

SWS Research Brief

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Floodplain Forests and People: Inextricably Linked

Background

Who doesn't enjoy a relaxing hike through the woods? For most people, it's a chance to get a breath of fresh air and escape the hectic pace of modern life. Others love drifting lazily down the river, casting from a boat in hopes of catching the biggest fish in the water. No one can resist the temptation to jump into the lake to escape those sweltering summer days. Such activities are examples of people interacting directly with natural ecosystems. But is outdoor recreation all that society gleans from the environment? Does nature hold any practical value for people, or is it just a playground that should be set aside in national forest and wildlife refuges?

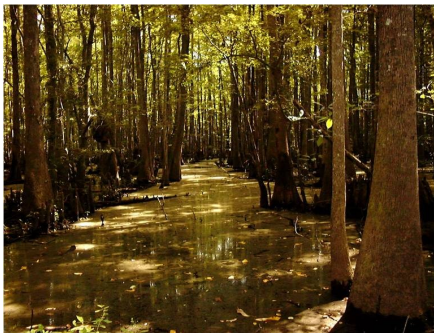


Figure 1. Floodplain forest on Bull Island, South Carolina. Photo courtesy of Dr. William Conner.

As a matter of fact, the environment performs many ecosystem services. Ecosystem services are defined as processes and resources that are supplied by natural ecosystems that benefit society. For instance, the floodplain forests (forests adjacent to streams and rivers) (Fig. 1) and other freshwater wetlands of the southeastern United States play a vital role in human

quality of life by purifying water and controlling flood levels during heavy rains. Such services have economic and public health benefits. If natural processes, such as soil filtration, did not provide an initial water purification step, society would have to significantly increase spending on water treatment to ensure that drinking water was safe for the public. Also, if floodplain forests didn't catch excess runoff water during heavy downpours, nearby roads, buildings, and other structures would be frequently damaged by flash floods.

These bottomland, or low elevation, ecosystems are clearly beneficial to society and should be protected and maintained. However, as society has evolved from sustenance living to an urbanized lifestyle, our dependence on the natural world is less direct and much more complex. As a result, people generally take natural ecosystems for granted and become careless with their treatment of the environment. It is important to re-establish direct links between floodplain forests and society in order to heighten public awareness of our dependence on these ecosystems and ensure quality land management (Fig. 2).

Study Goal

The goal of our work has been to illustrate the various ways that society impacts and is impacted by floodplain forests and, therefore, the importance of maintaining healthy ecosystems. By studying historical connections to the environment, we realize that, while people today use natural resources in a broader context than past generations, we still depend on the forest as heavily as our ancestors did and should strive to protect the environment in our developing world.

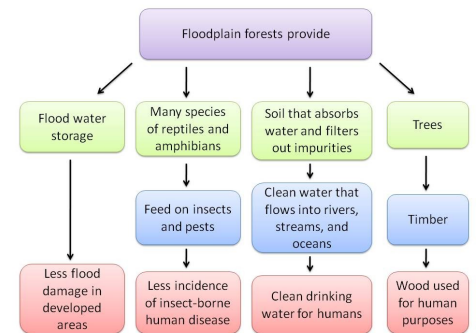


Figure 2. A flowchart depicting the ways floodplain forests are linked to humans.

Floodplains and Humans

Perhaps when one envisions a swamp or flooded forest, words such as “gloomy” or “dreary” come to mind. However, William Bartram painted a much different picture in his 1791 account of the southeastern floodplain forests. He described the great diversity of plant and animal species with a sense of amazement and respect. He wrote that the floodplain trees “are by far the tallest, straightest--most enormous that I have seen...[and the river] abounds with excellent fish: the forests and meadows with wild game.”

Native Americans also valued and depended on the floodplains because corn, their primary crop, required fertile soil. They farmed the land adjacent to rivers and streams and relied on periodic flooding to deposit rich river sediment on their agricultural fields. Native Americans placed great value on floodplains because these systems were needed to ensure their survival.

FLOODPLAIN FORESTS PROVIDE ECONOMIC AND PUBLIC HEALTH BENEFITS FOR SOCIETY.

Just a Politician?

Although Europeans typically viewed wetlands and floodplains as worthless, one particular European descendant described such landscapes as “rich” and “magnificent.” Theodore Roosevelt, the 26th President of the United States and an avid hunter and conservationist, possessed the foresight and wisdom to value swamp-lands for their future economic worth as well as their natural beauty. He recognized that floodplain forests had rich soil that would provide fertile farmlands once the land was cleared and dikes were built to control flooding. However, he did not allow the potential financial value of floodplains to overshadow their intrinsic worth. Instead, he appreciated the life that abounded from wetlands as he related detailed accounts of “amphibious” swamp rabbits, plentiful owls, numerous reptiles, colorful songbirds, and various woodpeckers. Furthermore, he eloquently titled cypress trees “kings of the green-leaved world...of our eastern forests.”

Roosevelt’s philosophical view of floodplain forests sets an example for members of today’s society. Because he simultaneously respected the beauty of the natural ecosystem while recognizing the need for society to advance and develop, he maintained a balanced, practical approach to land management. Such land ethics must be applied in modern society if sustainable development and wise land use is to be achieved.



Roosevelt and crew on a bear hunt in the swamps of Louisiana. Photo courtesy of Auburn University Libraries.

European Arrival

In contrast to the Native Americans, European explorers and settlers arrived in the southeast in the 1500s with a different lifestyle and mentality. They held a utilitarian philosophy that only placed value on forests for resources that directly benefited society and their way of life. Consequently, land that was not suitable for farming (or non-arable land), timber harvest, or settlement was considered useless and treated with neglect and apathy. As Europeans gained control of the New World and eradicated the Native American people, the utilitarian approach to land management became prominent and America’s landscape changed radically.



Figure 3. Prior to technological advances, the rate of land conversion was greatly limited by reliance on hand labor. Photo courtesy of USDA Forest Service.

Because European settlers did not understand or value the ecosystem services of wetlands as much as farmlands, they began converting floodplain forests into agricultural fields in the early 1600s and continued to do so into the late 1700s. However, the settlers’ efforts to clear and drain wetlands were severely limited by their reliance on hand labor (Fig. 3). With the advent of technology, such as the steam engine in the early 1800s, land conversion increased rapidly, and pristine wetlands became increasingly scarce.

By 1912, the First National Drainage Congress was established to focus “interest in drainage and reclamation of non-arable land in the United States.” By 1925, soybean farming had become popular in the United States and thus altered the definition of farmable land. Because soybeans grew in soils that were too moist for corn or cotton, land that had previously been useless for agriculture suddenly became profitable.

Logging also took its toll on floodplain forests. From the 1600s to the early 1800s, timber was intensively collected from areas that were not being farmed. Just as technology accelerated land conversion, it also heightened timber harvest in floodplains. With the invention of the steam engine, highly flooded areas such as the tupelo-bald cypress swamps were more easily accessed and logged via steamboats. At the turn of the 20th century, other technological advances, such as the railroad, further enhanced timber harvest and transport (Fig. 4), and the results were catastrophic. Because large oak trees were the most valuable on the timber market, loggers selectively harvested them. Such harvesting techniques led to a shift in the size and species composition of trees, altering the entire ecosystem.

For example, bird communities were directly affected by the change in tree species composition. Species like the ivory-billed woodpecker relied on large hardwood trees for their survival.



Figure 4. The development of the railroad and other technology enabled mass timber harvest, such as this 1928 logging operation in Louisiana. Photo courtesy of USDA Forest Service.

In the Southeastern U.S., only one million of the original four million hectares of bottomland hardwood forests remain today.

Once these trees were removed, ivory-billed woodpecker populations were severely reduced and eventually exterminated.

Not only did clearing, draining, and logging impact floodplain forests, but agricultural practices in uplands (higher elevation) also indirectly impacted lowland ecosystems. From about 1820 to 1930, cotton farming boomed in the Southeast. Upland forests were cleared and the land was plowed in preparation for cotton planting. However, without the thick forest vegetation covering the ground and keeping the soil in place in the uplands, significant erosion occurred during heavy rains and runoff water deposited large quantities of soil onto banks and streams (Fig. 5). The large amounts of soil deposition altered the movement, distribution, and quality of water, or the hydrology, in bottomland areas.

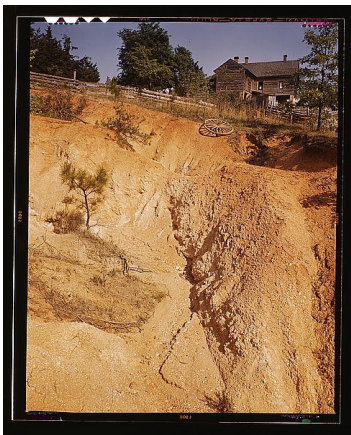


Figure 5. Extensive soil erosion occurred when upland areas were cleared for farming. Library of Congress, Prints & Photographs Division, FSA-OWI Collection, LC-USF35-563.

Consequently, trunks of floodplain trees were buried under sediment and exposed to prolonged flooding. Because tree species are adapted to specific environmental conditions and moisture levels, such drastic changes in the landscape likely caused a major shift in species composition, degrading the overall function of the ecosystem.

Manmade structures designed to control water flow, such as dikes and dams, also greatly influenced floodplain forests and wetlands. For instance, dikes were typically constructed to protect agricultural fields and towns from flooding. Floodwaters were stored between the dikes on both sides of the river and the areas outside of the dikes became drier. Dams, on the other hand, were designed to retain water, thus flooding large tracts of land that were naturally dry. Such manipulation of natural flood zones led to significant alterations in the hydrology of the area.

Significance

The combination of clearing, draining, and logging wetlands, wetland conversion to agricultural fields, and the construction of dams and dikes proved to be incredibly detrimental to floodplain forests. In fact, only one million of the original four million hectares of bottomland hardwoods in the Southeastern U.S. remain today. In centuries past, agricultural conversion has been the primary threat to wetlands in the United States; however, since 1992, urbanization has been the leading cause of wetland loss in the Southeast. As we continue to build large cities and develop land, we must learn from the mistakes our predecessors made.

It is essential to remember that wetlands and floodplain forests are impacted by activity immediately surrounding them as well as development occurring within associated watersheds.



Saugahatchee Creek in Auburn, AL.
Photo courtesy of Robin Governo.

As urbanization continues, the linkages between forests and people will become more indirect and less apparent. One logical and practical way to guarantee quality management of floodplain forests is to restore obvious ties between these ecosystems and society. This would ensure that the general public fully realizes the benefits of functioning floodplain forests. One of the first steps in achieving this goal is to place a monetary value on the ecosystem services floodplain forests provide such as improved water quality. Once the worth of floodplain forests becomes real in an economic sense, the public would no longer be able to overlook their benefit to society. People will understand that society must either pay the price of ecosystem services or reap the savings. Consequently, it is in the public interest to protect and maintain floodplain forests.

Additional Information

Lockaby, B.G. 2009. Floodplain ecosystems of the southeast: Linkages between forests and people. *Wetlands* 29: 407-412. <http://www.bioone.org/toc/wetl/29/2>

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