



FOREST POLICY FORUM
A Forest Carbon Future



The Forest Policy Forum – A Forest Carbon Future

OUR FOCUS

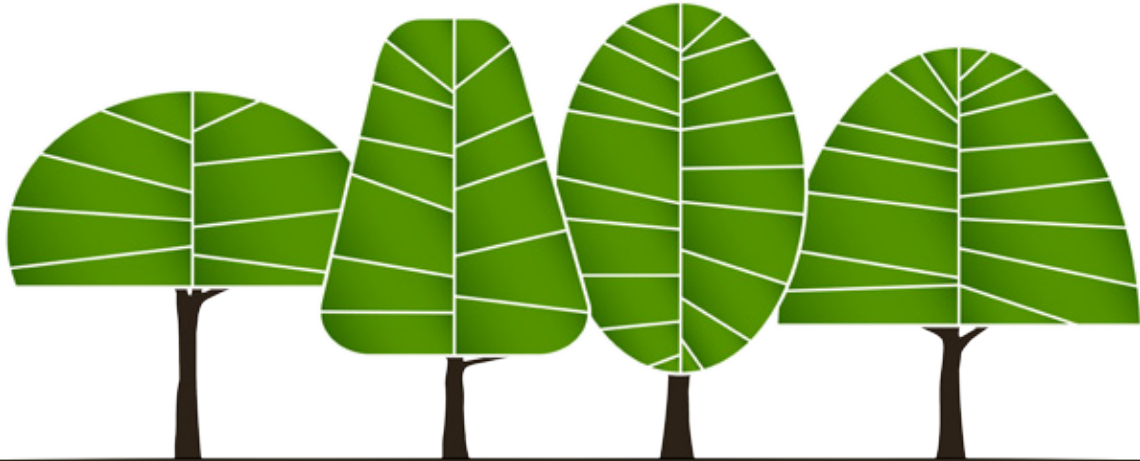
Sustaining a Forest Carbon Future that recognizes the carbon-related benefits of managed forests and the array of products those forests produce – from lumber to paper to packaging to energy – all essential products that are renewable, reusable and/or recyclable and support forest-based carbon benefits.

Forests filter our air and water, provide wildlife habitat, and support our economy. Today the average tree produces enough oxygen for two peopleⁱ and forested watersheds provide drinking water for two of every three Americans.ⁱⁱ In addition, more than 1,400 species of birds, mammals, amphibians, and reptiles in the US are forest dependentⁱⁱⁱ and the forest products industry is a top ten manufacturing sector employer in 47 of the 50 states.^{iv} Forests do all this while sequestering 12-15% of annual nationwide carbon emissions. The United States includes more than 760 million acres of forestland, almost exactly one-third of the country.^v Our nation has more than 1.5 times as much forestland as cropland.^{vi} The forests in America currently store more than 40 billion tons of carbon. An additional 200 million tons of carbon (735 million tons of carbon dioxide) are sequestered each year – because of net forest growth - the equivalent of taking 135 million cars, or one-half of all vehicles, off the road.^{vii viii} The additional carbon stored each year in forest products offsets roughly 1% of annual

U.S. greenhouse gas emissions^{ix} or 17% of annual U.S. building construction emissions.^x

Forests and forest products act as a sink for carbon, which may allow for monetization or recognition for related benefits. However, forest health and productivity can also be impacted by the stressors of climate change. This creates a complex set of management drivers. Fiber supply, **MITIGATION** and **ADAPTATION/RESILIENCY** all shape these forces. Managing forests for carbon can be integrated with traditional forest management, including opportunities to enhance carbon related benefits through mitigation and **BEST PRACTICES**. In addition, healthy markets for forest products act to help keep forests in place as forests, instead of seeing them converted to other, less carbon friendly, uses. In other words, if we want more land growing trees, we need more markets for those trees.

See page 16 for end notes.



Forest Sector and Forest Products Industry leaders – from landowners to manufacturers – have come together to identify opportunities and solutions for our forest carbon future.

The Forest Policy Forum (Forum) is focused on maintaining and growing productive and managed forests in the United States, with the goal of ensuring that federal and state public policies and voluntary customer initiatives recognize the carbon benefits of forests and a full range of forest products.

There are important legal, regulatory, and voluntary market initiatives that will continue to focus on reducing the carbon footprint of products and practices. Because the forest and forest products sector has inherent carbon advantages, as noted above, we are actively engaged in shaping these policies to further lower our carbon footprint in ways that fairly represent – and enhance – our sector’s inherent advantages with regard to demonstrated carbon benefits.

Forest Policy Forum – Carbon Principles

1. Managed Forests are part of the solution

In a world where reducing carbon emissions is a broad public policy objective, forest management, supported by research and monitoring, can provide and enhance carbon benefits.

2. Support for healthy, resilient, and growing forests supports that solution

Policies that encourage landowners to maintain healthy, resilient and growing forests will provide greater carbon benefits as well as a full range of co-benefits for water quality, wildlife habitat, recreation, and the economic vitality of numerous local communities. Likewise, policies that support markets for forest products help support the economics underlying these forests.

3. Recognition of the positive carbon contribution of managed forests and forest products helps realize that solution

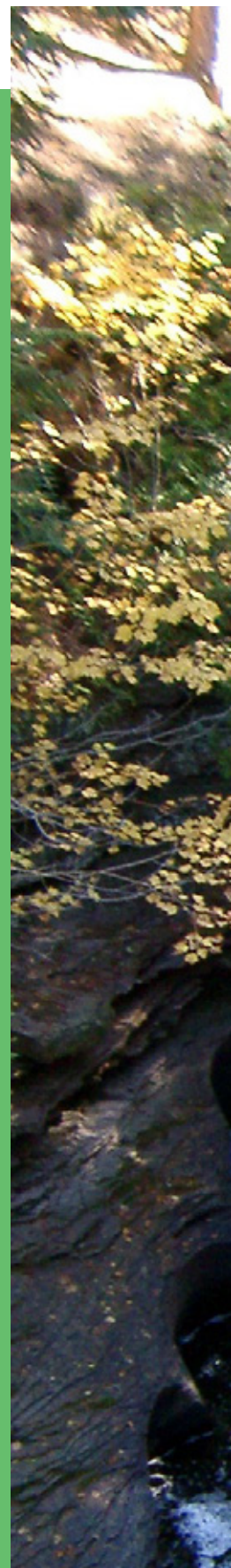
The development of broad recognition of the positive carbon contribution of managed forests and the products made from them will enhance our carbon future. To understand and address atmospheric carbon benefits achieved through forestry, a workable carbon accounting system of measurement using USDA inventory data is necessary - and the simpler, the better for supporting clear and consistent improvements.

4. Understanding Public Policy and Market Mechanisms and their effects on forests is key to the carbon solution

Changes in market mechanisms and public policies can impact forests and forest carbon in important ways.

5. Support innovation in the Forest Products Sector that supports long-term benefits for addressing the carbon challenge

Carbon benefits can come from innovations in the forest products sector and can support a business case for reducing carbon.



About the Forest Policy Forum

The Forest Products Forum came together as a voluntary group in January of 2013 to identify issues of consequence to the broad forest sector, and develop plans for how they might be addressed. Participants in the Forum come from a broad cross section of forest sector participants and stakeholders. Leaders in the forestry and forest products community who recognize how central carbon issues are to the industry met to identify key areas to strengthen alignment of the industry within the broader public discourse. The Forum represents leadership in the industry. Initial work by the Forest Policy Forum has focused on the question of how to ensure the conversation and evolving policy around carbon recognizes that forests and forest products are part of the solution as we move toward a lower carbon world.



Key Opportunities

The Forest Policy Forum (Forum) is focused on maintaining and growing managed forests in the United States, and encouraging the use of forest-based products, while enhancing the benefits of carbon for the forest products industry as a whole.

Managed Forests are part of the solution

In a world where reducing carbon emissions is a broad public policy objective, forest management, supported by research and monitoring, can provide and enhance carbon benefits.

In the United States, managed forests are a carbon solution, with multiple benefits to the forest products industry, the nation, and the environment. Although all forested landscapes – private, state and federal, offer part of the solution to our carbon challenge, given stresses on all forests today, actively managed forests may offer more opportunity to achieve sustainable solutions.

Key Opportunity:

- » We need to learn more about the interplay between carbon and forests through research and demonstration projects.
- » We need to better demonstrate how changes in active management affect carbon and forest health.
- » We need to make the case for carbon-related benefits and active forest management for the products, services and benefits these lands provide.
- » We need markets to help support the economics of healthy, managed forests.

Support for healthy, resilient, and growing forests supports that solution

Policies that encourage landowners to maintain healthy, resilient and growing forests will provide greater carbon benefits as well as a full range of co-benefits for water quality, wildlife habitat, recreation, and the economic vitality of numerous local communities. Likewise, policies that support markets for forest products help support the economics underlying these forests.

Tax policy, and other policies that drive turnover in landownership patterns and result in land being broken up into smaller pieces make management for any reason, including carbon storage, more difficult. In addition, carbon benefits associated with managed forests should be accounted for in government policies.

Key Opportunity:

- » We must collaborate to promote tax policies and a full range of policies that encourage landowners to maintain healthy, resilient, regenerating, and growing forests that actively store carbon, produce **SUSTAINABLE** forest-based products, and provide a full range of **CO-BENEFITS**.



Recognition of the positive carbon contribution of managed forests and forest products helps realize that solution

To understand and address carbon benefits from forests and forest products, a workable carbon accounting system of measurement using USDA inventory data is necessary - and the simpler, the better for supporting clear and consistent improvements. The development of broad recognition of the positive carbon contribution of managed forests and the products made from them will enhance our carbon future.

Managed forests and the products and services they provide offer significant public benefits, including significant opportunities to positively contribute to carbon goals. Increased recognition in public policy of the role of forest products and managed forests is necessary to ensure the benefits can be more fully realized. A straightforward, workable system for identifying and quantifying the carbon benefits of forest products and managed forests that can be broadly and simply applied is also needed and can be informed by work done by private and public research organizations (e.g., USDA Forest Service, NACASI, Woodworks, CORRIM, and others). Such a policy and system should work together to promote market-based rewards and increase carbon benefits.

Key Opportunity:

We support increased recognition of the carbon benefits context of managed forests in public policy, including:

- » Policy mechanisms that provide recognition or credit for these benefits
- » Greater general recognition by policy makers, customer initiatives and the public

We need to establish a workable system for identifying and quantifying carbon benefits that includes consideration of:

- » Carbon benefits associated with forest management
- » Raw materials and finished products
- » Emissions of **BIOGENIC CARBON DIOXIDE**, **FOSSIL CARBON DIOXIDE** and other greenhouse gases
- » Easy integration with existing reporting systems (e.g., certification, financial reporting, etc.)
- » Appropriate spatial and temporal scale
- » Increases in carbon pools outside of the forest such as long-lived wood products
- » We need markets to help support the economics of healthy, managed forests.

Understanding Public Policy and Market Mechanisms and their effects on forests is key to the carbon solution

Changes in market mechanisms and public policies can impact forests and forest carbon in important ways.

Key Opportunity:

We will work to understand the effects that market mechanisms and public policy proposals may have on forests and the products and services they provide, including carbon storage. (Examples: Bio-preferred Programs, Green Building Programs and Standards, Certified Procurement Standards, Tax Policy, Establishment of Carbon Markets, etc.)



Supporting Innovation in the Forest Products Sector that supports long-term benefits for addressing the carbon challenge

Carbon benefits can come from innovations in the forest products sector and can support a business case for reducing carbon.

Forests and forest products, such as paper, lumber and wood panels, and new technology, such as **BIOMASS-BASED ENERGY**, **CELLULOSIC ETHANOL**, and **CELLULOSIC NANOMATERIALS**, touch many aspects of our economy and American lives. From our homes to our offices and schools, building products and green building initiatives impact the business case for reducing carbon. Programs that support energy-efficiency, new product development, and innovations are important as we seek to reduce carbon.

Key Opportunity:

We will continue to support innovations in **GREEN BUILDING**, energy efficiency, new product development, **RENEWABLE ENERGIES** and policies that enhance the business case to reduce carbon.



The Forest Carbon Context and FAQs

What do we know about total carbon emissions globally, North American and US domestic?

“Global carbon emissions from fossil fuels have significantly increased since 1900. Emissions increased by over 16 times between 1900 and 2008 and by about 1.5 times between 1990 and 2008. Emissions of non-CO₂ greenhouse gases have also increased significantly since 1900.”
(Source: EPA, <http://www.epa.gov/climatechange/ghgemissions/global.html#four>)

“In 2008, the top carbon dioxide (CO₂) emitters were China (23%), the United States (19%), the European Union (13%), India (6%), the Russian Federation (6%), Japan (4%), and Canada (2%). These data include CO₂ emissions from fossil fuel combustion, as well as cement manufacturing and gas flaring. Together, these sources represent a large proportion of total global CO₂ emissions.”

(Source: EPA, <http://www.epa.gov/climatechange/ghgemissions/global.html#four>)

What is the scale of the forest and forest product carbon pool – acres, tons of carbon, annual uptake, annual emission related to wildfire?

“Efforts in forestry to reduce atmospheric CO₂ levels have focused on forest management and forest product use... Forest product-use strategies include the use of wood wherever possible as a structural substitute for steel and concrete, which require more carbon emissions to produce. The carbon emissions offset from using wood rather than alternate materials for a range of applications can be two or more times the carbon content of the product.”

(Source: National Climate Assessment, <http://nca2014.globalchange.gov/report/sectors/forests>)

“The total amount of carbon stored in U.S. forest ecosystems and wood products (such as lumber and pulpwood) equals roughly 25 years of U.S. heat-trapping gas emissions at current rates of emission, providing an important national “sink” that could grow or shrink depending on the extent of climate change, forest management practices, policy decisions, and other factors. For example, in 2011, U.S. forest ecosystems and the associated wood products industry captured and stored roughly 16% of all carbon dioxide emitted by fossil fuel burning in the United States.”

(Source: National Climate Assessment, <http://nca2014.globalchange.gov/report/sectors/forests>)

“The amount of carbon taken up by U.S. land is dominated by forests (Figure 7.5), which have annually absorbed 7% to 24% of fossil fuel carbon dioxide (CO₂) emissions in the U.S. over the past two decades. The best estimate is that forests and wood products stored about 16% (833 teragrams, or 918.2 million short tons, of CO₂ equivalent in 2011) of all the CO₂ emitted annually by fossil fuel burning in the United States.”

(Source: National Climate Assessment, <http://nca2014.globalchange.gov/report/sectors/forests>)

“In the U.S., afforestation (active establishment or planting of forests) has the potential to capture and store a maximum of 225 million tons of additional carbon per year from 2010 to

2110, (an amount almost equivalent to the current annual carbon storage in forests).”
(Source: *National Climate Assessment*, <http://nca2014.globalchange.gov/report/sectors/forests>)

“Since 1990, CO₂ emissions from wildland forest fires in the lower 48 United States have averaged about 67 million tons of carbon per year.”
(Source: *National Climate Assessment*, <http://nca2014.globalchange.gov/report/sectors/forests>)

“It is estimated that up to 230 years would be required to recapture the carbon released in the 1988 Yellowstone fire.”
(Source: *Kashian, D., Romme, W., Tinker, D., Turner, M., and Ryan, M. 2006. Carbon Storage on Landscapes with Stand-Replacing Fires. BioScience 56(7): 598-606.*
http://www.uwyo.edu/tinkerlab/pdf%20files/kashian_et_al._2006_bioscience.pdf)

“There are currently nearly 300 billion trees at least 1-inch in diameter in the U.S.:
(Source: *National Report on Forest Resource*, <http://www.fia.fs.fed.us/slides/major-trends.pdf>)

Who owns the “forest” (e.g. public, private & other) – by acres, by carbon pool?

“Private entities (such as corporations, family forest owners, and tribes) own 56% of the forestlands in the United States. The remaining 44% of forests are on public lands: federal (33%), state (9%), and county and municipal government (2%).“
(Source: *National Climate Assessment*, <http://nca2014.globalchange.gov/report/sectors/forests>)

“Ownership changes can bring changes in forest objectives. Among corporate owners (18% of all forestland), ownership has shifted from forest industry to investment management organizations...Non-corporate private owners, an aging demographic, manage 38% of forestland.”
(Source: *National Climate Assessment*, <http://nca2014.globalchange.gov/report/sectors/forests>)

What is the annual harvest vs. growth vs. mortality math – how much is attributed to public vs. private land?

“Less than 1% of the volume of commercial trees from U.S. forestlands is harvested annually, and 92% of this harvest comes from private forestlands.”
(Source: *National Climate Assessment*, <http://nca2014.globalchange.gov/report/sectors/forests>)

“Natural mortality on U.S. timberlands amounted to nearly 7.8 billion cubic feet in 2006 and was equivalent to over 13% of global industrial roundwood harvests in that year. This rate of loss remains less than 1 percent of the growing stock volume for any U.S. region or owner group (private, national forest or other public holding).”
(Source: *Smith, W. Brad, tech. coord.; Miles, Patrick D., data coord.; Perry, Charles H., map coord.; Pugh, Scott A., Data CD coord. 2009. Forest Resources of the United States, 2007. Gen. Tech. Rep. WO - 78. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office. 336 p. Available at: http://www.fs.fed.us/nrs/pubs/gtr/gtr_wo78.pdf)*

“Average growing stock volume per acre continues to rise across the United States, with the largest gains in the North and South where volumes per acre are nearly double what they were in 1953.”

(Source: FIA, http://www.fia.fs.fed.us/library/briefings-summaries-overviews/docs/2002_ForestStats_%20FS801.pdf)

“Historical trends indicate that the standing inventory (the volume of growing stock) of hardwood and softwood tree species in US forests has grown by 49 percent between 1953 and 2006. In the same time period, the total annual net growth of growing stock (annual growth minus annual mortality) increased 75 percent.”

(Source: <http://www.safnet.org/publications/americanforests/StateOfAmericasForests.pdf>)

What is the scale and potential for biomass energy?

“Bioenergy refers to the use of plant-based material to produce energy, and comprises about 28% of the U.S. renewable energy supply. Forest resources potentially could produce bioenergy from 504 million acres of timberland and 91 million acres of other forested land. Bioenergy from all sources, including agricultural and forests, could theoretically supply the equivalent of up to 30% of current U.S. petroleum consumption, but only if all relevant policies were optimized. The maximum projected potential for forest bioenergy ranges from 3% to 5% of total current U.S. energy consumption.”

(Source: National Climate Assessment, <http://nca2014.globalchange.gov/report/sectors/forests>)

Where is that harvest consumed – i.e., how much by which sector?

“The United States has 5 percent of the world population and consumes 27 percent of the world’s industrial wood products. Although domestic timber inventory is only 8 percent of the world total, 76 percent of U.S. consumption of industrial wood comes from domestic supplies.”

(Source: FIA, <http://www.fia.fs.fed.us/library/brochures/docs/2010/Forest%20Facts%201952-2007%20English%20rev072411.pdf>)

“Since the late 1980s, roundwood harvest for export has declined, and roundwood equivalent of imports has increased. Domestic roundwood harvest increased from 1950 through the mid-1980s and has remained steady since then, maintaining a volume of 15 billion cubic feet in 2006. Total consumption of solidwood and paper products has increased steadily since 1950. In 2006, consumption for the North, South, and West was 55.7, 116.5, and 35.4 million dry short tons, respectively.”

(Source: FIA, <http://www.fia.fs.fed.us/library/brochures/docs/2010/Forest%20Facts%201952-2007%20English%20rev072411.pdf>)



Glossary of Terms

ADAPTATION – the process of permanent, evolutionary (genetic) adjustments in structure, form, or function that fit individuals, populations, or species to their environment 2. the process(es) whereby individuals (or parts of individuals), populations, or species change to better survive under given environmental conditions 3. the changed structure or function itself (SAF)

BEST PRACTICES – commercial or professional procedures that are accepted or prescribed as being correct or most effective. (Oxford)

BIOGENIC – resulting from activity of living organisms; necessary for continuation of life processes (SAF)

BIOGENIC CARBON DIOXIDE – emissions related to the natural carbon cycle, as well as those resulting from the combustion, harvest, combustion, digestion, fermentation, decomposition, or processing of biologically based materials. (EPA)

BIOMASS – the living or dead weight of organic matter in a tree, stand, or forest in units such as living or dead weight, wet or dry weight, ash-free weight, etc. 3. harvesting the wood product obtained (usually) from in-woods chipping of all or some portion of trees including limbs, tops, and unmerchantable stems, usually for energy production (SAF)

BIOMASS-BASED ENERGY – energy derived from biomass (derived definition)

CELLULOSE – an insoluble substance that is the main constituent of plant cell walls and of vegetable fibers. It is a polysaccharide consisting of chains of glucose monomers. (Oxford)

CELLULOSIC – of, relating to, or made from cellulose (Merriam-Webster)

CELLULOSIC ETHANOL – ethanol produced from cellulosic materials (derived definition)

CELLULOSIC NANOMATERIALS – materials comprised of cellulose and made via nanotechnology (derived definition)

CO-BENEFIT – The benefits of policies that are implemented for various reasons at the same time including climate change mitigation acknowledging that most policies designed to address greenhouse gas mitigation also have other, often at least equally important, rationales (e.g., related to objectives of development, sustainability, and equity). (EPA)

ETHANOL – a colorless volatile flammable liquid C_2H_5OH that is the intoxicating agent in liquors and is also used as a solvent and in fuel (Merriam-Webster)

FORESTRY – the profession embracing the science, art, and practice of creating, managing, using, and conserving forests and associated resources for human benefit and in a sustainable manner to meet desired goals, needs, and values —note the broad field of forestry consists of those biological, quantitative, managerial, and social sciences that are applied to forest management and conservation; it includes specialized fields such as agroforestry, urban forestry, industrial forestry, nonindustrial forestry, and wilderness and recreation forestry (SAF)

FOSSIL CARBON – emissions resulting from the combustion of fossil fuels (derived definition)

FOSSIL FUEL – a general term for organic materials formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years. (EPA)

GREEN BUILDING – the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high performance building. (EPA)

MANAGED FORESTS – lands with active forestry (derived definition)

MITIGATION – 1. action taken to alleviate potential adverse effects of natural or human-caused disturbances 2. compensation for damage done —note in this usage, in-kind mitigation is replacement of a lost resource with one similar (stream for stream or species for species), while out-of-kind is replacement of one kind with another (lake for stream or one species for another) (SAF)

NANO – one-billionth part of something (Merriam-Webster)

NANOTECHNOLOGY – the branch of technology that deals with dimensions and tolerances of less than 100 nanometers, especially the manipulation of individual atoms and molecules. (Oxford)

RENEWABLE ENERGY – energy resources that are naturally replenishing such as biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action. (EPA)

RESILIENCE (RESILIENCY) – a capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment. (EPA)

SUSTAINABLE – able to be maintained at a certain rate or level (Oxford)

SUSTAINABLE FOREST MANAGEMENT – 1. the practice of meeting the forest resource needs and values of the present without compromising the similar capability of future generations —note sustainable forest management involves practicing a land stewardship ethic that integrates the reforestation, managing, growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water quality, wildlife and fish habitat, and aesthetics (UN Conference on Environment and Development, Rio De Janeiro, 1992) 2. the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality, and potential to fulfill, now and in the future, relevant ecological, economic, and social functions at local, national, and global levels, and that does not cause damage to other ecosystems (the Ministerial Conference on the Protection of Forests in Europe, Helsinki, 1993) —note criteria for sustainable forestry include (a) conservation of biological diversity, (b) maintenance of productive capacity of forest ecosystems, (c) maintenance of forest ecosystem health and vitality, (d) conservation and maintenance of soil and water resources, (e) maintenance of forest contributions to global carbon cycles, (f) maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies, and (g) a legal, institutional, and economic framework for forest conservation and sustainable management (Montréal Process, 1993) (SAF)

UNMANAGED FOREST – lands without active forestry (derived definition)

Sources

EPA, Glossary of Climate Change Terms, <http://epa.gov/climatechange/glossary.html> also see <http://epa.gov/climatechange/ghgemissions/biogenic-emissions.html> and <http://www.epa.gov/greenbuilding/pubs/about.htm>

Merriam-Webster, <http://www.merriam-webster.com>

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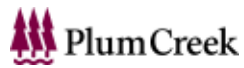
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End Notes

- i. McAliney, Mike. Arguments for Land Conservation: Documentation and Information Sources for Land Resources Protection, Trust for Public Land, Sacramento, CA, December, 1993; Also see: http://www.americanforests.org/discover-forests/tree-facts/#_ftn2
- ii. <http://www.conservantiontaxcenter.org/conservation-resources/US-Endowment-for-Forests-and-Communities-Program/31139>
- iii. 689 tree and 1,486 terrestrial animal species are associated with forest habitats in the U.S. (including 227 mammals, 417 birds, 176 amphibians, 191 reptiles, and 475 butterflies). Source: http://www.fs.fed.us/rmrs/docs/pubs/flather-curtis%20h/Indicator_6.1-pager+tech_doc.pdf
- iv. The forest products industry is among the top ten manufacturing sector employers in 47 states and generates approximately \$200 billion a year in sales and about \$54 billion in annual payroll. In 2013, 63.5% of paper consumed was recovered for recycling. The forest products industry is the leading generator and user of renewable energy. <http://www.afandpa.org/our-industry/economic-impact>
- v. National Report on Sustainable Forests – 2010. June 2011. FS - 979. U.S. Department of Agriculture, Forest Service. 214 p. Available at: http://www.fs.fed.us/research/sustain/2010SustainabilityReport/documents/2010_SustainabilityReport.pdf
- vi. Major Uses of Land in the United States, 2007. by Cynthia Nickerson, Robert Ebel, Allison Borchers, and Fernando Carriazo Economic Information Bulletin No. (EIB-89) 67 pp, December 2011. The United States has a total land area of nearly 2.3 billion acres. In 2007, the major land uses were forestland at 671 million acres (30 percent); grassland pasture and rangeland at 614 million (27 percent); cropland at 408 million (18 percent); special uses (primarily parks and wildlife areas) at 313 million acres (14 percent); miscellaneous uses (like tundra or swamps) at 197 million acres (9 percent); and urban land at 61 million acres (3 percent). Note: The 766 million acres of forest area reported by the Forest Service utilizes a slightly different definition than that used by the Economic Research Service which separates forestlands in special uses (parks and wildlife areas).
- vii. USDA (2010). New Data Highlights Role of Forests in Fight Against Climate Change. Retrieved March 23, 2014 from <http://www.usda.gov/wps/portal/usda/usdamediafb?contentid=2010/10/0532.xml&printable=true&contentidonly=true>.
- viii. Approximately 254 million vehicles were registered in the United States as of 2012. <http://www.statista.com/statistics/183505/number-of-vehicles-in-the-united-states-since-1990/>
- ix. 2013, April. Environmental Protection Agency. National Greenhouse Gas Emissions Data (1990-2012) <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2014-Chapter-7-Land-Use-Land-Use-Change-and-Forestry.pdf>

* http://architecture2030.org/the_problem/buildings_problem_why

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