

ENVIRONMENTAL IMPACT APPRAISAL
BY THE ENVIRONMENTAL AND HYDROLOGIC ENGINEERING BRANCH
EVALUATING PROPOSAL TO DELETE TERRESTRIAL
ENVIRONMENTAL MONITORING REQUIREMENTS
AT FORT ST. VRAIN NUCLEAR GENERATING STATION
DOCKET NO. 50-267

The Public Service Company of Colorado has requested that NRC delete terrestrial, non-radiological monitoring requirements at the Ft. St. Vrain Nuclear Generating Station. This appraisal considers that request through an evaluation of data gathered during pre-operational and operational periods of 1972-1976 and 1977-1979, respectively. Five different monitoring programs of terrestrial biota were conducted concurrently to obtain baseline and operational data to demonstrate impacts of power plant operation.

The staff evaluated data from the licensee's ecological monitoring programs and concluded that with the exception of a study to determine the potential for effects from drift deposition, the monitoring studies not be continued. Some question exists on the potential impacts to agricultural crops from cooling tower salt drift. The staff is requiring, in the revised Environmental Protection Plan (Section 4.2), that a monitoring program consisting of low-level aerial infra-red photography be used to monitor vegetation within a two-kilometer radius of the cooling towers. The staff recommends that photographs be taken annually for three successive years. Photographs should be taken during the height of the growing season for most agricultural crops in the area.

The following discussion summarizes each of the five monitoring studies and gives staff conclusions. In general, most of the studies were unable to demonstrate a cause-effect relationship of plant operation. Confounding

factors included weather variations between years, the influence of grazing, habitat manipulation (i.e. drawdown of Goosequill Pond) and the lack of information on physical factors unrelated to plant operation that could have affected terrestrial biota. More importantly, the plant operated less than 50% of the time during the period 1977-1979, resulting in much less drift deposition than would be anticipated under normal plant operation.

Vegetation Monitoring

Standing crop biomass (production) and vegetation cover measurements were taken on herbaceous vegetation within and outside of seven grazing exclosures on site. Due to the flooding of some exclosures and disturbance by livestock only data for the period 1974-1979 were used for comparison.

No trend is apparent in the data for either vegetation cover or production. Production did seem to increase with time within some exclosures but is likely the result of decreased grazing pressure and not power plant operation.

The staff has evaluated the vegetation cover and production data and concludes that further monitoring is unwarranted. Operational data suggest that, for herbaceous vegetation, no power plant impacts have occurred. Long-term changes in vegetative species composition, particularly for perennial species within the exclosures, was not evident during the study.

Ecophysiological Characteristics

Studies were initiated in 1972 to determine effects on vegetation of cooling tower salt drift deposition. Leaves of representative natural occurring species (cheatgrass, Bromus tectorum; kochia, Kochia scoparia; cottonwood, Populus sargentii) were collected and examined for leaf size and leaf injury from air pollutants, disease and insects. Collections were taken at radial distances of 1/8, 1/4, 1/2 and 1 mile from the cooling towers. Chemical analyses of leaves for 14 elements and ions were conducted for cottonwood and kochia. The pinto bean, Phaseolus vulgaris, a common crop species in the area was also analyzed for these elements and leaf area. Leaves of plants grown at distances of 50 ft. and 1/4 mile of the cooling towers were collected and analyzed during each growing season for the period 1973-78.

Comparisons of pre-operational and operational data show no significant trends or directional effects from cooling towers for leaf area and damage for cheatgrass, kochia and cottonwood. Leaf area of pinto beans was significantly smaller ($p < .05$) in plants growing 50 feet versus 1/4 mile from the cooling towers. Phosphorus, calcium, zinc, iron and sulfate all were more concentrated in above-ground biomass of pinto beans after the power plant commenced operation than before. The same trend for sulfates was also apparent in cottonwood and kochia. Because of confounding factors such as background ambient air SO_2 and $SO_4^{=}$ concentrations and variations between years precipitation, it is difficult to show a cause-effect relationship between cooling tower drift deposition and

vegetation chemical concentrations, particularly for sulfates. Also the applicant did not attempt to correlate changes in plant tissue chemical composition with any differences in crop yield or annual growth of native species. A more distant site than 1/4 mile from the cooling towers for the pinto bean studies would have provided a better controlled experiment.

Given the significant increases in leaf sulfate concentration in native vegetation and pinto beans after the onset of plant operations the staff believes that salt drift may be negatively impacting vegetation. In the case of pinto beans the increase in leaf sulfate content is especially interesting given that the power plant was operating only at less than 30% electrical generating capacity for the 6-week period from mid-July to the end of August each year. The staff calculated from data provided by the applicant (pg. 6, 1980 Final Report, Ecological Monitoring Fort St. Vrain Generating Station) that the plant was operating at approximately 5, 17, and 28% capacity for 1977, 1978, and 1979, respectively, during the 6 week pinto bean drift exposure period. If the plant had been operating at more normal power levels (i.e. greater than 50%) the leaf sulfate content and potential impacts would presumably have been greater based on the increasing concentrations shown from 1977-1979 in Table 8 of the Final Report. Also the lack of a site more distant than 1/4 mile from the towers did not provide an adequate control for comparison of leaf sulfate concentrations.

Given these uncertainties and the existence of some offsite areas northeast of the plant which are within one mile of the cooling towers, the staff believes that a surveillance monitoring program for vegetation should be implemented. The

staff will require the use of low-level aerial infra-red photography within a two-kilometer radius of the cooling towers to continue monitoring of vegetation (see Environmental Protection Plan, Section 4.2). While the study will not provide the detail of leaf composition analysis, it can indicate potential salt drift impacts to vegetation.

The staff concludes that the existing studies of plant growth and chemical composition can be terminated.

Terrestrial Invertebrates

Pitfall and light traps were used to monitor six different invertebrate groups in areas immediately adjacent to the South Platte River east of the plant and a slough west of the plant. Studies were conducted from 1972 through 1979. Two sites were near the blowdown area and one site near the intake area.

Species composition was essentially the same at all three monitoring locations during the eight-year study. Some annual fluctuations occurred within invertebrate groups but are not likely the result of power plant operation. The data did show a reduction through time in numbers of adult caddisfly in vegetated areas near the blowdown area. This may actually have been related to thermal discharge effects on caddisfly larval stages rather than direct effects on adults.

The staff concludes that further studies on terrestrial invertebrates at the Ft. St. Vrain Generating Station are unwarranted.

Bird Studies

Bird populations were monitored from 1972-1979 on three study areas within 3 km of the nuclear generating site. Standard avian census methods were used to gather data on population density and breeding activity at each site. Seasonal determinations were made of species diversity for each site during preoperational and operational years of monitoring.

One hundred eighty-seven species (plus three subspecies) were encountered during the eight years of monitoring. A comparison of preoperational and operational data showed no significant differences in species diversity at any of the study areas. The number of breeding species declined in 1978 and 1979 over that observed in previous years. The reduction was attributed to heavy grazing and drainage of the Goosequill Pond, actions that greatly reduced nesting habitat for red-winged and yellow-headed blackbirds. The changes in habitat were not related to operation of the Fort St. Vrain Nuclear Generating Station.

The staff has evaluated the bird monitoring data and concludes that future studies are unwarranted. No evidence exists to suggest that habitat for migratory or resident bird species has been impacted by the first three years of plant operation or is likely to be impacted by continued operation of the Fort St. Vrain Generating Station.

Amphibians, Reptiles and Mammals

Species presence or absence was noted for terrestrial vertebrates during both pre-operational and operational monitoring. Particular attention was paid to breeding populations. Small mammal monitoring provided a means of identifying any abnormal changes in population densities which, together with chemical analyses of vegetation, might provide insight into impacts to small mammals from cooling tower drift or blowdown. Tissue analyses to determine concentrations of copper, zinc and lead were undertaken on prairie voles, Microtus ochrogaster, and woodhouse's toad, Bufo woodhousei. These metals were chosen for study since they are all toxic to vertebrates in high concentration and are known to increase in concentration in the plant cooling water system.

Small mammal population studies showed normal inter-seasonal fluctuations and no changes in density attributable to power plant operation. Amphibians and reptiles presence on site has not changed since the onset of power plant operation. Unfortunately no tissue analyses were conducted on prairie voles and woodhouse toads after the onset of plant operation, thus eliminating the opportunity for comparison and to investigate potential plant impacts.

The staff concludes that additional studies on amphibians, reptiles and mammals are unwarranted. The staff has seen no evidence of bioaccumulation of heavy metals by vertebrates from ingestion of vegetation at operating nuclear power plant sites and therefore sees no reason to continue tissue analysis studies. The seasonal fluctuation in small mammal population densities observed is typical and showed nothing indicative of a power plant induced impact.

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The following NRC personnel participated in the preparation of this Environmental Impact Appraisal:

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Documents Examined

- Progress Report. 1978. Ecological Monitoring Fort St. Vrain Generating Station, January 1, 1978 - June 30, 1978. Prepared for Public Service Company of Colorado by Thorne Ecological Institute. 142 pp.
- Progress Report. 1979. Ecological Monitoring Fort St. Vrain Generating Station, January 1, 1979 - June 30, 1979. Prepared for Public Service Company of Colorado by Thorne Ecological Institute. 115 pp.
- Final Report. 1980. Ecological Monitoring Fort St. Vrain Generating Station. Prepared for Public Service Company of Colorado by Thorne Ecological Institute. 216 pp.