Data Submitted (UTC 11): 3/23/2020 4:00:00 AM
First name: Nathan
Last name: Johnson
Organization: Ohio Environmental Council
Title: Public Lands Director
Comments: Attached, please find the comments of the OEC regarding the Draft Assessment Report.

Please note that this set of comments is separate from the OEC petition comment submitted earlier today.

Also attached are a handful of studies that were not submitted during previous comment opportunities.

Thank you.

Re: The Ohio Environmental Council's Comment on the Draft Assessment Report

Dear Forest Plan Revision Team,

As the largest public forest in Ohio, the Wayne National Forest is the best nature-based option Ohio has to address the threat of climate change. Maximizing the Wayne's capacity to fight climate change is also the best and most effective way to help remedy some of the most severe ecological and recreational gaps in the state. The Wayne, like most forests in the eastern United States, is ecologically immature and still in the early-to-mid stages of recovery from near total extraction during the late 1800s and early 1900s. What if the Wayne were allowed to continue growing into its fullest ecological potential? The Draft Assessment neither asks nor examines this question. We urge that the Assessment acknowledge and examine the benefits of allowing for landscape-scale recovery of old forest characteristics ("proforestation") for climate, for habitat, and for awe-inspiring deep woods recreation.

Proforestation and Climate Change

Proforestation - allowing existing forests to grow intact to their ecological potential is the most effective, immediate, and low-cost nature-based approach to remove significant amounts of carbon dioxide from the atmosphere (Moomaw et al. 2019). Because existing trees are already growing, storing carbon, and sequestering more carbon more rapidly than newly planted and young trees (Harmon et al. 1990; Stephenson et al. 2014; Law et al. 2018; Moomaw et al. 2019). "Stable forests" play an outsized role as a climate solution due to their carbon sequestration and storage capabilities (Funk et al. 2019). The largest 1% of trees account for ~30% of above ground biomass in U.S. forests (Lutz et al. 2018).

The climate crisis requires immediate action. To keep temperatures from raising excessively, scientific consensus holds that global CO2 emissions must reduce rapidly and drastically, and that CO2 removal from the atmosphere must increase substantially. To avoid excessive temperature increases, "global net anthropogenic carbon emissions [must] decline by about 45% from 2010 levels by 2030 [...] reaching net zero around 2050." (IPCC 2018).

The Drat Assessment mentions overabundance of (commercially) mid-age stands, and focuses on a perceived need for young brushy habitat. But it provides not corresponding discussion of the need for old growth and large diameter trees for wildlife, for recreational enjoyment, and for atmospheric carbon removal. Northeast secondary forests, like the Wayne, have the potential to increase biological carbon sequestration between 2.3 and 4.2-fold (Keeton et al. 2011). Eastern U.S. forests, including the Wayne, have a particularly high untapped capacity for carbon storage and sequestration because of recent recovery from an extensive history of timber harvesting and land conversion for agriculture in the 18th, 19th, and early 20th centuries (Pan et al. 2011; Duveneck and Thompson 2019).

Carbon sequestration and storage potential is highest when old growth forests are allowed to recover. This is because old growth forests in the eastern United States are superior to all other forest age classes for both carbon sequestration and carbon storage (see McGarvey et al. 2015; Liebman et al. 2017; Stephenson et al. 2014; Burrascano et al. 2013; Lichstein et al. 2009). Old growth forests of the eastern United States sequester and store significantly more carbon than both young and mature forests (McGarvey et al. 2015; Burrascano et al. 2013) because they generally host significantly more large living trees, above ground biomass, and dead wood (McGarvey et al. 2015; Burrascano et al. 2013), because they have been shown to have lower soil respiration rates than younger forests (Libeman et al. 2015), and because the rate of tree carbon accumulation increases continuously as trees grow in size (Stephenson et al. 2014). The transition of young and mature secondary forests in the United States to old growth status is an especially promising opportunity to increase carbon sequestration and storage (Lichstein et al. 2009).

The Draft Assessment Report and Draft Carbon Supplemental Report do not examine the power and importance of afforestation. Instead, the focus is on a purported underrepresentation of early successional habitat on the landscape. No corresponding lack of old-growth habitat is acknowledged, which is concerning because old-growth forest once dominated the sate and much of the nation. Today, in Ohio certainly, it is all but completely gone. It takes hours or days to create early successional habitat. It can take hundreds of years for forests to recover old-growth characteristics and status. The Draft Carbon Supplemental Report also includes focus on the supposed carbon benefits of carbon storage in harvested wood products. But, a long series of papers has established that, if the residency time (or "life cycle") of carbon in wood products is accounted for, the more intensively managed forest rarely catches up with the less intensively managed one in terms of net atmospheric carbon dioxide reductions (Harmon and Franklin 1990; Harmon and Marks 2002; Nunery et al. 2010). The Draft should consider this literature as well as the important ecosystem service of carbon sequestration and storage through landscape-scale pro-forestation.

Proforestation and Habitat

Ohio has a crying need for intact, old-growth forest recovery at the landscape scale. The state was once dominated by primary, old-growth forests where the forces of nature and indigenous presence were the primary system drivers. Those forests - forests at their fullest natural potential - and the biological, structural, and experiential diversity they provided are virtually completely gone today. Less than 0.4% of all forest stands in Ohio are over 140 years old (Ohio's 2010 Statewide Forest Resource Strategy). Big trees provide functions that cannot be duplicated by small or medium-sized trees. They provide unique habitat, strongly influence the forest around them, and store large amounts of carbon (Lutz et al. 2018).

White oak (Quercus alba) may be the single most important tree species in America. Its value to wildlife is likely unmatched on a tree species-by-species basis. It once dominated southeastern Ohio. An yet, white oak is in serious decline in the region due to the unsustainable harvesting. It is losing volume in Ohio, decreasing 7.3 percent from 2012 levels. Notably, white oak joins the insect-devastated white ash (-21.1%) as the only major tree species experiencing volume declines in the state (Albright 2018). The decline is alarming and rapid. The volume of white oak in Southeast Ohio declined by nearly 25% between 2006 and 2016 (Albright et al. 2018).

Among the most long-lived species, white oak should be protected and preserved on the Wayne National Forest for all of the many wildlife and aesthetic benefits it provides, and because of the dire harvesting and decline situation of the species on surrounding private lands. The imperiled cerulean warbler and the state-endangered American black bear are especially dependent on mature white oaks for breeding success, as well as on expansive deep woods habitat. A proforestation approach for the Wayne would address acute, trending system drivers (unsustainable harvest) and important habitat needs.

Cerulean warblers require specific old-forest features that are missing from many mature forests regenerated from state-replacing disturbances, such as clearcutting (Rodewald Report). White oak (Quercus alba) stands out as the most consistently preferred tree species (Newell and Rodewald 2011, Boves et al 2013a, Newell et al 2014, Wagner and Islam 2014, Barnes et al. 2016, Nemes and Islam 2017). Cerulean warblers are dependent upon interior forests with complex old growth features, including heterogeneous canopies, small gaps, and large, tall trees with extensive grapevine cover. Large white oaks (Quercus alba) are the preferred and most important nesting sites for the species. During the breeding season, Cerulean Warblers are most closely associated with old, structurally complex forest stands (>80-100 years) that have features typical of old uneven-aged, steady-state forests (Bakermans and Rodewald 2009). Steady-state forests, which are typically >100 years old, are characterized by gap dynamics and natural disturbance processes that result in complex vertical strata and heterogeneous canopy. One of the hallmarks of high-quality habitat for Cerulean Warblers is a relatively open and heterogeneous forest canopy that often includes gaps of ~40-100m2 in size [1/100th to 1/40th an acre] and well-developed vertical strata (Roth and Islam 2007, Bakermans and Rodewald 2009, Hartmann et al. 2009, Bakermans et al. 2012, Boves et al. 2013a. Kaminski and Kamal 2013). Canopy gaps of the size preferred by Ceruleans might be naturally expected to occur with natural disturbances including (but not limited to) treefalls in older forests with large and abundant grapevines, windstorms, icestorms, wildfire, or beaver activity.

White oak (Quercus alba) acorn availability is the single most important driver of black bear population growth in the Appalachian region (Azad 2017; Vaughn 2002; Prange Report: "Simply put, mature, mast-bearing oaks - especially white oaks - are the driving force behind black bear population dynamics and movements."). Most importantly in this region, successfully reproducing black bear populations will need large expanses of mature interior forest (Rogers and Allen 1987; Smith et al. 2016; Prange Report) that contain high levels of white oak mast (Azad 2017; Prange Report), mature oak forest-dependent squawroot (Conopholis americana) (Vaughn 2002; Siebert and Pelton 1994; Prange Report), large (>33 in dbh) hollow oak trees for den sites (Ryan and Vaughan 2004; Vaughan 2002; Oli et al. 1997; Prange Report), and significant amounts of downed coarse woody debris that hosts food insects (Beeman and Pelton 1980; Bull et al. 2001; Prange Report). Older stands, which support high levels of hard mast and moderate levels of soft mass, should be maintained to sustain population growth of black bears in the Appalachians (Reynolds-Hogland et al. 2007; Prange Report). Simultaneously, the acerage of intermediate stands (10-25 years) - which result from clearcutting - support very low levels of both hard mast and soft mass, should be minimized (Reynolds-Hogland et al. 2007; Prange Report).

Proforestation and Resiliency

While the Draft Assessment mentions mycorrhizal relationships, it does not acknowledge or examine the significance of the recent scientific trends and discoveries in the field of forest mycology. Until fairly recently, the essential role of mycorrhizal relationships for forest health and resiliency was not well understood. That is no longer the case, and the implications for forest management are immense. Emerging science has demonstrated the foundational role of mycorrhizal networks - dubbed the "Wood Wide Web" - in forest ecology. And an impressive cultural awareness of the Wood Wide Web has spread among contemporary society. Intact forest soils that have highly developed mycorrhizal structure are important for forest health and resiliency (Simard 2010). Mycorrhizal networks (MNs) influence the survival, growth, physiology, competitive ability, and behavior of the plants and fungi linked in the network (Forzelak et al. 2015). MNs enable networked trees to share nutrients, carbon, water, electrical signals, and biochemical information. Plant behavioral responses that have been measured thus far include rapid changes in mycorrhizal colonization root growth, shoot growth, photosynthetic

rate, foliar nutrition, foliar defense chemistry and defense response to pest pressures (Gorzelak et al. 2015). And, large old trees tend to serve as especially important netword "hubs" in MNs, as they have been found to have more numerous and robust mycorrhizal connections than younger, smaller trees (Beiler et al. 2015).

We now know that preserving intact forests is vitally important for protecting the health, function, and resiliency of mycorrhizal networks and thereby the health, function and resiliency of the forests of which they are an inseparable part. Data shows that clearcut harvesting is especially destructive of ectomycorrhizal fungal networks (Hartman et al. 2012). A meta-analysis of harvesting impacts on ectomycorrhizal fungi found that it generally takes 90 years for ectomycorrhizal species richness to approach that found in undisturbed old growth forests (Spake et al. 2015). And, we know that mycorrhizal networks are the primary vectors for the transmission of photosynthetic to the soil. Soil carbon represents roughly 60% of forest carbon storage in temperate forests (James and Harrison 2016). Harvesting substantially disrupts soil carbon storage and causes signficant carbon emissions (James and Harrison 2016). A proforestation approach for the Wayne will allow for the survival of robust and diverse mycorrhizal networks, which are vital for forest health and resiliency - particularly in the face of major climatic trends and pressures.

And, recent studies have shown that atmospheric Nitrogen (N) deposition pollution may be negatively impacting oak seedlings in significant ways. The Midwest and the Wayne have been subjected to high N pollution for decades due, in large part, to coal-fired power plant emissions. Increased soil N may be depressing or destroying ectomycorrhizal communities and ectomycorrhizal fungal species richness and simultaneously favoring arbuscular fungal species and associated tree species (Dyer and Hutchinson 2019; BassiriRad et al. 2015). In addition, soil nitrogen pools turn over very slowly, meaning forest soils in the region will likely experience the direct effects of past nitrogen pollution for many decades to come (Giliam et al. 2019). Preserving existing ectomycorrhizal communities and long-lived, hard-mast-bearing tree species like oaks, hickories, and beeches is all the more important while Nitrogen-compromised ectomycorrhizal forest systems slowly recover from decades of industrial atmospheric pollution.

Conclusion

Proforestation is a key driver for many vital ecosystem services, including carbon storage and sequestration, wildlife habitat and biodiversity, human aesthetic and recreational enjoyment, and forest health and resiliency. The Draft Assessment should disclose and discuss the benefits and possibilities of proforestation for the Wayne National Forest.

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