

Ecological Effects



United States
Department of
Agriculture

Forest Service
Air Program

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Background

1990s lichen monitoring (Fig 1) by Pacific Northwest Region Air Program and Forest Inventory Analysis-Forest Health Monitoring staff revealed that air pollution in western Washington and Oregon is adversely affecting the Columbia River Gorge National Scenic Area (Figs 2 & 3) and national forests near major urban areas (Mt. Baker/Snoqualmie NF: Seattle, Mt. Hood NF: Portland). In other national forests, air quality was good to excellent and sensitive species (Fig 4) were widespread.

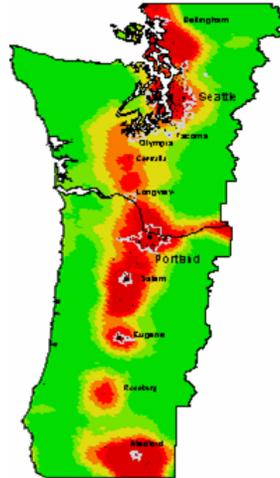


Fig 1. Lichen-based air quality map of western OR and WA. Green areas support all sensitive species; pollution-loving species dominate red areas.

monitoring results provided strong evidence of ecologically harmful levels of acid, sulfur, and nitrogen deposition in the Scenic Area originating primarily from 1) the Portland/Vancouver metropolitan area to the west and 2) the eastern Columbia Basin where agricultural operations and a coal-fired power plant produce polluted air masses that drain through the Scenic Area during winter inversions.



Fig 5. Instrumented, passive monitoring and modeling results provided evidence of high nitrogen, sulfur, and acid deposition from Portland to the west and from a coal fired power plant, crop fertilizers, and dairy and cattle operations to the east.



Fig 2. The Columbia River Gorge National Scenic Area, Washington and Oregon



Fig 3. Weedy orange lichens thrive in eutrophied environments and are widespread in the Scenic Area.

Goals

To better define air pollutants and sources in the Scenic Area, Pacific Northwest regional air staff collaborated with Forest Service Pacific Southwest Station researchers to passively monitor bulk, throughfall & cloud water deposition and ambient gases (Fig 5). Plume modeling and passive, lichen, IMPROVE, and NADP



Fig 4. Endemic nitrogen-fixing lichens like Oregon Lung Lichen, play important ecological roles but are highly sensitive to acid rain and eutrophication. This widespread lichen is nearly absent from the Scenic Area.

Successes

- Scenic Area monitoring results made the headlines of the Sunday regional paper, "The Oregonian", creating widespread public awareness of air quality issues in the Scenic Area, and sparking debate in public meetings and multiple secondary newspaper articles.
- Air Program evidence of significant and serious air quality problems in the Scenic Area aided negotiations with one of the regions last major point source polluters (the Boardman coal-fired power plant at the east end of the Gorge impacting seven Class I wildernesses and the Scenic Area), resulting in an agreement to significantly lower emissions from this source.

Conclusions

By collaborating with other public agencies to monitoring and model air quality and by sharing information in public forums (meetings with regulators & industry, town meetings, newspaper briefings, scientific journals), the Forest Service Air Program plays an active and influential role in protecting forest ecosystems.