

BASELINE SURVEY OF PLANT AND ANIMAL SPECIES;
EVALUATION OF THE RIVERSIDE ENVIRONMENT,
GRANT-KOHR'S RANCH NATIONAL HISTORIC SITE

Jerry J. Bromenshenk
Peter M. Rice
Phillip C. Tourangeau
Environmental Studies Laboratory
University of Montana
Missoula

Objectives

This research project has two primary objectives. The first, which has been funded for the growing season of 1983, is to furnish a core of basic data essential to proper management of the historic site. This includes surveys of plants and animals to identify species which currently exist, their relative abundances and distributions, the occurrence of exotic versus native species, as well as, the presence of any rare or endangered species. Plant collections for display and reference purposes will be established. Survey results will be collated into maps presenting the geographic distribution of dominant species and their relative abundance. In addition, we will prepare in cooperation with James Taylor, Superintendent, and his staff a set of management recommendations concerning the natural resources of the site.

The second major objective, for which we have submitted a continuation proposal with a request for a funding overlap in the summer of 1983, is to evaluate denuded areas along the Clark Fork River which occur on the Ranch. This activity includes identifying and mapping the extent of these areas, chemically analyzing soils, sediments, vegetation, and small mammals for the presence of heavy metals, and comparing soil and vegetation at affected versus unaffected areas in or outside the Ranch boundaries. The final product will be a management plan presenting options for the potential administration and possible rehabilitation of these sites.

Methods

A detailed discussion of the methods is included in our proposals. We received notification of proposed financial support to be awarded to us on March 25, 1982, but we did not receive authorization to proceed until late August, 1982. This effectively precluded field surveys in 1982. On October 20, 1982, we attended a pre-research conference with James Taylor, Superintendent, in order to set up work plans and schedules, obtain site maps and background information, and to begin to plan the study needs and the content of the management plans. Also, at that time we conducted a walking tour of the site in order to identify potential sampling sites and to photograph the ranch as an aid in planning our 1983 activities. Additionally, we examined several of the

denuded areas near the river and collected grass and soil samples from three different sites for chemical analysis. The purpose of these collections was to provide an opportunity for us to assess the hypothesis of Park Service personnel that smelter and mine tailings carried downstream from the former Anaconda Copper Company operations had contaminated the soils of the river flood plain. At each site, we gathered a composite grass sample (*Poa* spp.) and soil samples from three depths (0-0.5 cm, 0.5-4 cm, and 4-12 cm). Procedures follow those detailed in our original proposal. However, we did not randomly select subsamples since this effort was intended only as a "pilot" experiment.

We performed duplicate arsenic analyses using 0.25 grams of soil and a 1/1000 dilution factor as well as 0.10 grams of soil and a 1/100 dilution factor. Extractions were via a sealed Pyrex^R tube method (15 ml concentrated HNO₃, 150°C, 3 hours). This left some soil residue in the tubes since we did not use hydrofluoric acid to dissolve the silica. As such the results may not represent "total" extractable arsenic, and the values obtained are considered to be conservative estimates.

Results

We identified seven plant communities which will be addressed in our field surveys. Also, there appears to be a remnant of native rangeland adjacent to the Ranch, although there does not seem to be any on the site itself. We will include this area in our investigations, since from the historical standpoint of livestock grazing, there is a need to identify and if possible preserve any remaining grassland which has not been radically changed as a result of agricultural practices such as the introduction of exotic plant species by planting for hay. Most of the Ranch site appears to have been extensively disturbed by these types of practices. Interpretation of the site requires knowledge of these changes for the period from which it was first established until the present.

The results of arsenic analysis (Table 1) clearly demonstrate highly elevated levels in soil and vegetation. Levels in *Poa* spp. approximated those we observed near the lead smelting complex in East Helena in 1981. In this area, dilution feeding is often employed to protect livestock from potentially hazardous exposures to heavy metals. Although at this time we have not analyzed the soils and vegetation from Grant-Kohrs for other toxic metals, it is likely that they are also present given that arsenic occurs in such high concentrations.

Conclusions

We believe that the heavy metal problem deserves immediate attention and have requested that this aspect of the study be carried out next spring and summer as originally proposed. We feel a sense of urgency regarding the evaluation of this problem for the following reasons:

1. The levels of arsenic in soil were exceptionally high which tends to support the hypothesis of contamination by tailings. However, we have

Table 1. Arsenic content of soil and grass from denuded areas near Clark Fork River¹.

Site	Arsenic Concentration, ppm (dry weight)			
	0 - 0.5cm	Soil 0.5 - 4cm	4 - 12cm	Poa Leaves & Stems
1	258.7	239.1	392.3	4.29
3	167.1	408.1	1102.7	4.04
4	509.0	420.8	354.8	7.06
NBS Orchard Leaves	9.85 \pm 0.28			

RSD = 4.3%

¹NAS (1977) summary gives 0.1 to 40 ppm as the natural content of arsenic in virgin soils, 0.50 to 0.94 ppm for untreated grass, and 2.5 to 12.0 ppm for grass from smelter regions.

no information regarding kinds and levels of other toxic chemicals that may be in these deposits nor do we have any indication of the extent of the affected areas other than visible lack of vegetation.

2. Levels of arsenic in vegetation were high enough to be of some concern regarding the welfare of wildlife and domestic animals which might graze these areas over extended periods. Again, there may be other toxic chemicals in the vegetation.
3. We have no data about whether any toxic metals from these areas are affecting small mammals and birds which reside near them.
4. The Missoula Department of Health, last year, found arsenic in drinking water from wells in East Missoula to be in excess of Federal Drinking Water Standards (50 ug/l). Tests carried out by the Montana State Water Quality Bureau and faculty at the University of Montana Geology Department indicated that the arsenic may be coming from sediments from the Clark Fork River which are piled behind the Milltown Dam. Given the history of dumping which occurred in this river and the fact that Milltown is downstream from the Grant-Kohrs Ranch, the arsenic in soils at the Ranch and in the Milltown reservoir may be inter-related.
5. The U.S. Environmental Protection Agency has listed the Deer Lodge valley as a candidate for toxic waste clean-up assistance from the "Superfund". Missoula officials are hopeful that the East Missoula problem may also qualify.

Therefore, we believe that the denuded areas at Grant-Kohrs may be indicative of a more widespread problem involving the entire river drainage. An evaluation of these areas could provide information necessary for sound and timely management decisions, pertaining not only to the historic site but also to more widely spread environmental, welfare, and human health concerns.

Literature Cited

National Research Council. 1977. Committee on Medical and Biologic Effects of Environmental Pollutants. Arsenic.