

Northwest Science Abstracts Fall 2002 76, #4

A Key to the Hepaticae of Montana

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A key emphasizing vegetative characters is provided for 132 species and 3 subspecies in 45 genera and 26 families of liverworts recorded from Montana. A list of synonyms is provided.

Comparison of hepatic flora and floristic affinities among four neighboring Islands, Queen Charlotte Islands, British Columbia.

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The hepatic flora of Burnaby, Hotspring, Huxley, and Ramsay Islands, in the southeastern Queen Charlotte Islands, Canada, contains 20 families, 33 genera, 61 species, 1 subspecies, and 2 varieties. Specifically on Burnaby - 18 families, 28 genera, 44 species, 1 subspecies, and 2 varieties; on Hotspring - 16 families, 21 genera, and 33 species; on Huxley - 16 families, 18 genera, 32 species, and 1 subspecies; on Ramsay - 17 families, 24 genera, 43 species, 1 subspecies, and 1 variety. Thirty-seven taxa (57.8%) of the total 64 taxa present are boreal in distribution. Thirteen taxa (20.3%) are western North American and amphi-Pacific elements. Other distribution patterns: 3 are cosmopolitan; 1 is disjunct-montane and arctic-alpine; 4 are circumtemperate; and 5 are temperate disjunct.

Role of fungal diseases in decline of Pacific madrone

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There is concern over the health of Pacific madrone, a tree native to California, Oregon, Washington, and British Columbia. Declining trees have been reported in western Washington and British Columbia during the past 30 yr. The fungus *Nattrassia mangiferae* causes cankers and shoot blight and is associated with declining madrones. *Fusicoccum aesculi* causes branch dieback but is a secondary pathogen that attacks stressed trees. We found both fungi on declining madrone trees. More canker fungi were isolated within the first cm from the canker margin, and occurred more often on large diameter wood. *Nattrassia mangiferae* was found in 90% of samples from the margin of madrone

cankers and is considered the primary pathogen. Trees that were heavily infected with canker fungi had less stored starch in the root burl. Starch content in the root burl of declining trees was significantly lower than in healthy trees. Pacific madrone decline has a similar pattern to other declines involving early successional species that establish after a disturbance, where mature trees are more severely affected. Fire was the major natural disturbance agent with madrone, but disease now appears to be replacing fire as the main disturbance agent responsible for killing aboveground plant parts. Unlike fire, disease decreases starch accumulation in the root burl, so that declining trees are less able to resprout after the aboveground portion of the tree is killed by disease.

Ecosystem Use by Indigenous People in an Oregon Coastal Landscape

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Data regarding probable uses of biological materials by the indigenous people of the Salmon River-Cascade Head area of the Oregon coast were used to estimate the people's use of various ecosystems near villages. Of 308 uses identified, 256 were attributable to a given species; 124 species were identified. All local ecosystems were important sources of organisms for the people, with no apparent concentration of highly used species in any particular ecosystem. One species was cultivated, one domesticated, and five acquired by trade. Four major plant resources, camas, yew, hazel, and beargrass, are not known from the Cascade Head landscape, but may have been available from elsewhere in village territory. House construction without use of cedar planks, as indicated by ethnographic records, may have resulted from the paucity of western redcedar in the Salmon River lowlands. The scarcity of several widely used taxa near coastal village sites, especially western redcedar, may have limited the wealth of this indigenous population, even on the resource-rich Oregon coast.

Folivory of vine maple in an old-growth Douglas-fir-western hemlock forest.

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Folivory of vine maple was documented in an old-growth Douglas-fir-western hemlock forest in southwest Washington. Leaf consumption by lepidopteran larvae was estimated with a sample of 450 tagged leaves visited weekly from 7 May to 11 October, the period from bud break to leaf drop. Lepidopteran taxa were identified by handpicking larvae from additional shrubs and rearing to adult. Weekly folivory peaked in May at 1.2%, after which it was 0.2% to 0.7% through mid October. Cumulative seasonal herbivory was 9.9% of leaf area. The lepidopteran folivore guild consisted of at least 22 taxa. Nearly all individuals were represented by eight taxa in the Geometridae, Tortricidae, and Gelechiidae. Few herbivores from other insect orders were observed, suggesting that the folivore guild of vine maple is dominated by these polyphagous lepidopterans. Vine maple folivory was a significant

component of stand folivory, comparable to ~ 66% of the folivory of the three main overstory conifers. Because vine maple is a regionally widespread, often dominant understory shrub, it may be a significant influence on forest lepidopteran communities and leaf-based food webs.

The vertical occurrence of small birds in an old-growth Douglas-fir-western hemlock forest stand

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The vertical occurrence of the small bird assemblage (songbirds, small woodpeckers, nighthawks, and swifts) in a ~ 4 ha stand within the T.T. Munger Research Natural Area, a 500 yr old Douglas-fir-western hemlock forest, was quantified to characterize this assemblage and determine whether birds are vertically stratified within the canopy. We used a gondola suspended from a construction crane to count birds in a weekly series of vertically stratified fixed-area point counts, 5-min, 30 m radius, in the lower (0-20 m), mid (21-40 m) and upper (41-60+ m) canopy. Data are from 21 March 1996 to 21 March 1999, and included 121 survey days (mean 40 counts/yr, March-June 42, July-October 46, November-February 33). Twenty-nine species of birds were detected in the plots; the 20 most common were used for analysis. Fifteen of these species were detected significantly more often in one zone of the canopy. Timber foliage insectivores, air insectivores, timber seed-eaters, and most low understory herbivore-insectivores were stratified within the canopy. Bark insectivores (except brown creeper) and omnivore-scavengers (except gray jay), however, were not stratified within the canopy. The number of bird detections shifted to the upper canopy during winter. One species was generally restricted to the lower canopy, and five species were restricted to the upper canopy, whereas no species were found exclusively in the mid-canopy. The small bird assemblage of this old-growth forest stand was vertically and seasonally patterned and the vertical forest structure, particularly within the upper canopy, reflects these patterns.

Use of small streams and forest gaps for breeding habitats by winter wrens in coastal British Columbia

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Few studies have examined the value of riparian areas adjacent to streams ≤ 10 -m wide as habitat for forest birds. In mature (80-120 yr) and young (40-60 yr) coastal forests of southern British Columbia, we examined the habitat values for male winter wrens of riparian areas adjacent to small streams and areas upslope of these streams. In both riparian and upslope areas, wrens preferentially located nests (n

= 47) and song perches ($n = 77$) in disturbed sites with fewer trees than randomly located sites. Hydrological processes associated with streams, mortality of dominant canopy trees or uprooted trees can produce these disturbed sites. In mature forest, winter wrens chose stream banks and upturned root masses when available for building their nests with most nest substrates located within 5 m of small streams. In both young and mature forests, they also chose areas near small streams as locations for song perches. Winter wrens may use areas closer to streams when available because channel morphology, the associated heterogeneous forest structure, and microclimate likely provide optimal nesting and foraging habitat. Our research supports operational efforts by forest managers to conserve structures near small streams and in upslope areas because these structures maintain long-term habitat values for wildlife such as winter wrens.

Influence of Forest Age on Densities of Cope's and Pacific Giant Salamanders

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We surveyed first-order streams in forest stands 0–94 yr old on industrial timberlands in the Cascade Mountains of southern Washington during the summer of 1998 and 1999 to determine how short-term changes in forest age can affect the abundance of the stream-breeding Cope's and Pacific giant salamanders. Based on results from cross-validated regression trees, densities of both species were unrelated to changes in forest age or any other habitat variable measured. There was also no difference in any of the measured habitat variables between streams in which a species was present and streams in which it was not detected. However, densities of the Pacific giant salamander were negatively correlated to percent of riparian canopy cover in one of the years.

Reproductive Success of Northern Saw-Whet Owls Nesting in Hybrid Poplar Plantations

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I studied northern saw-whet owl nest productivity and survival in hybrid poplar plantations in eastern Oregon. I placed twenty-five nest boxes in 2- to 5-yr-old plantations and monitored them during the 1999 nesting season. Nine nesting attempts were made and eight were successful. Daily survival rates for eggs and nestlings as estimated by the Mayfield method were 0.9919 ± 0.0025 . Clutch size, number of eggs hatched, and number of fledglings for all nesting attempts were 5.22 ± 0.49 , 4.33 ± 0.69 , and 3.55 ± 0.60 . Hybrid poplar plantations can provide suitable nesting habitat for northern saw-whet owls if nest boxes are provided.