Climate Emergency Management of NJ's Public Forests: Proforestation and Ecological Restoration -- Perfect Together!
(Why Wood Belongs in the Woods)

By Leslie Jones Sauer, author of **The Once and Future Forest, a Guide to Forest Restoration Strategies,** Island Press

Responsible management of New Jersey's public forest has become a critical issue in the face of the existential threat of climate change, with its vast and worsening consequences for New Jerseyans. Continued burning of fossil fuels and wood releases enormous quantities of carbon, which traps heat in the atmosphere. The resultant rising temperatures of the air and seas worldwide are beginning to cause cataclysmic climate events. No industrial technology currently exists that can remove meaningful amounts of the excess carbon from the atmosphere. **But trees and forests do this naturally.** Trees take up atmospheric carbon with their leaves, and store it in their branches, trunks and roots. **The larger the trees and the greater their leaf area, the more carbon they can sequester (absorb and store carbon).** Fossil fuels – coal, oil and natural gas – are in fact the carbon that was stored by trees and other vegetation eons ago.

New Jersey's public forests – state, county and municipal – are held in the "public trust," for the benefit of the people of the State. Most of these lands were purchased with public funding from New Jersey's "Green Acres" Program. Therefore, they must be managed for the benefit of the public. Our State's public forests should be enlisted in the fight against climate change for the well being of our people, our state and our planet. To do so effectively, the forest management practice known as proforestation should be employed. Until inventories and plans are competed, proforestation should be the primary and default forest management practice for all of New Jersey's public forest lands.

"Proforestation" is a prescription for forest management in which forests are protected from logging so that they can achieve their highest ecological potential. This is in contrast to sustainable forestry where the goal is to foster continuous production and removal of lumber, firewood, or other products. Proforestation instead requires that all the forest resources remain on site, and that there be no removal of trees or other forest resources. These forest resources, including trees, understory vegetation, herbaceous plants, ferns, mosses, fungi, etc. are needed to restore the forest ecology. Fallen, dead, charred and diseased trees provide nutrients for other trees and plants to grow, and create the foundation upon which the entire forest's ecology is based. They eventually become sequestered as soil carbon, providing nutrients to other organisms and building the soil food web, while incurring very limited loss to the carbon pool.

Carbon Management and Stability Ending any extraction of wood products from our public forests is a crucial response to the need to both maintain and increase carbon sequestration and carbon storage as much as possible, given the very short timeframe we have to avert some of the worst climate change disasters. As New Jersey's public forests have generally not been subject to

logging for decades, the trees growing there are just now reaching their prime for high levels of carbon capture and storage. Carbon sequestration could continue unabated for centuries, because the rate of tree carbon accumulation increases continuously with tree size[1] resulting in maximum levels of carbon storage if they are not cut down.

Where intact forests are relatively pristine, they might not need any management in order for them to mature along natural trajectories. This is generally not the case in New Jersey, where many stressors impede the natural development of our forests. The State's past history of logging and its extremely high level of development, combined with an extraordinarily high density of deer, and lack of limits on invasive plant species introductions, have caused devastating impacts on our forests. These problems are amplified by the stresses related to climate change, from pests and fire to storms and blowdowns.

Ecological Restoration Should Be the Focus of Management in Our Public Forests
Ecological restoration seeks to restore a site to a natural successional trajectory. While foresters might be counting and sizing trees, restoration is more focused on the ground. What is reproducing? What is not? Is succession arrested by over-browse by deer or overwhelmed by invasive species? Where is this forest headed, and what would it look like if allowed to mature naturally? Like proforestation, the goal is to achieve the highest level of ecological development on each site

Proforestation does not limit ecological restoration activities management as typically described by foresters. The only tool that proforestation removes from the forest manager's tool box is the ability to remove the trees that are the most important means of combating climate change: the bigger, older trees. When viewed from an ecological lens rather than a timber focus, proforestation places no limitations on fostering native species and/or addressing concerns related to forest health and safety. Many Forest Stewardship Plans (FSP's) for private land involve no harvesting at all and focus instead on management of invasive species and other non-timber concerns.

It is true that proforestation protects older and larger trees and older forests from logging because it is focused on maintaining and expanding carbon sequestration and storage. On the other hand, removing young, small trees that likely do not yet even store carbon is an acceptable practice where control of woody material is necessary to address habitat or other concerns. Safety also may at times require removing some larger trees, but to the extent feasible, they should be left behind on the ground (perhaps cut up and strewn in pieces) to slowly convert into soil.

Proforestation also protects the forest from the negative impacts of logging. Perhaps most importantly, proforestation keeps all wood on site, which is a crucial component of restoration and soil building. Trees and branches are the primary food of the soil fungi that characterize the older forest with the highest levels of sequestration and water retention. Up to 40% of the carbon stored in a forest is below ground, in the roots and soils. Not only are deer and invasive increases slowed when logging stops, the soil is no longer being repeatedly damaged by heavy equipment and grading access.

Soils, like forests, succeed over time as they mature. Young soils are typically bacteria dominated but the older forests are increasingly fungi dominated. Every disturbance of the ground however, such as rutting and compaction caused by mechanized equipment, impacts this process negatively and allows bacteria to become dominant again. Nutrients are then released more rapidly, fueling invasive species and retarding the development of rich native understory and ground layers. Deer browse may suspend this state indefinitely. Without logging and the removal of wood, the forest can mature to its highest levels of carbon storage and water retention as well as biodiversity.

Public Forest Management Concerns and Activities

The following concerns and activities are important for managing our public forests, which should be addressed in public forest planning. Described below are management practices that address these concerns without logging.

Inventory. A primary management goal should be to know a site well before starting to modify it. New Jersey relies on "FIA" (Forest Inventory and Assessment) data that may yield information relevant to timber harvests but is worthless as an ecological planning tool, because it ignores nearly all non-tree species. New Jersey's recorded data regarding Special Concern, Threatened and Endangered (SC, T&E) species in our public forests are far too limited to provide meaningful information for forest site management. Addressing all plant species on site is vital and can be accomplished using Floristic Quality Assessment (universalFQA.org), a botanical monitoring method with accompanying data on its web site.

Deer Management. It is widely agreed that the most serious issue affecting both our public and private forests is New Jersey's extreme overabundance of deer. It is well known that canopy-opening projects tend to ***increase deer populations*** owing to the temporary increase in forage at ground level. Stopping logging on public lands will help some but in addition, a much more effective strategy is needed.

Pests and Invasive Species Management. The common methods for managing invasive species may involve mechanical removal as well as Integrated Pest Management (which may include use of herbicides/pesticides). Addressing the problem of invasive trees with logging would only exacerbate any existing problems with invasive species. Logging roads are also notorious pathways for invasive plants and ATV's. Logging to address bark beetles has been found to be less effective than maintaining a largely unmanaged forest. (See New Jersey Forest Action Plan.) Infected and infested species should be treated on-site to avoid spreading the problem.

Hazardous, Downed, and Dead Trees. The only difference in the proforestation management of trees that pose a hazard or just simply died is the need to keep all wood and woody debris on site rather than removing it. Wood retention is vital for rebuilding the soil and maintaining high levels of sequestration. While a standing dead tree may be a fire hazard, logs and branches that rest on the

ground are sponges, and become ‘nurse logs’ for newly sprouting tree seedlings. Where safety is a concern and many trees have been downed, on-site work is required to make sure that each trunk is on the ground rather than in the air. Larger branches may have to be managed for greater safety. In some locations, a sequence of brush piles can be located to provide valuable shelter for birds, reptiles and amphibians.

Young forest creation for Early Successional Habitat (ESH). The silvicultural approach has been to log in order to create new young forest. Valuable maturing habitats are sacrificed to create a younger forest stage that over time accrues an invasive understory and also takes more than 80 years to break even on the rate at which carbon is absorbed and stored, which is extremely detrimental to climate concerns. In addition these treatments rarely produce any net increase in oaks but do result in a tremendous loss of stored carbon and future sequestration potential. An especially serious problem with this approach is that relatively undisturbed sites are selected in order to make invasive species management easier. The alternatives primarily entail better gap management. Many deer exclosures have oak seedlings and saplings despite heavy canopy cover. Prescribed burning can stimulate the sprouting of oak seedlings under canopy as well, though they would be vulnerable where deer are not managed. Exclosures may be needed.

Regeneration. The need to encourage tree regeneration is often provided as the reason for opening the forest canopy by thinning and other silvicultural treatments. There is often however an almost total lack of regeneration which is not surprising as virtually no sites in NJ meet advanced regeneration requirements - largely owing to deer herbivory. In general, all woody material should be retained on site. To a forest, the wood, leaves and roots are the primary building blocks. The carbon that is left in downed or burned trees is slowly sequestered over time as soil carbon with only some loss to fungal respiration. Harvesting, on the other hand, entails rapid loss of nearly all the above-ground stored carbon and all future sequestration, which - except for very old diseased or dying trees - will be greater each year than past sequestration by the same trees.

Biodiversity and Selected Species Management. Not all species thrive under a closed forest canopy, but a no-harvesting approach does not compromise efforts to support these species. A good example is the Tranquility Ridge habitat restoration project where openings usable by Timber Rattlesnake and Golden-winged Warbler were created at a reasonable cost by girdling trees without requiring roads, skid trails, compaction, rutting and the introduction of invasive species on equipment. Over 17,000 native shrubs and wildflowers were planted in openings. Monitoring has documented subsequent habitat use by both the rattlesnake and the warbler. Past arguments for improving biodiversity by clear cutting have cited an increased number of species that utilize such environments, but aside from the fact that there are other approaches to achieve similar results, the clear cutting projects never recognize any of the negative tradeoffs from clear cutting, such as loss of carbon, loss of water quality/purification, prevention of damaging water runoff on slopes, damage to interior forest species habitats, increased access for invasive plants, or even the necessity to improve habitat for certain species in those specific areas. Approaches to habitat improvement using proforestation would avoid all of these negative impacts.

Soil management. Many of the most serious and irreversible impacts from logging include the damage to soils and vegetation from the use of heavy logging equipment. These adverse impacts would end with the cessation of logging in public forests. Ecological management recognizes that - like forests- soil food webs succeed over time. A complex array of amphibians, invertebrates and other soil organisms is a key component of native soils and should be protected. The basic rule with soil is: don't disturb it - protect it, and support it with wood and other high lignin food to foster the maturing soil food web. Wooden stakes, branches or any on-site woody material can be driven into the ground to break up compaction without grading, deliver moisture and support fungi. This discourages trampling and wheeled vehicles as well.

Retained Wood Management. In certain instances (such as hazardous conditions or the need to expand fire buffers), where woody material cannot simply be left behind, the felled trees should be disposed of as close to their source as is reasonable. Where this is not an option, the woody material can be chipped and spread across the woodland in a very thin layer. Lay logs along the slope to retain water and increase habitat. Cut branches where reasonable to bring them in contact with the ground to retain moisture.

Fire Management. The concept that thinning to reduce fuel loads reduces the risk of major wildfire has been proven untrue in the recent spate of fires in managed and unmanaged forests all over the globe. Drought and high winds are the actual drivers of wildfire risks. With a policy to leave all woody material and other forest components in the forest, prescribed burning is still a vital tool. Many sites require some fuel reduction before they can be safely burned. Dense low growth can be mowed and ladder fuels eliminated with lightweight equipment instead of being logged. The same is true for firebreaks. The NJFS has recently allowed a more natural burn regimen where that can be accomplished safely. This approach to fighting wildfires will provide better protection from fire and encourage more pyro-diversity in plant species.

Resilience Against Disturbances & Stressors. Research has shown no greater resilience in response to fire, invasives or pests is achieved by logging, thinning or removing wood from the forests. Logging to address bark beetles is less effective than maintaining a largely unmanaged forest. No solid evidence has emerged that extensive tree felling had an impact on the pine beetle movements.

Ecosystem Services. Ecological restoration—supported by science and well documented —can maximize these forest ecosystem services and ensure their continuation. The economic benefits to ecosystem services will increase continually.

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[1] https://pubs.er.usgs.gov/publicaton/70124417