

Mineral Resource Considerations In A Regional Management Plan

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Abstract

An evaluation of Indiana Planning and Development Region 6 (Blackford, Delaware, Grant, Henry, Jay, Madison, and Randolph Counties) land-use plans reveals that continued availability of mineral resources necessary for future growth has received little consideration.

Mineral resource data indicate that the construction materials sand and gravel and crushed stone are abundant but irregularly distributed throughout the region.

Much of the difficulty facing future mineral development would be removed, and prospects for an adequate supply would be improved, if potential mineral producing areas were designated as dual-use districts, such as agricultural-mineral resource district, industrial-mineral resource district, and flood plain-mineral resource district.

Introduction

In regions undergoing rapid urban expansion, special problems are inevitable in planning land-use and zoning. Many environmental considerations have some geologic base—water supply, disposal of solid and liquid wastes, flooding, erosion, mineral resources, and others. This paper addresses mineral resources that are essential to the economy of urban areas. Of the many types of mineral resources, those that present special problems in urban area are the low-cost, high bulk, construction materials—crushed stone and sand and gravel. Every community desires to have low-cost materials for construction and development, but few citizens individually wish to live near or be bothered by the quarries, pits, mines, and processing plants that produce the materials. Local planning efforts to solve this problem are commonly directed toward removing the problem from the immediate environs. The common effect is to intensify the problem elsewhere. Most community and county plans and zoning ordinance do not provide for the production of mineral resources except to recognize the existence of present mineral-producing activities. It is difficult to obtain approval for extension of such operations, and it is sometimes virtually impossible in many locations to secure permission to open new deposits. As urbanization proceeds, land use other than minerals production spreads across the potential producing areas, making it unlikely that new mineral production will be permitted. The only way to secure adequate supply of such minerals for future needs is to classify those limited areas that contain the mineral resources in such way that appropriate reserves will be maintained.

The Region

Indiana Planning and Development Region 6, includes seven eastern and northeastern counties—Blackford, Delaware, Grant, Henry, Jay, Madison, and Randolph. The population of the region is 472,606, or 9.10 percent of the state's total population (13). The region includes two Standard Metropolitan Statistical Areas (SMSA's), Anderson with a population of 138,451 people and Muncie with a population of 129,219 people (13). The region is expected to undergo a moderate to high (9.5 to 17.3) percentage increase in population for the period 1970 to 2000 (13).

The future demand for mineral aggregate resources can be estimated by the increase in contract construction in the region. Data for the Anderson SMSA indicate a 121-percent change, and for Muncie a 70-percent change in contract construction for 1971-1990, ranking the Anderson and Muncie SMSA's third and tenth in the state respectively (6).

Methods

The sand and gravel resource potential of Region 6 (Fig. 1) was determined by compiling and reconciling information from the Muncie and Cincinnati 1° x 2° quadrangle sheets (2 and 3); engineering soils maps of Delaware, Grant, and Madison Counties (11, 7, 10); water well logs from the Division of Water, Indiana Department of Natural Resources; and soil maps of Delaware (4), Madison (9), Randolph (1), Grant (5), and Blackford (12) Counties.

In addition, all of the available water-well logs were checked to locate sand and gravel deposits at reasonable depths (less than 50 feet) and with no more than 20 feet of overlying material, such as tough glacial till, that is difficult and costly to remove. These wells are not plotted on Figure 1; they occur not only in the designated prospective sand and gravel producing areas (Fig. 1), but also outside these areas (till).

The crushed stone resources (Fig. 1) were compiled by plotting depth to bedrock from water well logs, oil and gas wells, and seismic records and then drawing isopach contours for 100 feet, 50 feet, and 25 feet of overburden thickness. Figure 1 shows only the less-than-50-feet isopach contour.

The Zoning Map of Region 6 (Fig. 3) was compiled by obtaining the zoning maps of the townships and cities (where available) of Region 6. The different zoning districts within corporate city limits are not shown on the map. The urban, built-up areas of the region include lands classified as residential districts, although some are classified as business, industrial, and commercial districts.

Results

Sand and Gravel Resources

The prospective sand and gravel resources (Fig. 1) occurs as outwash-plain, valley train, and kame and esker deposits.

Most of the outwash-plain deposits occur mainly in the southern third of Delaware County and in southern Randolph County. The largest outwash-plain areas are west and southwest of Muncie. The sand and gravel outwash deposits are highly variable, some areas being essentially all sand and other gravel.

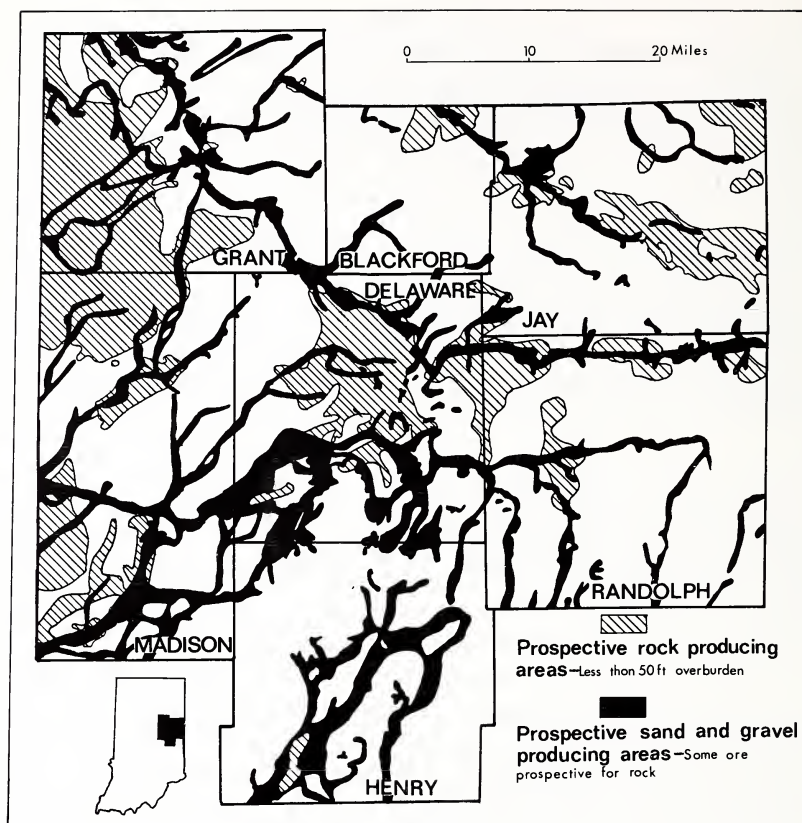


FIGURE 1.

The valley train deposits of the region are located along the numerous rivers and streams that occur in the region. The principal valley train deposits of the region occur in Henry County along the Big Blue and Flatrock Rivers. The valleys of these rivers are rather wide for the size of the streams, and sand and gravel deposits form terraces on either side of the streams. The terraces are 10 to 15 feet above the adjacent flood plain, and the overburden over much of the deposits range in thickness from 0 to 25 feet.

The kame and esker deposits of the region are highly variable. The eskers occur as long sinuous ridges in a general north-south direction south of Anderson and north of Muncie. The kames occur as rounded hill-like forms and as complexes in southwestern Henry and northwestern Jay Counties, and as small topographic highs in many parts of the region.

Crushed Stone Resources

The principal crushed stone resources of the region are to be found in Silurian reef rocks of the Huntington Lithofacies of the Wabash Formation, and

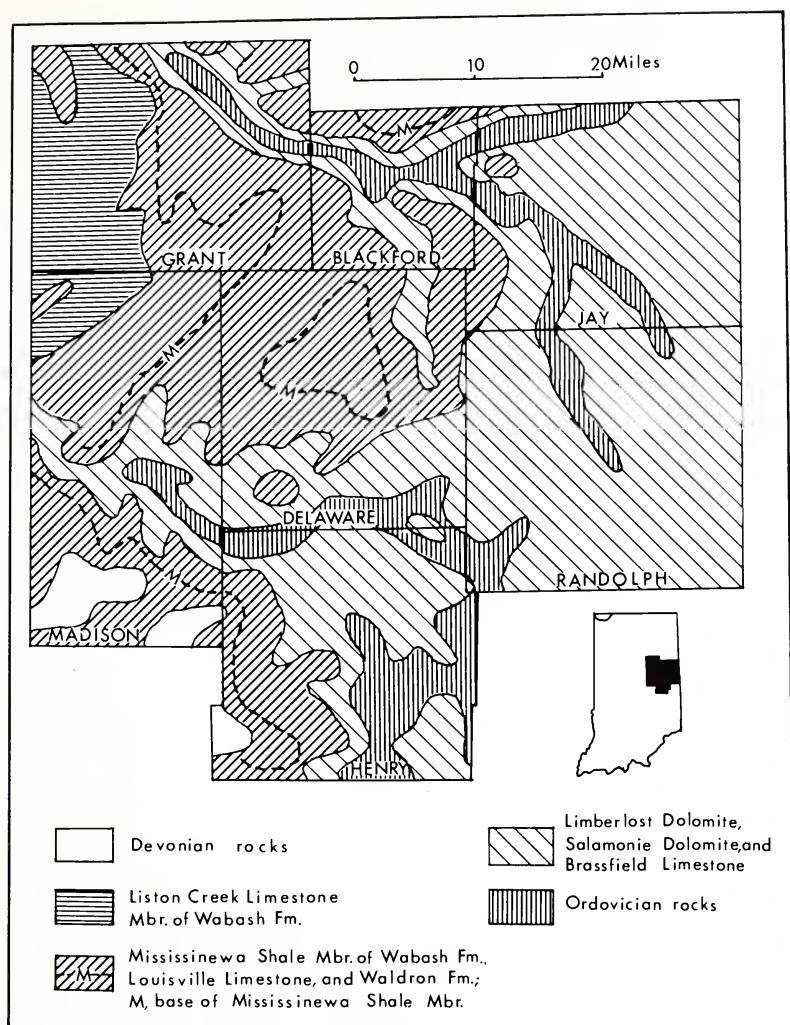


FIGURE 2.

in the Liston Creek Limestone Member of the Wabash, the Louisville Limestone, the Limerlost Dolomite, and the Salamonie Dolomite (Fig. 2). The Devonian rocks below the glacial drift in southern Madison County have only a limited potential. The Ordovician rocks have no economic potential as an aggregate source, as they are too inaccessible and occur as exposures only along buried valleys where the glacial drift is thickest. Two of these deep buried valleys occur in the region (Fig. 2).

The prospective crushed stone producing areas of the region are situated where the Silurian rock units are overlain by shallow drift (less than 50 feet) (Fig. 1).

The region as a whole has adequate aggregate supplies, but they are not equally or uniformly distributed in each of the counties of the region.

Land-Use Plans

For the purpose of this report, the present land-use classification for the region is simplified into three types of districts, the agricultural, the urban, built-up, and the incorporated (Fig. 3). The urban built-up and incorporated areas show the extent of urbanization of the region. Most of the urban built-up and incorporated areas are classified by the individual city and county zoning ordinances as residential land use districts, although other land uses such as business, industry, and commerce are allowed in certain parts of the urban built-up and incorporated districts.

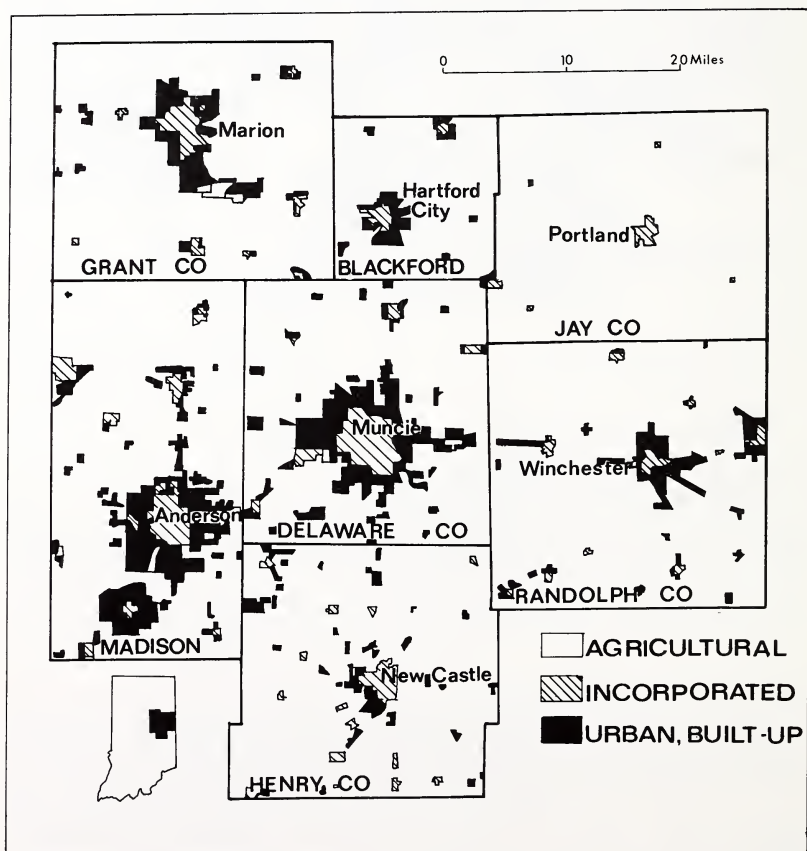


FIGURE 3.

In general, mineral extraction operations are not allowed in areas classified as urban built-up, as these operations cannot be located closer than 300 feet to a residence. Therefore, in areas such as the rapidly urbanizing Muncie and Anderson metropolitan areas, land-use conflicts could arise, as the two areas are growing toward each other (Fig. 3).

Present land-use classifications do not recognize minerals production as essential. Approval for mineral development can be obtained only through an Exception Use Permit, after meeting strict regulations for city and county zoning ordinances.

Conclusions

Mineral resource data indicate that the construction materials sand and gravel and crushed stone are abundant but irregularly distributed throughout the region.

In order to assure an adequate future supply and to prevent possible future land use conflicts, I propose that certain areas where mineral resource potential exists (Fig. 1) be set aside, and classified as a dual use zone district such as agriculture-mineral resource district, industrial-mineral resource district, or residential-mineral resource district. This takes extractive operations within the regulations rather than as a non-conforming Use or special exception. This dual classification would accomplish two things: (1) it would make it easier to obtain an operating permit to expand new operations, and (2) it would define certain areas or tracts for sequential use, that is from agriculture to mineral production to recreational-residential; going from low cost development to high cost development.

The above recommendation can be adopted as part of the land-use element in the Regional Development Plan now being formulated by the Region 6 Planning and Development Commission.

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