A dynamic economic systems community impact model applied to coal development in the Northern Great Plains
by George Sterling Temple

A thesis submitted in partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY in Applied Economics
Montana State University

Abstract:
ABSTRACT Large-scale coal mining and energy-related development may have substantial impacts on the predominantly rural Northern Great Plains. This dissertation investigates the impacts likely to occur in localities in this region, including both economic effects and fiscal consequences for governments.

The methodology employed is computer simulation. The simulation model is composed of an economic base submodel which determines labor requirements; a labor supply submodel which is used to predict employment/population ratios, migration and wages; a local government spending submodel; and a revenue submodel.

The model is used to predict economic and fiscal responses to forecasted coal mining in Montana. The dissertation concludes with an analysis of policy issues important in a rapid growth region.

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Chapter 1

INTRODUCTION

A debate continues in the United States over the domestic dependence on foreign energy supplies. The creation of a Federal Department of Energy is symptomatic of the importance of the issue. Most analysts conclude that increased use of domestic coal as one substitute for oil is inevitable. This study concerns the impacts expected to result from major coal development. The study area is the Northern Great Plains (NGP), defined as North Dakota and parts of Montana and Wyoming.

Coal is likely to be more important in the future than it is now, although coal is currently the most important source of energy for generation of electricity. Electricity usage has grown steadily even in the face of rising prices. Uncertainty about foreign intervention in the delivery of oil and gas may lead to conversion to coal use even if such fears are unfounded. Canadian petroleum supplies are currently being phased out. Coal use is being urged by governmental authorities as an energy source not subject to foreign political interruption. Finally, present air quality standards and the possibility of more stringent standards would lead to greater use of low-sulfur coal.

The NGP, especially Montana and Wyoming, is likely to be a major supplier of low-sulfur coal to the nation (figure 1).

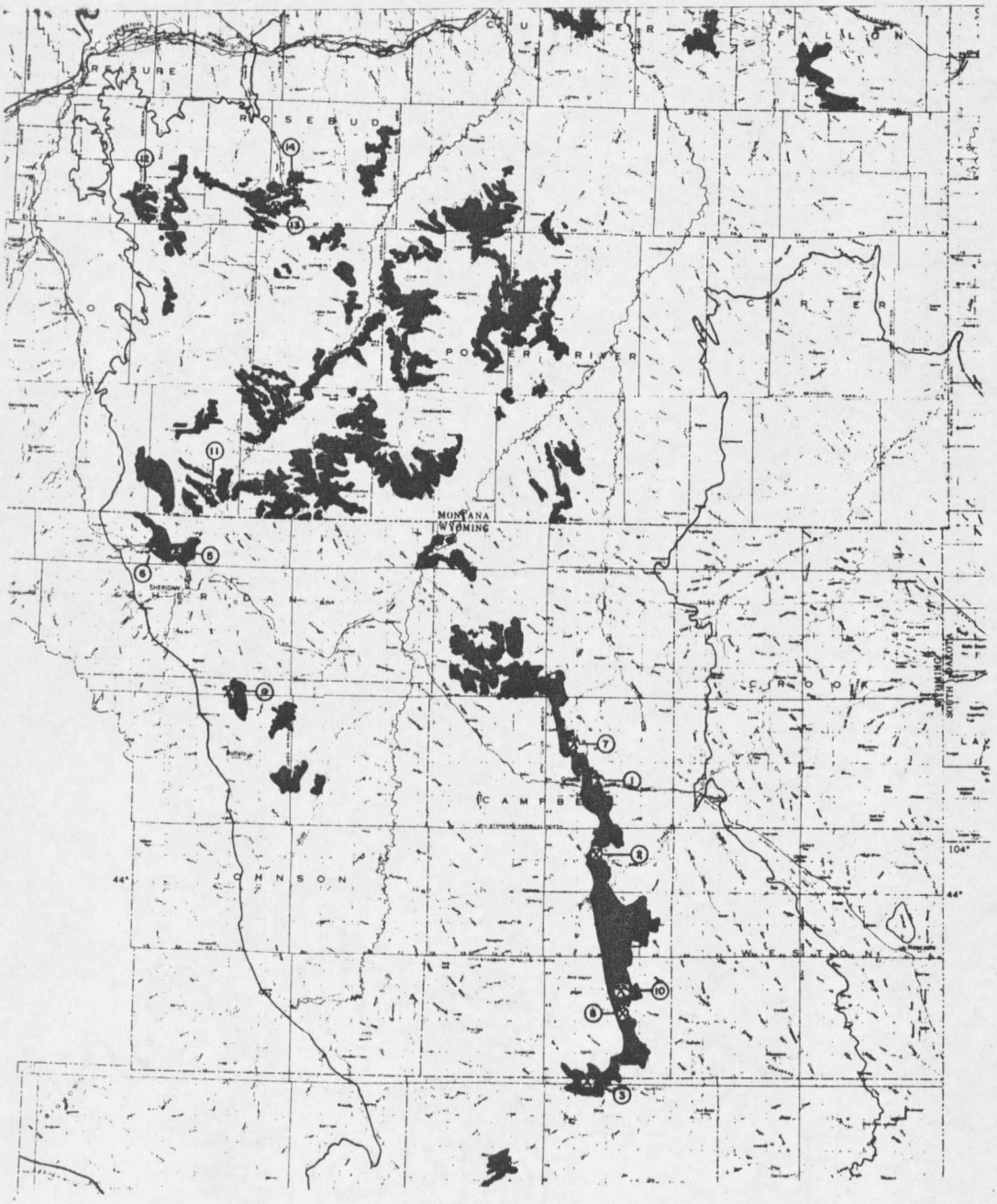

Figure 1. Surface Minable Coal Deposits, Montana/Wyoming Portion of the Northern Great Plains.
Source: U.S. Geological Survey.

Part of the demand will be the substitution of low-sulfur coal for high-sulfur coal and oil. But NGP coal also will satisfy the needs of new generators (figure 2). The NGP is expected to be the source of 45 percent of the coal demanded by new generating units in the U.S. through 1985 -- 159 million tons (table 1). More than 72 percent of this is already under contract, and is a much greater tonnage than any other region is expected to supply.

The NGP is capable of supplying the demand for low-sulfur coal due to the size of the deposits and low costs of mining. Favorable seam to overburden ratios of NGP deposits reduce mining costs. The five states of Montana, the Dakotas, Wyoming and Idaho contain almost one-third of the currently recoverable U.S. bituminous and subbituminous coal deposits containing less than one percent sulfur standardized for BTU content (Reiber, 1975). Most of this coal is concentrated in the study area. Forecasts of productive capacity of mines currently scheduled in Montana, North Dakota and Wyoming show a potential production of almost 450 million tons annually by 1985 (U.S. Federal Energy Administration, 1977).

Population growth primarily due to immigration will accompany coal development in the NGP. Population growth and new development will reverse trends in an historically stagnant region. Myers, Hines, and Conopask (1977) describe the region as a net exporter of