DOVETAIL PARTNERS

Old Growth Report: *Guest Responses*

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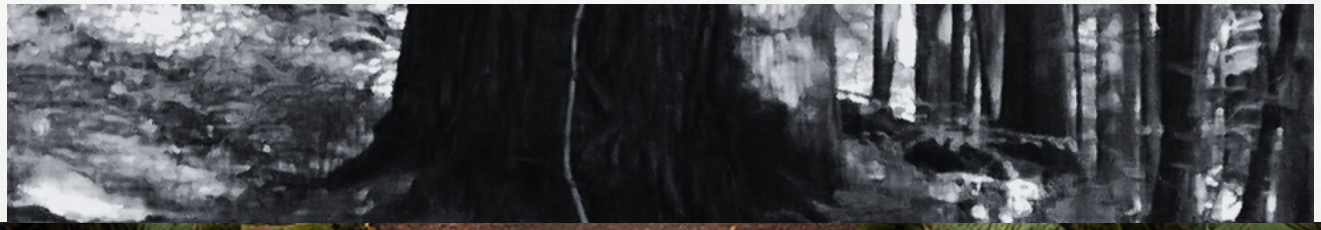


Marcella is an Associate Professor with the Department Of Forest Resources at the University Of Minnesota

Old Growth Response

By: Marcella Windmuller-Campione

Dear Dovetail Community,

Old growth - Two words that manage to have so much meaning and at the same time such vagueness. Old growth stirs emotions in many of us; those emotions can be especially complex for folks within the forest and natural resource field. Old growth can bring forward personal experiences and opportunities within forest ecosystems that allow us to wonder, reflect, and be humbled to live within the world that we do. The term old growth can also bring up tensions – what does this mean and how do we consider this classifications across the diversity of global forested ecosystems. The white paper *Old growth forests: How much is enough?* explores this complex and nuanced topic. Kathyrn Fernholz and Dr. Ed Pepke and the broader Dovetail authorship bring their wide-ranging experience working within forestry which spans continents and disciplines. It is this multifaceted approach that allows the authors to explore the nuance within definitions and how those definitions impact our interpretations of the term old growth. A piece that they explicitly draw out is the relationship with people and old growth;

"The growing recognition of opportunities to integrate academic research understanding with Traditional Ecological Knowledge (TEK) creates an emerging space for honoring and uplifting Indigenous practices while moving towards a future in which all people are culturally supported in the care of natural systems. Through this lens, human involvement in many ecosystems is the baseline and a key strategy for ecosystem health and resilience …. A new relationship with old growth forests that respects and honors the role of people as part of nature and elevates our capacity to care for forests and engage in these practices is needed." p. 13.

It is from this lens and with the willingness to acknowledge the complexities and relationships that have shaped the definition of old growth that we can look to the future. There are many opportunities that are explored in this document (and other Dovetail white papers) regarding new and emerging technologies and innovations within the forest products industry. Can we be open to these emerging technologies? Can we be open to how time, space, and values shape our relationship to old growth? The decision to actively engage in stewardship with intentional management for old growth conditions can provide opportunities for ecosystems benefits. Likewise, the choice of passive management or protection, is an intentional decision. As noted in the report, old growth forests are continually developing through disturbances.

Marcella

As Executive Director, Zander focuses on building partnerships, promoting sound policy, and supporting on-the-ground implementation of ecological forestry. He has a PhD from the Yale School of Forestry and Environmental Studies and worked as a cartographer and spatial analyst with the US Geological Survey.

A review of the report, *Old growth forests: How much is enough?*

Dr. Alexander Evans, Forest Stewards Guild

The recent report from Kathryn Fernholz and Ed Pepke of Dovetail Partners makes a timely contribution to the national discussion of mature and old forests. The authors wisely begin with a discussion of definitions since the phrase ‘old growth’ has been given many, sometimes conflicting meanings. Their admonition that the definition “ultimately reflects our values and perspectives” provides important context. For example, Gyde Lund’s definition of old-growth forests appears to draw from a utilitarian perspective. He emphasizes that old-growth forests are mature forests that are losing productivity or even degraded. From a wood utilization perspective that measures productivity in diameter growth, old-growth forests may not be productive (though see Sillet and colleagues, 2010 doi.org/10.1016/j.foreco.2009.12.003). However, from the perspective of ecosystem services or habitat provision, old-growth forests are highly productive, as Fernholz and Pepke note in section *IV: Why do we need old growth?*

A nuance that Fernholz and Pepke elucidate in the discussion of definitions is the challenge of preserving, or holding stable, dynamic ecosystems. The authors suggest that efforts to conserve old-growth forests are “set up for failure in the long term by striving to ‘protect’ a somewhat singular condition that exists at a specific time and place in a dynamic system.” This emphasis on the dynamic nature of forests is crucial because it is impossible to preserve, in the sense of holding constant, ecosystems that are ever-changing. Old-growth ecosystems usually exhibit less change within human lifespans than young forests. However, they are still alive and constantly changing, and attempts to hold them stable ignore the very forces that shaped them.

The authors delve into another important aspect of the definitional discussion with the concept of ‘primary’ forest. Labeling forests with minimal or no evidence of human disturbance as ‘primary’ as opposed to ‘old-growth’ forests helps separate the human intervention variable from age or other characteristics. It also opens the conversation about Indigenous forest stewardship. The authors include the UN Food and Agriculture Organization (FAO) definition which clearly states that primary forest “includes forests where Indigenous Peoples and local communities engage in traditional forest stewardship and management/use activities.” This seems at odds with the main FAO definition of primary forest as having “no clearly visible indications of human activities.”

In my view, this is the result of the tension between Indigenous stewardship and the myth of uninhabited wilderness. The FAO acknowledges the integral role of Indigenous Peoples in landscapes, but the idea of primary forest still carries the false narrative of an untouched forest primeval that permeated early conservation. Too much of 20th Century conservation involved separating humans from the places targeted for preservation. The forced removal of Indigenous Peoples from National Parks is an example of the cruel reality of what 'uninhabited wilderness' meant in practice (see Kantor's Ethnic Cleansing and America's Creation of National Parks http://scholarworks.umt.edu/plrlr/vol28/iss1/5).

The historical context of Indigenous removal and of preservation setting people apart from forests informs the current discussion of old growth, because it drives the "presumption that people are not a desired part of nature and old-growth forests develop when people are absent," as Fernholz and Pepke note. If it is true that old-growth forests develop only in the absence of people, then definitions of old-growth forests must reckon with Indigenous presence. Alternatively, the acknowledgement of the reality that Indigenous stewardship had extensive and significant effects on forests signifies that people and old-growth forests are *not* incompatible. This is part of the impetus for the authors to suggest adding 'managed old-growth forests' to the lexicon. If the idea of a managed old-growth forest seems an oxymoron, that is because of the lingering impact of the concept of 'primary' or 'untouched' forest. If we can do away with the idea of pristine wilderness, then new options for old-growth forests emerge. The "requirement that human impacts are not evidenced, means that by definition there is no possibility of increasing old growth areas through human actions," as Fernholz and Pepke state. This is particularly problematic in an era when all forests are impacted by humans due to climate change.

Given the significant threats to the remaining old-growth forests and their importance to people and ecosystems, opportunities to encourage mature forests to develop old forest characteristics are crucial. I assert that since humans precipitated many of the threats to old-growth forests, we bear responsibility to mitigate and respond to those threats. The changing climate, wildfires, drought, insect outbreaks, and forest diseases all affect old-growth forests. Of course, until recently, the primary driver of old-growth loss was timber harvest. However, a recent assessment from the US Forest Service (USFS) indicates that, in this century, the top causes for old-growth forest loss were wildfires (689,000 acres) and insects and disease (134,000 acres), followed by tree cutting as a distant third at 10,000 acres (data are from of the forthcoming USFS old-growth threat assessment). The same assessment suggests that nearly 70 percent of mature and old-growth forests on National Forest system land will face high exposure to extreme heat, nearly 60 percent to drought, and nearly 100 percent to fire-related mortality by 2100. To me, these estimates are a moral imperative to act to conserve existing old-growth and foster the next generation of old forests. Thankfully, USFS agrees.

On December 19th, 2023 the USFS released a proposal for Land Management Plan Direction for Old-Growth Forest Conditions across the National Forest System to conserve and restore old-growth forests (see federalregister.gov/d/2023-27875). For the first time, USFS is proposing to amend all 128 National Forest plans at once and make long-term resilience the objective for forests with old-growth characteristics. The USFS proposed amendment is the result of months of hard work to define, inventory, and analyze the threats to old-growth and mature forests – as well as in-depth comments from many organizations. The amendment would recognize that all forests, including old-growth forests, are dynamic and defined by local ecology. At the same time, it would bring consistency to stewardship of inventoried stands with old forest characteristics across the country by prioritizing resilience and persistence of old-growth forests – while still recognizing regional ecological variability. The amendment would also require USFS to monitor their condition across the National Forest System to ensure progress toward the goal of conservation and restoration. Notably, the amendment would "effectively braid place-based Indigenous Knowledge and Western science to inform and prioritize the conservation and recruitment of old-growth forest conditions through proactive stewardship."

In my view, the proposed amendment signals an important shift at the USFS and likely forest management more broadly. It puts people into the solution for old-growth forest conservation and recognizes the need for stewardship: "Standards are proposed to prevent degradation of old-growth conditions and to enable conservation and proactive stewardship within old-growth forest conditions to foster or increase resilience to disturbances and stressors." I see another systemic shift denoted in the amendment's emphasis on ecological integrity. For the first time, ecological integrity would be the guiding light for management of a large portion of the National Forest System. The amendment would dictate that "vegetation management within old-growth forest conditions may not be for the primary purpose of growing, tending, harvesting, or regeneration of trees for economic reasons," though cutting trees would be allowed in old forests to promote the composition, structure, or ecological processes that confer resilience. Though focused on old-growth forests, this still represents a significant shift in focus for the USFS. The USFS's transition away from management directed at removing old-growth forests to an emphasis on ecological integrity has been slow over the last century, but it may be that in years to come this amendment is a discernible turning point.

Certainly, many other trends have fed into the gradual shift in management focus. As Fernholz and Pepke explain in section *V. Why don't we need old growth?* forest management and the wood products industry have largely moved beyond old-growth timber. The stands with old forest characteristics that are removed from potential harvest are unlikely to be in areas that forest industry would have interest in cutting, as evidenced by Fernholz and Pepke's discussion of engineered wood products. New processes and products have helped make old forest conservation less contentious. In fact, the 92,000 comments the USFS received and integrated into the proposed amendment brought to light large areas of agreement, including the value of old-growth forests and the concern over climate-amplified disturbance impacts. While the challenges are daunting, the proposed amendment is an example of hope for old-growth forests and all the irreplaceable values they provide.

Dave is a Family Forest Owner and President of the Montana Forest Owners Association; he is one of the authors of the Mass Timber Report.

Old Growth Commentary

By: Dave Atkins

I am a forest, tree and wood geek! The picture of me peeking out of a Giant Sequoia was part of a trip with my family that we called the Treefecta. We visited the oldest trees (Bristlecone pines >5000 years), the largest (Giant Sequoia) and the tallest (Coast redwood). I have a B.S. in Forest Science (Silviculture and Soils) and an M.S. in Forest Ecology My thesis was about the definition of old growth in the moist forests of northern Idaho and northwestern Montana. The other picture is our off-grid cabin under construction using a combination of cross laminated timber, wood fiber insulation and traditional post and beams. I am a sustainabilist: a person searching for the sweet spot when ecological, social and economic objectives are all achieved.

Dovetail's paper, *Old Growth Forests: How much is enough?* does an excellent job of providing a high-level review of the topic and the many facets associated with it: defining old growth, determining how much should there be, and how we should manage it to protect it or recruit it, particularly in the context of rapidly changing climatic conditions.

I want to explore these facets with you by dropping into a regionally specific forest type, fleshing out more of the complexity than they could cover. I want to explore a specific example of old growth to illustrate the pitfalls of a national policy that is too broad or simplistic to address the ecological variation that exists across the country.

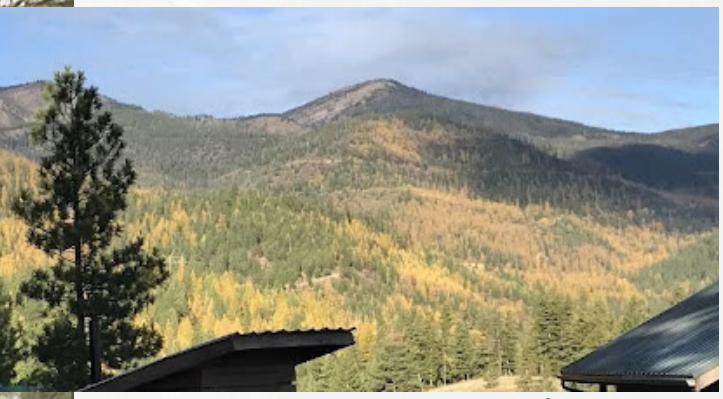
The moist old forests of NW Montana and Northern Idaho are most often characterized by large, old western larch, a beautiful, impressive tree. But they may include many other species including Douglas-fir, Engelmann spruce, lodgepole pine, grand fir, subalpine fir, and birch. Western white pine was also very significant before white pine blister rust was introduced to North America. The purpose of my thesis in the early-1990s was to identify the defining characteristics that would differentiate an old growth forest from other forest conditions.

In the northern Rockies, the temperature/moisture gradients are extreme in their expression across different aspects and elevations resulting in shorter time intervals between disturbance events. Different species of trees have evolved different adaptations to surviving and recovering after a fire or insect outbreak. I worked in western Oregon in the late 1970's and early '80's where the seminal work on Douglas-fir old growth had been conducted in the H.J. Andrews Experimental Forest. The iconic images from those forests are still often used to describe old growth in general. In the western Cascades, Douglas-fir (DF) is the dominant seral species for a very wide elevational range across all aspects, and the key old growth characteristics are relatively similar until you get to higher elevations where other species start replacing Douglas-fir. In coastal DF forests the fire frequency was more often measured in multiple centuries rather than multiple decades to a century or slightly more. These fundamental differences in ecological drivers shape what we call "old growth" and their characteristics in different forest types and ecological settings. In northwest Montana you can cross a ridge from a mixed larch forest on a northeast aspect to a ponderosa pine forest on the southwest aspect.

I had walked, crawled and climbed through numerous coastal DF old growth forests. I read the literature, and knew in my body, having walked five feet above the ground on downed logs above the brush, as well as in my mind, that there were key, defining characteristics that set these forests apart. These areas were defined by very large, old, living and dead Douglas-fir, cedar or hemlock trees, with large dead and downed logs. They were multi-layered with more shade tolerant species of various sizes, from seedlings to large trees whose crowns mixed with the Douglas-firs. Spies and Franklin had published a paper that had used discriminate analysis statistical calculations that showed that these characteristics were very powerful predictors or identifiers of old growth.

For my thesis I used the same type of discriminant analysis and tested many variables including those that were so powerful in the coastal DF forests. I was surprised to find that the large snags, the large down woody material and the presence of decadence in the trees were relatively weak predictors, even when used in combination with each other. To get straight to the punchline, the number of cohorts (age classes) was the most powerful variable to discriminate old growth. I tested two cohort variables. One was the number of cohorts regardless of the species of tree in that age-class and the second was the number of western larch cohorts. Both variables were very powerful and could be used individually.

For those unfamiliar with western larch, it has some important characteristics to understand that help interpret the significance of multiple cohorts in the top of the canopy. Larch are potentially quite long-lived, over 800 years. They have thick bark, are very shade intolerant, are more resistant to fungal rot and have no significant bark beetle killers compared to the other species they may grow with. Their seeds do not sprout and grow very well on soil with leaf litter and decomposing organic matter. Rather, they germinate best in mineral soil. They are also deciduous conifers, meaning they lose their needles every fall painting the mountain sides with a blaze of yellow gold color in October. Deciduous conifers are very unusual.



These characteristics of larch are crucial to understanding the dynamics of these old growth forests and how they are shaped through time as disturbances occur over the decades and centuries. The multiple ages of larch indicate two things: one, some survived multiple fires; second the fire was severe enough to open the forest for larch to regenerate, starting a new cohort. This is referred to as a mixed severity fire, one in which it is severe enough that most of the tree species that are not resistant to the fires are killed. The thick bark of larch protects it, and its deciduous needles allow the trees to have a flush of new needles the following spring. Ponderosa pine and Douglas-fir are the other two fire-resistant species that might be present, but if all or most of their needles are scorched it is unlikely they will survive. If they do survive, they may be killed by bark beetles in the 2-3 years after a fire, depending on how stressed they were by the fire.

The larches' shade intolerance means they lose lower branches (reducing ladder fuels in a fire) as the tree grows taller and competes for light with neighboring trees. Since the larch needles die every year, they have fewer chemicals in them to resist defoliating insects and diseases, and so their needles are less flammable. Therefore, the greater the percentage of larch in the overstory, the less likely the fire can run through the canopy of the forest killing the buds at the top of the tree. Larch weren't the only survivors, but they were the most common.

The fact that that there are multiple cohorts of larch in an old growth forest tells us that the fire was severe enough to kill most of the trees, also creating the desirable mineral soil and open enough conditions to have the regenerating trees not only survive but thrive enough to become members of the dominant canopy layer over time. This pattern of fire is repeated over and over, creating multiple age-classes.

What does this disturbance pattern, that creates a forest with three, four, five or more cohorts of larch in them with ages of 70, 120, 160, 300 or 410 years old, tell us about the number of large snags and downed logs being weak predictors of old growth? They are present inconsistently because the fires are frequent enough that some of the downed logs and the base of snags are consumed in the fires. Intervals between the fires vary substantially.

One time it may only be 30-40 years. Another time it might be 120-140 years. The length of the interval affects the size of the trees that are the resulting snags and future downed dead material. This disturbance pattern also means that it is rare for the shade tolerant, thinly barked species to be older than the most recent fire and are thus rarely in the dominant tree canopy because they never get old enough.

The result is there is substantial variation in what an old growth larch forest looks like.

At the end of my thesis, I posed the question of whether the forest was still old growth after the mixed severity fire created a very open, early seral forest dominated by seedlings and saplings as time passes, while the large older trees were still scattered through it. If you decide it is not old growth, then when does it return to old growth?

If we continue to call it old growth immediately after the fire, which my discriminant analysis did, then our notion of old growth is very different than coastal DF old growth, which is what many people conceive it to be. It also means that our ability to take active management to create new old growth is greatly enhanced.

Why is all this detail important about this one form of old growth? Several reasons:

- First, we don't want to get trapped into thinking old growth is one system and one set of attributes.
- Two, disturbances are inherent in any old growth system, and they determine how long it will remain in the landscape and are a critical driver of how new old growth is created.
- Three, the assumption that old growth is high density carbon storage and stays that way is not always true because disturbances happen whether it is fire, hurricane winds, insect or disease outbreaks or a combination of these.
- Four, old growth is part of a shifting mosaic across a landscape and the temporal endurance of that stage is dependent upon the base ecological driver of climate that affects the other disturbance regimes of fire, insects and diseases.

The absolute wild card is that climate combined with disturbance regimes determine niches of tree species and their distribution across the landscape. Niches are changing as the climate changes and thus we can't assume the old growth will survive like it did under previous climatic conditions. Protecting old growth requires intentional management based on our best understanding of the forces that shape it. Simply putting a line around it and saying hands off will not protect larch old growth forests. The same can be said of mature forests and every other stage of forest growth. If we do not accept this reality and embrace the challenge of monitoring and adapting our management in the face of this changing climate, our forests will not remain the carbon sequestration and storage system they have been in the US for the past 75 years. Nor will we have the biological diversity we desire.

Forests are at substantial risk during the next 20-80 years from climate change depending on how rapidly we reduce our fossil carbon emissions and then reduce the CO2 content of the atmosphere. A number of states in the Rocky Mountains and California have had their forests become net sources rather than sinks for carbon due to drought, extended fire seasons, and massive insect outbreaks in the stressed trees. Wildfires, insects and disease have caused the greatest loss of old growth in recent decades, according to the USFS analysis. The management of our forests to enhance their ability to meet the many different benefits they provide, from diverse habitats for plants and animals, to water storage and filtration systems, capturing carbon from the atmosphere, providing wood to replace fossil carbon intensive materials like concrete, steel, aluminum and places to recreate and re-create our souls, is of paramount importance. Simplistic solutions that do not account for all these values and more are inadequate.

We have substantial knowledge and understanding of our forests. We have a powerful monitoring system in place (Forest Inventory and Analysis) along with a network of Experimental Forests and Research Natural areas. The concept of Adaptive Management based on intentional management, monitoring, interpretation of the results and modifying management based on the lessons learned has never been more essential. This is the only way we can truly achieve Climate Smart Forest Management. Many different owners have already started down this path.

Our forests and how they get managed has been a battleground for well over a century, pitting preservation against utilization, no management vs. intensive production management. We need to acknowledge that forests were managed by Native Americans and learn from their millennia of experience, incorporating it with what the advances in science have taught us. If we are going to take advantage of the natural capacity of forests to suck carbon out of the air and store it, we need to manage our forests for resistance and resilience to drought, disease, insects and fire. We need a circular economy based on renewable wood based structural materials, from houses to bridges to high rise buildings, and we should use wood fiber for insulation, packaging, nanocellulose, renewable chemicals and biochar. We need to manage our forests to produce more wood, store more carbon and provide diverse habitats, and we need to rethink the methods that sustain us ecologically, socially and economically. Many models for this relationship with the forest exist in the world. With good communication and the willingness to listen to diverse perspectives, we can get there.

We need to remember that if we don’t grow it, we mine it. It doesn't matter if you are a musician, actor, software engineer, carpenter, nurse, or medical doctor. Everything we do depends on one of those two sources for materials every society depends on to sustain it.

Joseph is a Key Account Manager at NCX and has a deep rooted passion for sustainable forest management.

Letter to the Editor of “Old Growth Forest: How much is enough?”

By: Joseph Vaughn, CF

The presidential administration recently initiated a significant conservation effort to protect groves of old-growth trees in national forests across the U.S., while also aiming to limit logging activities. The decision is happening in the face of threats such as wildfires, insect infestations, and disease outbreaks in our forests, all of which pose severe risks to those ecosystems and the products and services we render from them. Recognizing these forests as vital ‘natural capital’ this announcement markets a pivotal moment in environmental policy. By examining other headlines and discussions surrounding old-growth forests, it becomes evident that this move has sparked a wider conversation of conservation priorities and strategies. Questions I found in response to the announcement included: How will this decision impact the future of our national forests? What does this mean for the communities and industries reliant on these forests? And, importantly, how does this align with other efforts to combat climate change? Additionally, this approach signifies a transition in how we appraise the value of timber, recognizing its worth beyond the paper and lumber industry.

I perceive a significant missed opportunity when conversations only include answers for what old growth is and why it is important. This report explores additional areas providing additional actionable strategies for leading to more effective forest management. By addressing these gaps, stakeholders could enhance their overall approach to protecting these forests while aligning with other land management objectives.

The report *Old Growth Forests: How Much is Enough?* is timely, addressing key aspects of old growth forest conservation. Its insights make it an invaluable resource, alongside other Society of American Forester's materials, for those of us engaged in advocacy. I'll first share my preconceived notions about "old growth" that were effectively addressed in the section titled "What is Old Growth." The subsequent sections, notably "How Can We Make More Old Growth" and "Protection of Old Growth," provided enlightening examples and processes that captured my attention and feel are relevant to expand on. The discussions in "Why Do We Need Old Growth?", and "Why Don't We Need Old Growth?" introduced several new considerations, enhancing my understanding of the topic holistically. The comprehensive summary in these sections, particularly the balance between the need for and against old growth I believe, equip readers with valuable insights for future discussions on its protection. Additionally, the concluding remarks in "Bottom Line" offer key areas of focus for engaging with stakeholders.

The report's detailed analysis fundamentally changed my views on old growth forests, revealing the complexities I previously overlooked. My initial perspective of old growth forests as unchanging and of limited utility was heavily influenced by my experience with the markedly different environment of pine plantations, which are typically managed on a 30-year rotation age. This regular, predictable cycle initially made the seemingly static nature of these forests appear less dynamic and significant by comparison. The authors highlight the importance of retaining primary forests at a landscape scale, which not only ensures the preservation of a full spectrum of ecosystems. The authors even warn against having a narrow focus on old growth forests because it can be limiting and ignore essential ecological processes. It makes sense to have a more holistic approach that includes managing various stages of forest ecosystems to maximize benefits for both climate and biodiversity. Old growth forests are rich in biodiversity, but so are the other successional stages. All the stages support a range of species, habitats, and ecological processes like clean air & clean water, contributing to the overall ecosystem resilience and societies.

The quotes, "Global assessments show that there are vast areas of primary forests in some countries, e.g., the Russian Federation, Brazil, and Canada," and "Embedded in most definitions

is the presumption that people are not a desired part of nature and old growth develops when people are absent, with some accommodation provided for Indigenous cultures and traditional practices," collectively caught my attention for their nuanced portrayal of old growth conservation and management. These insights starkly contrast with my experiences as a forester in the US South, where forestry is predominantly focused on timber production, creating a different ecological dynamic from the expansive tracts of primary forests found in countries like Russia, Brazil, and Canada. This global variability in forest management and preservation highlights the complex interplay between humans and nature. I am acutely aware of how geopolitical events, such as the ongoing conflict between Ukraine and Russia, can significantly influence forest conservation. This conflict exemplifies how global political and economic upheavals can redirect attention and resources away from environmental stewardship, potentially hindering conservation efforts even in regions distant from the turmoil. The situation in Ukraine and Russia underscores the delicate balance between human affairs and environmental stewardship, and the need for a comprehensive understanding of international relations in our efforts to protect and foster more old-growth forests.

The concept of "managed old growth," which embraces human involvement in forest management, particularly indigenous practices, is slowly being adopted. However, this approach challenges the traditional view that human presence is inherently detrimental to forests. It underscores the value of sustainable practices. This broader perspective invites a reevaluation of our approach to old growth forests. This interconnection between distant geopolitical events, indigenous practices, and environmental conservation is a stark reminder of the complexity and global nature of forest management. It emphasizes the need for a multifaceted approach to forest conservation, one that acknowledges the diverse methods of forest management and integrates the wisdom of management practices with contemporary conservation efforts.

Working with landowners on ecosystem services has broadened my perspective on the value of old growth forests. The observation, "that [a service] old growth forests provide is storing carbon and the associated climate change mitigation benefits," illuminates the critical role these forests play in carbon sequestration, an essential tool in combating climate change. This experience has been eye-opening, teaching me that there is a significant place for, and indeed a need to prioritize, old growth forests due to the various ecosystem services they provide. While society often focuses on the immediate utility of tangible wood products, the less visible but equally vital services offered by forests, such as carbon storage, habitat diversity, and water regulation, are now coming to the forefront through emerging markets that pay landowners that manage for ecosystem services. Recognizing these benefits is reshaping how I, and the landowners I work with, view the management and preservation of these ecosystems.

This growing appreciation underscores the importance of integrating conservation into broader land management strategies, highlighting the need to balance immediate economic gains with long-term environmental sustainability. Initially, I believed the reduction of these forests was largely due to the 'cut out and get out' era of logging, characterized by rapid timber extraction. However, a significant insight emerged:

"Nowadays non-wood materials or engineered wood products can be manufactured to provide more consistent performance than solid, large dimension timber."

This trend signifies a shift in practices. This revelation has reshaped my perception of old growth forest decline. While historical logging practices played a role, the current preference for smaller, more uniform trees and non-wood materials has also been a contributing factor. The convenience and consistency offered by these materials have led to a gradual shift away from using large, old trees, indicating a change in both market demand and forestry practices.

Considering the transformative initiatives and insights discussed earlier, it becomes clear that our relationship with old growth forests is at a pivotal juncture. As articulated in the quote from the Bottom-Line section, "A new relationship with old growth forests that respects and honors the role of people as part of nature and elevates our capacity to care for forests and engage in these practices is needed," we are called upon to redefine our interaction with forests. This new relationship acknowledges the integral role of human stewardship, particularly the invaluable contributions of indigenous practices, in nurturing and maintaining forests. Embracing this perspective shifts our approach from mere preservation to active, sustainable engagement with these natural resources.

In conclusion, it is evident that mature and old-growth forests play a vital role in our ecosystem, offering a wide range of benefits to society. However, the looming threats posed by climate-amplified disturbances such as wildfire, drought, insects, and disease underscore the urgent need for action. As forestry professionals, we are uniquely positioned to make a difference. To protect, maintain, enhance, and cultivate these invaluable forests, as well as sequester and store more carbon to combat climate change, we must embrace science-based management practices. It is not only our responsibility but also our opportunity to safeguard these precious natural resources for future generations. Let us commit to preserving our mature and old-growth forests by advocating for sustainable practices, supporting research, and engaging in conservation efforts to ensure their longevity and the multitude of benefits they provide. Together, we can make a lasting impact and secure a brighter future for our forests and the planet.

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