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A fundamental aspect of prudently considering and applying relevant knowledge to a complex process is considering the source (thus the credibility) of the information. As the member of the team of Pacific Northwest Research Station Scientists assigned to review and analyze all information used to address wildlife viability issues for the 1997 TLMP, I contributed directly to the initial conceptual framework and subsequent species-specific elements that became the 1997 (now the 2016) TLMP conservation strategy. Over the 10 years following the 1997 ROD, I designed and implemented experimental research testing critical, underlying assumptions of the TLMP Conservation Strategy, the findings of which were presented at scientific conferences and published in numerous articles in national and international peer-reviewed journals. More recently, the science previously published in numerous journals that examined essential assumptions of the TLMP wildlife conservation strategy was summarized in an attached review article (Smith and Flaherty 2023). Therefore, I submit that the following comments represent a unique understanding and perspective reflecting both the direct knowledge and experience gained through developing a landscape-scale wildlife conservation strategy and the comprehensive and credible science experience and knowledge from more than two decades of published research examining its assumptions, especially those related to Species of Conservation Concern. Accompanying this document is a list of salient peer-reviewed publications that provide the scientific basis and support for my comments. I have also attached PDFs of the most recent publication plus 2 additional publications that speak directly to the risk of extinction of an obligate late-seral forest island endemic, the Prince of Wales Island flying squirrel (Glaucomys sabrinus griseifrons).

Moreover, landscape context and ecological and evolutionary realities dictate environmental context (Smith et al. 2011). First, consider that Prince of Wales Island (POW) is a biological diversity hotspot of southeastern Alaska, especially for the bird and mammal fauna, with multiple old-growth obligate, island endemics whose entire distributions are limited to POW or it's biogeographic province (Smith 2005). Below, I describe one example that was previously proposed as federally endangered and is currently undergoing further analyses; further loss of the latter's habitat and dispersal capabilities will likely result in reconsideration of its status under the Endangered Species ACT. Regardless of land ownership, further loss of old-growth forest on POW will increase the risk to viability of this island endemic because of further isolation and reduction of the overall population and genetic diversity, the latter of which is the lowest of all population throughout its geographic distribution. The science supporting this conclusion is below and publications are attached.

Prince of Wales Flying Squirrel:

Natural History, Ecology, and Conservation

Northern flying squirrels (Glaucomys sabrinus) are gliding, arboreal small mammals that rely on mature coniferous (western North America) or mixed-hardwood conifer forests (Smith 2007a, Smith 2012a); this species throughout its range achieves its highest densities in uncut (Holloway and Smith 2011) or old-growth forests (Smith 2012a). The vegetative diversity and structure of old-growth forests facilitate its safe, efficient locomotion and provide an abundance and variety of food types and sources (Flaherty et al. 2008, 2010a, b).

The Prince of Wales flying squirrel (G. s. griseifrons) is an endemic of Prince of Wales Island and nearby islands off POW's western coast (Dall, Long, Kosciusko, Tuxekan; MacDonald and Cook 1999). The entire geographic range of this unique subspecies is limited to POW and these associated islands. This subspecies has the lowest genetic diversity of all northern flying squirrels in North America (Bidlack and Cook 2001; Arbogast and Schumacher 2011). Consequently, it is especially vulnerable to inbreeding with significant additional negative demographic consequences for isolated populations that currently exist (Smith et al. 2011; Smith and Flaherty 2023) and become isolated as a result of further habitat loss and fragmentation across its range, which limits dispersal and prevents demographic and genetic rescue.

One might question the importance of this endemic as a member of the rainforest ecosystem; so, what if it becomes locally extirpated? Flying squirrels have an obligate mutualistic relationship with young spruce and hemlock seedlings that results in successful regeneration and development of the two dominant canopy species. Through the consumption of truffles and spreading of spores throughout the forest, flying squirrels facilitate the transfer of nitrogen-fixing bacteria to developing seedlings; they enable the development of their own habitat (Smith 2007a, 2012a)!

Smith and Nichols (2003) and Smith et al. (2005) demonstrated that productive old-growth forest (POG) is the primary habitat of the POW flying squirrel. Although squirrels do occur in non-commercial forests, these habitats are "sinks" (Smith et al. 2011) and do not support breeding populations (Smith and Person 2007). Managed habitats (i.e., recent clearcuts and second-growth) do not support flying squirrel populations and empirical evidence indicates that regenerating forest patches [le]40 yrs. old are selected against at the broader scale (Shanley et al. 2012); flying squirrels rarely (if ever) even move through those habitats (Smith 2007a, Flaherty et al. 2008, Holloway and Smith 2011, Smith 2012a). Thus, across managed landscapes POG is the only cover type that supports breeding populations of POW flying squirrels. Habitat patches require [ge]73% old-growth forest cover or a minimum total area of 73 ha (170 acres) of old-growth forest to be even occupied by flying squirrels (Shanley et al. 2012). To sustain isolated breeding populations for an extended period (50 years) with a high probability (0.95), old-growth reserves need to be over 5000 ha (12,500 acres) and comprised of 100% POG); the existing small OGRs (designed for flying squirrels; USDA Forest Service 1997) have about an 80% probability of supporting flying squirrel populations for 50 years (Smith and Person 2007). Smith and Person (2007) also reported that flying squirrels were not captured in a 40-ha (100 acre) patch of POG on Kosciusko Island that was surrounded by managed forest ([pound]40 year-old second growth), whereas a similar amount of effort captured several squirrels in a nearby large (several thousand acres) POG patch in the same landscape. Proposed timber harvest areas (and except for Honker Divide, all of north POW) is highly fragmented with few (if any) large (>10,000 acres) patches of 100% POG habitat. Thus, there are few (if any) OGRs or any POG habitat patches (except Honker Divide) in the project areas (and all of north POW) that likely can support POW flying squirrel populations in isolation (Smith et al. 2011). Any further logging of POG will further reduce the size of existing POG habitat patches, further fragment the landscape, disproportionally impact landscape integrity and connectivity, and thus increase the risk of local extinction in managed watersheds across north POW and other portions of its range in which isolated patches (separated by more 1 km of managed matrix) are less than 12,500 acres (5000 ha) of 100% productive old-growth.

Because of their findings, Smith and Person (2007) concluded that POW flying squirrel populations across north POW need to be functionally connected (matrix is permeable to dispersal) to ensure viable populations in managed landscapes. However, several studies demonstrated that flying squirrels are unlikely to move through clearcuts or young second growth because they cannot perceive POG (while in second growth) beyond 50 m from the POG forest edge (Flaherty et al. 2008), and food availability in managed habitats is significantly less than POG (Flaherty et al. 2010a). Also, POW flying squirrels are unable to move efficiently and safely through managed habitats because the forest structure does not allow them to use their primary mode of locomotion (Scheibe et al. 2006, Flaherty et al. 2010b); it costs flying squirrels more 2.5 times the energy to run than glide (Flaherty et al. 2010b), and flying squirrels experience more predator attacks in managed habitats (most in clearcuts) than POG (Smith 2012a). An experimental study demonstrated that it takes POW flying squirrels 10X more time to move through clearcuts than POG (Smith et al. 2011), increasing the time 10-fold in which they are exposed to higher predator attacks and require more food to offset higher energy costs of transportation in habitats with less food (Flaherty et al. 2010a,b). The result of all of this is that young squirrels have a very low probability of natal dispersal in managed landscapes of north POW and more than 50% of the POG habitat patches (OGRs, stream and shoreline buffers, OG LUD, etc.) are not functionally connected (Smith et al. 2011). The proposed actions of additional old-growth timber harvests will further fragment and isolate POG patches and POW flying squirrel populations, all of which will increase the risk of extinction in managed watersheds of north POW and similarly managed watersheds across its range. Moreover, because of obligate or facultative symbiotic relationships between POW flying squirrels and multiple members of its forest community (Smith 2012a), significant biodiversity is also at risk.

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