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To Whom it May Concern:

With the proposed revisions to the NWFP, the future of the majority of mature and old-growth forests in the United States lies at a crossroads; the update to the NWFP could lead to greater protections for the last remaining old-growth, enhanced carbon storage and improved climate resiliency (Halsey 2024). Or it could loosen restrictions to allow for mature and old-growth timber harvesting and reduce or eliminate monitoring of rare species through [ldquo]Survey and Manage[rdquo] efforts.

We write on behalf of the Northwest Lichenologists, a non-profit organization whose mission is to maintain and promote high standards of performance in field lichenology. Collectively, our Board members have over 200 years of experience working with the Forest Service and conducting research in the forests of the PNW. As regional experts in old-growth forest ecology and rare species conservation, we implore forest managers and policy makers to utilize the best available scientific information for making conservation decisions that impact the future of our forests. We present here a compilation of research, which clearly supports preserving ALL remaining old-growth forests in the PNW region. Long-term conservation of old-growth dependent species will also require the creation of suitable habitats in younger forests. The NWFP must also protect mature forests (80 to 200 years old for Douglas-fir forests of the Pacific Northwest) that will be become the old-growth of tomorrow (Spies and Franklin 1991).

Although lichens and bryophytes can be "difficult to detect, inventory, monitor, and study because they require specialized expertise in the field and the laboratory" (Amendment, 3-59), the Forest Service and Bureau of Land Management have been contracting surveyors that specialize in these species to search for and map S&M species for at least 24 years. Clearly, they are not too small to survey for and detect, even for the most cryptic species such as calicioid lichens, as is evidenced by the hundreds of papers that have been published about their distribution and ecology of the last 50 years (eg. Rikkinen 2003; Edwards et al 2004; Glavich et al 2005; Villela et al 2023). Highly qualified surveyors specializing in these organisms have conducted this research and continue to be trained in the Pacific Northwest. We must dispel the myth that these taxa are [ldquo]unknowable[rdquo] and continue to include them alongside more charismatic flora and fauna in conservation efforts at the state and federal levels (Allen & Lendemer, 2015).

Epiphytic lichens play critical roles in forest ecosystems; contributing to hydrologic and nutrient cycles, food webs, and overall biomass and biodiversity (Ellis 2012). Some lichens are necessary to the lives of vertebrates, for example Bryoria spp. are food and nesting materials for flying squirrels, deer and elk eat lichens as part of their regular, diverse diet and many species of lichens are used by passerine birds to construct their nests

(Hayward & Rosentreter,1994). Although these examples may seem inconsequential, any deterioration of habitat for these vertebrates adds on to the stresses of rapidly changing forests. Retaining these important elements of the ecosystems in the face of rapidly changing forests must be considered in the amendment. Lichens are also used by Native Americans as part of their traditional diets (Turner, 1977; Hutten & Woodward, 2002); with the increased interest by tribes to continue their traditional ways of life, lichens are a significant factor.

Another important role lichens play in our forests is direct input of useable forms of nitrogen into the forest ecosystem. Cyanolichens (those with cyanobacteria instead of algae as their photobiont) dominate the epiphyte communities in the canopies of our moist forests in the Pacific Northwest (Pike et al. 1975). Nitrogen fixation by Lobaria oregana, one of the major epiphytes in moist old growth forests, provides an ecologically significant input of new N to the moist forests (Antoine 2004, Johnson et al. 1982). Together with other cryptogamic organisms (bryophytes, cyanobacteria, and fungi), they are responsible for almost 50% of terrestrial nitrogen fixation (Elbert et al., 2012).

Lichens are well-known to be sensitive to disturbance such as forest fire and logging (Johansson 2008, Miller et al. 2018; Rose 1976) and many are dispersal-limited (Goward 2003; Sillett et al. 2001). Few protections exist for the conservation and management of forest epiphyte lichens at the federal level in the United States, despite their ecological importance and sensitivity to environmental change (Allen et al. 2019). For example, out of approximately 5,823 lichen species that occur in North America north of Mexico, only two are protected by the Endangered Species Act (Esslinger 2021; USFWS 2007, 2013). At the state-level, some Natural Heritage Programs review and maintain lists of rare and threatened lichen species (Groves et al. 1995). However, no formal process or funding exists to maintain the states' rare lichen lists. Instead, the process relies mainly on volunteer work of regional lichen experts to revise and update rare species lists.

The [ldquo]Survey and Manage[rdquo] provisions of the Northwest Forest Plan were set in place to provide protection for all known sites where old-growth dependent species, including lichens, occur within National Forests (U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management 1994; 2001). Studies indicate that old-growth associated lichen species are significantly declining in the Pacific Northwest bioregion. For example, Nephroma occultum Northwest Forest Plan (Category A) is considered at high risk of extirpation in Washington state due to its dependence on the very oldest trees as a substrate, few occurrences and severe threats to remaining populations (Sillett and Goward 1998; WHNP 2024). Similar to N. occultum, recent surveys of historical sites found that several populations of Pseudocyphellaria rainierensis in Oregon and Washington have been completely eliminated due to wildfire and logging (pers. comm. J. Villella and J.E.D Miller 2025; J.E.D. Miller 2024) including the southern-most known population in Douglas County, Oregon. Considering that eleven lichen species hold a Category A status and are likely declining without documentation, this entire old-growth, epiphytic lichen community is most likely threatened.

We recommend a moratorium on cutting old growth in the Gifford Pinchot National Forest in the southern Cascades of Washington State and the Willamette National Forest in Oregon. These areas contains dozens of historical rare lichen populations, likely due to the many mature and old-growth forest stands conserved within late-successional reserves (LSR), that exist within matrix lands of younger timber rotation forests. These LSR[rsquo]s, which were established under the NWFP, represent extensive habitat for many rare and threatened old-growth dependent species (DellaSala et al. 2022). Unfortunately, these populations are at great risk for future declines because of an increase in frequency and severity of wildfire in recent years (Halofsky et al. 2020). Over 2 million acres have burned in these two states, and over 100,000 acres have burned multiple times between 2001 and 2024. Transfer of matrix into LSR lands (specifically the 72,857 acres of forests over 200 years in age) within these National Forests would protect existing habitat for old-growth dependent species while increasing overall forest resilience to wildfire through the creation of cooler microclimates provided by shade in older forests (Frey et al. 2016; Halsey 2024).

We recommend targeted conservation of riparian forests that are adjacent to old-growth and late-seral stands, as these habitats serve as important refugia for old-growth dependent lichens, particularly for cyanobacteria-containing species (Liden & Hilmo 2005; McCune et al. 2002). Riparian environments are ideal for lichen growth because they introduce light gaps in the forest canopy and waterfalls and river aerosol provide high humidity (Bj[ouml]rk et al. 2009). Currently, stream buffer zones protect a very narrow zone along streams. While this is helpful to some degree, much larger buffers would protect lichens and also result in cleaner streams with less particulate matter, by providing a filter area to catch runoff from logging operations. Old-growth-dependent, aquatic lichens are very sensitive to changes in water quality and stream turbidity and can only thrive where the runoff is minimal and silt does not cover them (Glavich 2009).

Protecting old-growth forest stands located in valley bottoms and in toe-slope positions should be considered a high conservation priority for old-growth dependent lichen communities. Old-growth forests in valley bottoms are scarce today because they were often the first to be logged; these highly productive stands produced enormous trees prized for timber and were located on the least steep terrain ideal for building roads. These sites also act as refugia from wildfire because of wet soils and abundant groundwater, leading to the accumulation of an abundance of rare canopy lichens over time (Goward and Arsenault 1999).

Protecting remnant old-growth trees that occur adjacent to mid-seral and mature forests is especially important because they [ldquo]seed[rdquo] younger stands with lichen propagules. Because many old-growth dependent lichens are dispersal- (Sillett et al. 2000) or colonization-limited (Bartemucci et al. 2022), it is essential to that the distance between lichen propagule sources (i.e. old-growth trees) of nearby regenerating forest stands be minimal. These practices will help to create new habitats where old-growth dependent lichens can establish and thrive.

In summary, beyond biodiversity loss, declines in epiphytic lichen communities would lead to major shifts in carbon and nitrogen cycles and decrease food and nesting material insects, birds and mammals in the temperate rainforests of the Pacific Northwest (Asplund and Wardle 2017; Pike 1978; Sharnoff 1994). The NWFP must continue to ensure that old-growth temperate rainforests of the Pacific Northwest continue to exist. This will not only protect lesser-known threatened species like epiphytic lichens, but will also conserve habitats that provide important ecosystem services (Brandt et al. 2014), store carbon (Keith et al. 2009; Smithwick et al. 2002), provide thermal buffering to reduce the chance of catastrophic wildfire (Frey et al. 2016), and protect federally-listed species such as the northern spotted owl (USFWS 1990).

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ATTACHMENT-LETTER TEXT: NWL Final comments.docx; this is the same content that is coded in text box; it was originally included as an attachment