the decline in the numbers of hunters in Virginia. In the past 10 years, hunting has decreased from an activity engaged in by 17 percent of households in 1994 to 7 percent of households in 2006. According to the 2007 Virginia Outdoors Plan "the continued change in land use patterns from rural to urban and suburban may have driven this change. Sixty-five percent of hunters in Virginia hunt on

private lands. The lack of access to previously hunted private lands due to landowner changes has also driven a change in supply of lands for hunting. In fact, where lands remain rural, hunting participation rates are much higher than in the urban crescent (Northern Virginia). Participation in the mountain region was 21.4 percent, Piedmont region was 16.4 percent and Chesapeake region was 16.5 percent, as contrasted with the participation rates of 6.1 percent in the urban crescent."

The Resources Planning Act (RPA) Assessment reports on the status and trends of the Nation's renewable resources on all forest and rangelands, as required by the Forest and Rangeland Renewable Resources Planning Act of 1974. The RPA mandates periodic assessments of the condition and trends of the Nation's renewable resources including recreation, fish, wildlife, biodiversity, forest and range resources as well as land use change, climate change and urban forestry. Consistent with this Act, the U.S. Forest Service Southern Research Station and the University of Georgia, Athens, develop and present outdoor recreation participation projections for specific recreation activities or recreation composites for regions of the United States. Future renewable resource conditions are influenced by changes in population, economic growth, and land uses. Using these major drivers, three equally likely scenarios were used by the 4th Assessment by the Intergovernmental Panel on Climate Change (IPCC 2007) and are adopted by the U.S. Forest Service and University of Georgia in developing projections for participation in outdoor recreation. They are labeled scenarios A1B, A2 and B2. Table A-6 provides general descriptions of these three scenarios regarding projections in population, personal income and household income.

Table A-6 General Descriptions for Projections Scenarios

Factor	Scenario A1B	Scenario A2	Scenario B2
U.S. Population Projection	447 million people 370 million adults	505 million people 418 million adults	397 million people 329 million adults
Avg. Personal Income by 2060	$73,000	$50,000	54,000
Avg. Household Income by 2060	$137,000	$97,000	$108,000
Source: Bowker, J. M., and Askew, Ashley (forthcoming). Outdoor Recreation Participation Projections 2010 to 2060. In: Outdoor Recreation Trends and Futures: Technical Document Supporting the Forest Service 2010 RPA Assessment. GTR-SRS-XXX. Asheville, North Carolina: U.S. Department of Agriculture, Southern Research Station.			

Table A-7 provides Forest Service projections in public participation in outdoor recreation activities on the George Washington NF. This list of individual activities or activity composites was derived from the National Survey on Recreation and the Environment and was adjusted for the GWNF.

Table A-7. Fifty Year Projected Activities in Outdoor Recreation on GWNF (number of people, in thousands)

Recreation Activity	2010	2020	2030	2040	2050	2060
Camping						
Developed Camping	105.16	117.44	130.13	140.87	151.81	163.68
Driving						
Driving For Pleasure	47.77	53.38	59.19	64.06	68.98	74.36
Other Motorized Travel	0.83	0.93	1.03	1.12	1.20	1.30
Motorized Water Travel	24.42	27.23	29.74	32.29	35.36	38.78
TOTAL FOR GROUP	73.02	81.55	89.96	97.47	105.54	114.45

Recreation Activity		2010	2020	2030	2040	2050	2060
Fishing							
	Fishing	189.82	208.12	224.94	238.62	253.22	268.93
General							
	General Relaxing	74.05	82.75	91.75	99.30	106.93	115.28
	Swimming	57.19	64.51	71.78	78.49	85.70	93.63
	TOTAL FOR GROUP	131.24	147.27	163.53	177.79	192.63	208.91
Hiking							
	Hiking/Walking	210.56	237.34	265.76	291.31	318.09	347.74
Hunting							
	Hunting	99.49	104.57	108.09	110.14	112.29	114.34
Nature							
	Visiting Nature Centers, VIS	1.23	1.38	1.54	1.69	1.83	1.99
	Gathering Berries, Natural Products	10.92	12.31	13.74	15.00	16.31	17.75
	TOTAL FOR GROUP	12.15	13.69	15.28	16.68	18.14	19.74
Off-Highway Vehicles							
	Off-Highway Vehicles	8.34	9.03	9.56	10.15	10.88	11.65
Primitive Camping							
	Primitive Camping	5.01	5.52	6.00	6.44	6.91	7.42
	Backpacking, Camp in Unroaded Areas	3.34	3.68	4.00	4.29	4.61	4.95
	TOTAL FOR GROUP	8.35	9.20	10.01	10.73	11.52	12.36
Picnicking							
	Picnicking	7.36	8.22	9.11	9.86	10.63	11.46
Trails							
	Bicycling	15.13	17.05	18.88	20.79	22.99	25.46
	Horseback Riding	2.52	2.82	3.08	3.37	3.73	4.13
	Non-Motorized Water Travel	1.67	1.82	1.93	2.07	2.24	2.42
	TOTAL FOR GROUP	19.32	21.69	23.90	26.23	28.96	32.02
Viewing							
	Viewing Scenery	117.33	131.12	145.38	157.35	169.43	182.66
	Viewing Wildlife, Birds, Fish	72.95	82.47	92.70	100.67	108.36	116.76
	TOTAL FOR GROUP	190.28	213.60	238.08	258.02	277.80	299.42
Wilderness							
	Wilderness	11.48	12.64	13.75	14.75	15.83	16.99
	TOTAL FOR ALL GROUPS	1,066.56	1,184.35	1,302.08	1,402.63	1,507.33	1,621.68

Data Source: Bowker, J. M., and Askew, Ashley (forthcoming). Outdoor Recreation Participation Projections 2010 to 2060. In: Outdoor Recreation Trends and Futures: Technical Document Supporting the Forest Service 2010 RPA

Assessment. GTR-SRS-XXX. Asheville, North Carolina: U.S. Department of Agriculture, Southern Research Station. The data for three projections scenarios were averaged by Paul Arndt, Regional Planner, U.S. Forest Service Southern Region. Omitted from the list are various winter sports, which are not relevant to projections for the Southern Region.

National recreation projections emphasize growth in some activities that require specialized skills and/or specialized equipment, such as snow skiing. Bringing the focus closer to home, Dr. H. Ken Cordell of the USDA Forest Service's Southern Research Station, offered the following information about how recreation in the Southern Region differs, in some regards, from the national picture. " …recent overall trends for the most popular activities in the South (having over 30 million participants) show that walking for pleasure, family gatherings outdoors, gardening or landscaping, viewing/photographing natural scenery, sightseeing, and visiting outdoor nature centers occupy the top six slots. Other popular growth activities include driving for pleasure, viewing/photographing flowers and trees, viewing/photographing wildlife (besides birds and fish), swimming in an outdoor pool, and picnicking. Activities oriented toward viewing and photographing nature (scenery, flowers/trees, and wildlife) have been among the fastest growing in popularity."

"For moderately popular activities, having between 10 and 30 million participants, the NSRE analysis indicated that the activities of viewing or photographing birds, bicycling, gathering mushroom/berries, warm water fishing, visiting a wilderness, visiting a farm or agricultural setting, viewing and photographing fish, and day hiking are most popular. Growth has been especially strong for off-highway vehicle driving, gathering mushrooms and berries, and visiting farms or agricultural settings."

"Among activities having under 10 million participants, camping at primitive sites, big game hunting, waterskiing, using personal watercraft, and equestrian activities were at the top and showed some growth. Kayaking was the fastest growing of these activities by a wide margin, followed by other water-based activities such as waterskiing and canoeing. Some activities posted declines during this decade."

"According to the U.S. Fish and Wildlife Service, the overall number of hunters and anglers in the U.S. declined about 7 percent from 1996 to 2006. On the other hand, wildlife watching participation increased about 13 percent during this period." [1]

Closer to home yet, demographic information collected for the 2001 Recreation Realignment report within the market area revealed trends that were popular across a variety of demographic groups (age, gender, number of people per household, race and ethnic strata). At the time of the Recreation Realignment effort, these were primarily those that do not require specialized skills or equipment and that can engage multi-generations together. The ten most popular activities on the GWNF, according to the Recreation Realignment Report, were viewing/photographing wildlife and birds, viewing/photographing features and scenery, swimming, hiking or walking for pleasure, visiting a Wilderness, gathering forest products, fishing, camping in a developed site, and ATV/OHV use.

Recreation Opportunity Spectrum (ROS)

For planning purposes, recreation supply is defined as the opportunity to participate in a desired recreation activity in a preferred setting to realize desired and expected experiences. Recreationists choose a setting and activity to create a desired experience. Three components of supply are settings, activities and facilities. (SAA, p.140) The US Forest Service manages a supply of settings and facilities.

The Recreation Opportunity Spectrum (ROS) is a planning tool used to identify and evaluate the supply of recreation settings on national forests. Five ROS classes have been inventoried on the George Washington National Forest. These settings include Primitive (P), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), Roaded Natural (RN), and Rural (R).

[1] Cordell, H. Ken. forthcoming. Outdoor recreation trends and futures. A technical document supporting the Forest Service 2010 RPA Assessment. GTR-SRS-XXX. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station.

Primitive (P) is the most remote, undeveloped recreation setting on the forest. These settings are generally unmodified, natural environments located at least three miles from any open road and are 5,000 acres in size or larger. Interaction between users is very low and motorized use within this area is not permitted. The area is managed so that it is essentially free of evidence of on-site controls and restrictions.

There are no land areas on the George Washington National Forest that are more than three miles from any open road, however there are areas that are managed to meet the other Primitive setting descriptions. Specifically, the Primitive ROS class is assigned to all designated Wildernesses on this national forest, even though they may not meet the size or distance from road(s) requirement. Designated wilderness areas currently range in size from 4,608 to 9,835 acres and do not contain any open roads. With few exceptions, the Wilderness Act restricts the use of mechanized equipment and motorized transport for recreational use, search and rescue, resource protection, trail construction, and maintenance. A Forest Supervisor's Order restricts group size in Wilderness to ten or less to retain a sense of solitude.

Semi-Primitive Non-Motorized (SPNM) areas are predominated by a natural or natural appearing environment. Interaction between visitors is low, but there may be evidence of other users. They are managed to achieve a sense of remoteness, although SPNM areas can be as small as 2,500 acres in size and only a half-mile or greater from any open road. These areas are managed to minimize the presence of on-site controls and restrictions. These settings accommodate dispersed, non-motorized recreation.

Semi-Primitive Motorized (SPM) areas are natural or natural appearing. Interaction between visitors is low, but there often is evidence of other users. Motorized use is permitted. SPM accounts for areas on the National Forest that either buffer SPNM areas or stand alone as tracts of land 1,500 acres or larger with a low road density of 1.5 miles of road/1,000 acres.

Roaded Natural (RN) settings are natural appearing with moderate evidence of sights and sounds of humans. Interaction between visitors may be low to moderate, but evidence of other users is prevalent. Conventional motorized access is accommodated. RN areas are located within a half mile of a road and usually provide higher levels of development such as campgrounds, picnic areas and river access points.

Rural settings are substantially modified natural environments. Sights and sounds of other humans are readily evident and interaction between users may be moderate to high. Facilities for concentrated motorized use and parking are provided. Rural settings represent the most highly modified natural settings on the forest and include only highly developed recreation sites. Acreage in the Rural ROS class is negligible.

Table A-8 Current Distributions of ROS Classes as Inventoried on the George Washington National Forest

Recreation Opportunity Spectrum (ROS) Class	Current ROS Inventory Acres on the GWNF (approximate acres)	Current Percentage of each ROS Class on the GWNF
Primitive (P)	0*	0%
Semi-Primitive Non-Motorized - SPNM	198,000	18.6%
Semi-Primitive Motorized - SPM	211,000	19.8%
Roaded Natural - RN	656,000	61.6%
Rural	<2,000	<1%
Urban	0	0%

Source: GWNF Geographic Information System (GIS inventory data)

*There are no lands on the GWNF that meet the inventory requirements for Primitive ROS setting (due to proximity to roads). However, the GWNF manages all designated Wilderness (42,674 acres) as Primitive ROS setting.

The Southern Appalachian Assessment: Social, Cultural, Economic Technical Report (SAA) provides data about landscape settings in 10 ecological sections of the Southern Appalachians. The report includes settings on both public and private lands. It states that about 5% of the region is developed into urban settings and 12% is developed into suburban or transitional settings. Approximately 45% of the landscape is in rural settings, 2% are covered in large rivers and lakes and 3% could not be determined using satellite imagery. About 8% of the area in the study provides Primitive or Semi-Primitive settings, with 100% of the Primitive settings being provided on public lands. [2]

Developed Recreation Supply

A developed site is characterized by a built environment containing a concentration of facilities and services used to provide recreation opportunities to the public. They typically represent a significant investment in facilities and management under the direction of an administration unit in the National Forest System. Recreation sites are developed within different outdoor settings to facilitate desired recreational use. Developed recreation sites include such facilities as campgrounds, picnic areas, shooting ranges, swimming beaches, interpretive sites, visitor centers and historic sites. Developed recreation sites provide different levels of user comfort and convenience based on the assigned Recreation Opportunity Spectrum (ROS) setting. Development levels range from 1 to 5, with the lower end of the spectrum representing the most primitive, natural settings. Site amenities are provided only if needed for the protection of resources. The upper end of the spectrum represents the highest level of development and facilities for the comfort and enjoyment of the visitor.

The George Washington National Forest has three Development Level 5 recreation areas: Bolar Mountain, Sherando Lake and Trout Pond. Each is a recreation complex offering amenities and services for the comfort of users. They offer multiple types of camping facilities (family and group) and campsites with utility hookups. The campground roads are paved, bathhouses have flush toilets and warm water showers, and each offers a highly developed day use area. There is an entrance station and on-site staff and volunteers.

Brandywine Lake, Cave Mountain Lake and Morris Hill are three examples of Development Level 4 campgrounds. They also offer many facilities for the comfort of users including bathhouses with flush toilets and showers and have day use areas. However they are smaller in scale than the Level 5 sites and they do not offer utility hookups. Volunteer campground hosts are on-site during the peak use season.

Hidden Valley, and North Creek are examples of Level 3 Campgrounds. They have gravel roads, restroom facilities that may have vaults rather than flush toilets and no showers. There is typically, but not always, an on-site volunteer campground host during peak season weekends.

Level 2 sites include campgrounds like Hawk and McClintic Point. These provide facilities for the protection of resources rather than for visitor comfort. These are smaller areas offering vault toilet buildings, gravel roads and rarely, if ever, an on-site volunteer host. Some do not offer drinking water or trash collection – users pack in drinking water and pack out trash. Mowing is done infrequently.

The Forest Service defines the capacity of developed recreation sites in terms of “people at one time” that a site can support, called PAOTs (pronounced “pay-yots”). Currently, there are 59 developed sites managed by the George Washington National Forest to accommodate different recreation activities. Tables A-9 and A-10 illustrate the different types of facilities provided across the forest and their current capacity in PAOTs.

[2] Southern Appalachian Man and the Biosphere (SAMAB). 1996. The Southern Appalachian Assessment Social/Cultural/Economic Technical Report. Report 4 of 5. Atlanta: U.S. Department of Agriculture, Forest Service, Southern Region.

Table A-9 Current Supply of Day-Use Developed Areas on George Washington NF

Site Type	Number of Sites	Total Capacity (PAOTs)
Motorized Boating Sites*	2	350
Campgrounds & Complexes**	21	6,740
Horse Campgrounds	1	25
Interpretive Sites	10	815
Observation Sites	4	485
Picnic Sites	10	730
Swimming Sites*	7	945
Target Ranges	4	120
Grand Total	59	10,210
Source: INFRA-Recreation Sites Report. INFRA is a Forest Service database that contains all developed recreation sites inventory data.		
*Coles Point offers both a swimming area and a boat ramp. The entire capacity of Coles Point is listed with the swimming site.		
** All of the level 5 campgrounds and three of the level 4 campgrounds have day lakes with sand swimming beaches. The capacity of these day use areas is included with the Campgrounds & Complexes.		

Several Level 2 campgrounds on the George Washington National Forest have developed over time in response to riparian resource degradation and sanitation concerns in concentrated use areas along popular river and stream corridors. Facilities installed to protect resources have included vault toilets, designated parking areas and hardened impact areas for camping. A couple of examples where facilities are provided to protect resources from the impacts of recreational uses are Oronoco and North River campgrounds.

The public demand for campsites with utility hookups currently exceeds supply on the George Washington National Forest. The Forest has not installed additional utility hookups in recent years due to the cost of installation and ongoing maintenance, desires to reduce our carbon footprint, and in keeping with our Forest's recreation niche which is primarily trails and dispersed recreation. State parks and privately owned campgrounds meet some of the public demand for sites with utility hookups and other amenities for visitor comfort. State parks and private sector campgrounds are, typically, more highly developed than Forest Service campgrounds.

Shooting ranges have historically been challenging to keep maintained to Forest Service standards due to ongoing vandalism. Any attempt to close a shooting range as a result of ongoing vandalism is met, appropriately, with objections from responsible users who enjoy these facilities. The US Forest Service is partnering with Tread Lightly! in their campaign "Respected Access is Open Access" in hopes to curb the vandalism to shooting ranges as well as other remote recreation facilities.

Dispersed Recreation Supply

Dispersed recreation is defined as those activities that occur outside of developed recreation sites such as boating, hunting, fishing, hiking and biking. Parking is also provided at two hang gliding sites, although they have seen little use and little maintenance in recent years. There are 56 developed recreation sites that facilitate dispersed use of the forest such as trailheads, trail shelters and boat ramps. Table A-10 provides a summary of the developed areas used to access dispersed recreation opportunities on the national forest.

Table A-10 Developed Access Points for Dispersed Recreation on the George Washington NF

Site Type	Number of Sites	Total Capacity (PAOTs)
River and Lake Boating Access	9	325
Fishing Sites	7	701
Observation Sites	3	96
Hang Gliding Sites	4	70
Trail Shelters	13	109
Trailheads	20	1,307
Grand Total	56	2,608

Source: INFRA-Recreation Sites Report, 08/20/2010. INFRA is a Forest Service database that contains all developed recreation sites inventory data.

The George Washington National Forest offers approximately 1,078 miles of trails. The majority are for non-motorized, multiple uses and are shared by hikers, equestrians and bicyclists. Notable exceptions are the Appalachian National Scenic Trail and several short interpretive trails that are open to hikers only and trails in designated Wilderness where bicycles are prohibited. Also excluded from multiple uses are some trails within developed recreation areas. Approximately 65 miles on three trail systems provide motorized use opportunities. All three trails are open to all-terrain vehicles and motorbikes, and one of the three trails has portions open to off-road or four-wheel drive trucks.

Table A-11 gives a breakdown of the miles of trail that are managed for various types of uses. The total trail miles do not add up to the total National Forest System Trail miles because of the overlap in uses allowed.

Table A-11 Approximate Miles of Trail Offered on the George Washington NF

Wilderness	68	Total of approximately 1,078 miles.
Non-Wilderness	1,010	
Trail miles that allow hikers	1,008	Should be all trails = 1,078; error in Infra.
Trail miles that allow equestrians	811	All except Appalachian Trail, interpretive trails, and trails within developed recreation areas including angler trails
Trail miles that allow bicyclists	794	All except Appalachian Trail, trails in designated Wilderness, interpretive trails and certain trails within developed recreation areas including angler trails
Trail miles that allow ATVs and OHVs	65	Allowed on designated motorized trails only
Source: INFRA-Trails Report, 08/30/2010, edited to manually separate Pedlar Ranger District Trails from combined Glenwood-Pedlar Ranger District trails.		

Demand for long-distance trails for special recreation events, such as long-distance mountain bicycling, equestrian endurance rides and runner marathons, has increased in recent years. The demand is greatest among the equestrian and mountain biking communities. Events are not permitted in designated Wilderness and neither of these user groups is permitted on the Appalachian National Scenic Trail. Concern has been expressed among these user groups that any additional Wilderness designations exclude, to the extent possible, trails that currently are used, or that by their connectivity to other trails could be used, for long-distance trail riding opportunities and special recreation events.

There is more demand for than supply of motorized trail opportunities. There is a goal in the current George Washington National Forest Land and Resources Management Plan to add a new motorized trail in the area of Archer Run, however the Archer Run area does not meet the criteria for establishing a new ATV trail. Furthermore, due to concerns with resource damage on and off trail, the Patterson Mountain all-terrain vehicle trail on the north end of the Jefferson National Forest is temporarily closed and potentially could be closed permanently, putting more stress on the motorized trails of the George Washington National Forest. At several public meetings related to this Forest Plan Revision, local communities expressed concern over losing economic benefits of motorized trail users due to our current limited supply of motorized trails.

The ability of the national forest to provide such a significant trails program is largely dependent on the volunteer workforce that helps with maintenance of trails. In fiscal year 2010, volunteers contributed 50,928 hours to the dispersed recreation program, equivalent to 28 full time employees. The motorized trail program relies heavily on grants from the Virginia and West Virginia Recreational Trails Fund program. While support from volunteers and the grant programs have been consistent, a decline in either of these programs will have negative implications for the sustainability of the dispersed recreation program.

Hunting and fishing are traditional and popular recreational uses of the George Washington National Forest. The Forest Service manages the habitats that sustain populations of small and big game species as well as cold and warm water fisheries. The Virginia Department of Game and Inland Fisheries stock certain streams, and the national forest stocks some small lakes for organized kids' fishing days. Table A-12 provides acres currently managed for fish and wildlife habitat emphasis.

Table A-12 Acres of Current Fish and Wildlife Habitat Emphasis Areas

Type of Fish & Wildlife Habitat Emphasis	Unit of Measure
General Big & Small Game Habitat	463,394 Acres
Early Successional Habitats	39,651 Acres
Stocked (Put & Take) Streams	67 Miles of Streams

Type of Fish & Wildlife Habitat Emphasis	Unit of Measure
Stocked (Put & Take) Reservoirs	2,830 Acres*

*This includes 2,530 acres at Lake Moomaw.

Minerals – Supply and Demand

Federal Leasable Oil and Gas

The federal government owns 100% mineral rights on about 84% of the Forest. Private parties own mineral rights on the remaining 16% of the Forest. As of September 2010, federal oil and gas leases were in effect on about 1% of the Forest (12,412 acres) but there are no active oil and gas wells. Exploration on GWNF lands has been sparse and activity on surrounding lands has been minimal. Thus far, only five wells have been drilled on Forest lands. All were designed to test a specific horizon and all were dry holes. Two small natural gas fields have been developed adjacent to GWNF lands, but, with the exception of one well, there has been no drilling activity since the 1990's.

Several oil and gas plays exist in the area. The most significant of these plays is related to the Marcellus Shale which is present on the surface and in the subsurface under more than half of the GWNF lands. Current industry focus directed toward the exploration for and exploitation of organic shales, and in particular the Marcellus, is high at this time. Development of the Marcellus shale is generally done with horizontal drilling and use of hydrofracking at numerous locations throughout the horizontal bore holes. Marcellus shale-type development through horizontal drilling has not yet occurred on the Forest. Patchen and Avary (2008) state, "The Middle Devonian Marcellus Shale is the oldest, thickest and most widespread of four formations in the Hamilton Group of central and eastern New York. This black shale unit extends from New York southward to Virginia and West Virginia, and westward into eastern Ohio where it pinches out beneath the Middle Devonian unconformity. In Ohio, the Marcellus Shale generally is not separated from younger rocks in the lower Olentangy Formation; in Virginia, the Marcellus usually is included in the basal portion of the thick Millboro Shale." Enomoto (2009) states, "In the Virginia portion of the Appalachian Basin, the Devonian Mahantango Formation and the Marcellus Shale are mapped collectively as one unit that is named the Millboro Shale. This unit in Virginia consists of black, fissile shale units, with interbeds of dark gray argillaceous limestone or calcareous shale. Thin, dark gray, aphanitic limestone beds occur near the base. Geophysical logs from wells drilled in Highland and Rockingham counties, Virginia, indicate that the thickness of the Millboro Shale ranges from 368 to 570 feet thick in this region." The following table shows the estimated extent of the Marcellus shale formation on the Forest, as it relates to oil and gas leasing considerations.

Table A-13. GWNF Mineral Status and Marcellus Shale

MINERAL STATUS	ACRES	Percent of GWNF (%)	Marcellus Shale Acres	Percent of Land Status in Marcellus Shale (%)
TOTAL GWNF ACRES	1,065,499	100.0%	592,300	55.6%
Withdrawn from mineral leasing by law	50,727	4.8%	22,537	44.4%
Not withdrawn from mineral leasing by law	1,014,772	95.2%	569,763	56.1%

Outstanding or reserved mineral rights -Partial or complete private mineral interest (subtotal of "not withdrawn" acres)	167,206	15.7%	97,615	58.4%
100% federal mineral ownership (subtotal of "not withdrawn" acres)	847,566	79.5%	472,148	55.7%
Existing federal oil & gas leases	12,412	1.2%	12,412	100.0%

Future projections of the kind and amount of oil and gas activity that could be reasonably anticipated began with a Reasonable Foreseeable Development Scenario (RFD) prepared by the Bureau of Land Management (BLM). The RFD is based on the assumption that all lands on the Forest would be available for oil and gas leasing under standard lease terms and conditions, except for those areas withdrawn from leasing by law (Wilderness and National Scenic Area). It covers a time period of 15 years and includes all lands within the boundaries of the George Washington National Forest (GWNF) regardless of mineral estate ownership. Privately owned mineral rights are constitutionally protected property rights and can be exercised at any time. The Forest Plan can identify lands with federal mineral rights as administratively unavailable for federal leasing in addition to those withdrawn by law. Therefore, the RFD can be viewed as the 'maximum' amount of federal oil and gas leasing activity projected.

The RFD estimated that a maximum of 20 vertical exploration/evaluation wells could be drilled over the next 15 years which will prove the presence of productive Marcellus Shale in the area of the GWNF. Additionally, 50 vertical and 249 horizontal development wells could be drilled.

Minerals – Federal Leasable (other than oil and gas)

Historically, iron mining and some coal mining occurred on the Forest. But there is no recent interest in these or other hardrock leasable minerals. Some geothermal leasing occurred on the Forest in the 1980s, but there has been no recent interest in geothermal leasing.

Private Mineral Rights (Reserved and Outstanding Mineral Rights)

Private mineral rights (reserved and outstanding mineral rights) underlie about 16 percent of the Forest. These outstanding or reserved mineral rights (non-federal mineral rights) are partial or complete mineral interests. Reserved rights are those retained in part or in whole by the seller when the federal government acquired the tracts comprising the National Forest. Outstanding rights are mineral rights owned and retained by a third party when federal government acquired the tracts comprising the National Forest. Of the privately-owned mineral rights, about 76 percent are mineral rights outstanding to third parties, and 24 percent are mineral rights reserved by the grantor at the time of acquisition by the federal government.

The only active operation under private mineral rights is a shale mine in operation since the 1980s on the Pedlar Ranger District. Since 1993 reclamation of the previous shale mine has occurred, while additional mining has occurred in recent years. In 2005 the James River Ranger District received a proposal to exercise private mineral rights by mining. Forest Service requested additional information about the proposal, but has not received the information. To date, the proponent has not pursued the proposal with the Forest Service.