

Vegetation Monitoring of a Subalpine Oil Spill

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During the winter of 1985, an underground storage tank leaked in Mount Rainier NP, losing approximately 9,600 gallons of diesel fuel. The oil seeped out over a period of several months moving under snow or through soil into a subalpine meadow approximately one-third of a mile from the tank site. Following the July 1985 discovery of the pooled oil, site clean-up and monitoring of water quality and vegetation were initiated (Park Science, Cat Hawkins article, Spring 1986, pp. 20-23).

The major area of oil accumulation, approximately 9/10ths of an acre, was a subalpine meadow at 5400' elevation. This area gradually slopes from west to east with a small creek descending from the eastern end. The center of the area is depressed with a wet sedge vegetation type dominated by *Carex spectabilis*, *C. nigricans*, *C. lenticularis*, *Aster alpigenus*. The north and south edges are slightly elevated and are dominated by a mosaic of heath-shrub and low herbaceous communities.

Vegetation Monitoring

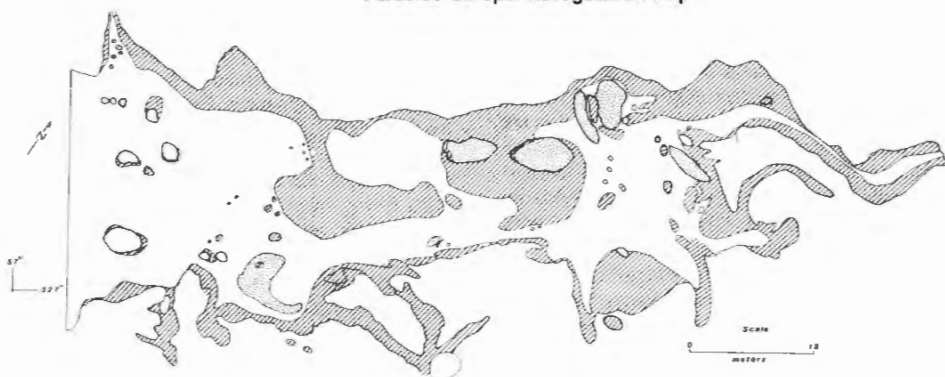
Vegetation monitoring began in August 1985 and consisted of establishing a grid system over the affected area (15 meter intervals), mapping the top-killed and live vegetation, and establishing one square meter vegetation plots systematically throughout the area. Within each vegetation plot percent cover is recorded for live vegetation, top-killed vegetation, bare ground, standing water, and individual species; density also is recorded for herbs and sedges. Percent cover was calculated using Daubenmire's canopy cover classes of < 1%, 1-5%, 6-25%, 26-50%, 51-75%, 76-95%, and 96-100%. Top-killed vegetation was recorded instead of dead vegetation because during the first year it was difficult to determine which plants were dead without digging up the roots. Mapping has been done annually and vegetation plots biannually since 1985.

Mapping has revealed a 53% increase in live vegetation between August 1985 and July 1987. Vegetation plots have shown an increase in live vegetation from 11.8% to 23.1%, a decrease in top-killed vegetation, an increase in bareground, and a marked increase in seedling densities (see Table 1). The areas recovering most quickly are the lower areas, which are frequently inundated by running water. This finding is consistent with the findings of Belsky (1982) in monitoring a 1972 oil spill at 5,000' near Mt. Baker, Wash. She explains that ground water in these areas initially prevents infiltration of oil into the soil and later continues to flush it out, thus enhancing plant growth and seedling establishment.

Importance values calculated each year revealed the same three dominant species: *Carex spectabilis*, *Aster alpigenus*, *Carex nigricans* having distinctly higher values than other species. Seedling densities also were highest for these three species with a fourth species *Agrostis sp* appearing in the October 1986 survey and increasing slightly in the 1987 survey. A survey of adjacent, undisturbed areas is still needed to compare their composition with those of the disturbed site.

Resource Management Implications

In addition to the vegetation monitoring initiated in 1985, 10 plots were established in that year to test management alternatives. Four plots were planted with greenhouse grown *Carex nigricans* plants (19 per



□ Areas of top killed vegetation

▨ Areas of standing water

▨ Areas revegetated by July 9, 1987

plot), two plots were seeded with *Carex spectabilis*, two plots were raked of dead debris and seeded with *Carex spectabilis* seeds, and two plots were just raked. All plots were one square meter in size and seeded plots were seeded with equal volumes of seeds. All seeds were collected in the immediate area and all greenhouse plants were propagated from local stock.

Management plots were monitored in 1986 and 1987. Ninety-five percent of all greenhouse plugs have survived. Approximately 35% have produced seeds, but none appeared to have increased in size. Of the remaining treatments, seedling densities are higher in the "rake and seed" plots than in either the "seed only" or "rake only" plots (2986 vs. 805 and 601 respectively).

Based on the vegetation mapping and monitoring plots, the area seems to be recovering rapidly on its

own and no revegetation efforts are recommended at this time. However, the western edge of the site is slightly higher and drier than the rest of the area and has shown very little plant recovery. If this section does not show some recovery over the next two summers management actions may be considered. In that case, seeding and raking appears to be the quickest and most successful revegetation technique.

Rochefort is a Botanist and Bivin is a Biological Technician at Mount Rainier NP.

Literature Cited

- Belsky, Joy. 1982. Diesel oil spill in a subalpine meadow: 9 years of recovery. *Canadian Journal of Botany*, 60:906-910.
Hawkins, Cat. 1986. Parks Need to Gear Up for 'Can't Happen Here Crisis.' *Park Science* 6(3):20-23.

Table 1. Summary of Vegetation Plot Data

Cover class	Percent Cover			
	8/85	7/86	10/86	7/87
Bareground	5.2	10.5	24.8	14.9
Top-killed	84.8	71.3	63.1	47.7
Live	11.8	16.5	11.1	23.1
Stream	6.0	6.0	6.0	6.0
Total Plant Densities per Sampling Period				
herbs and sedges	570	416	2416	3643
number of species within study plots	12	19	17	20