Milwaukee Road Corridor Study

Technical Appendix H

Title: AGRICULTURAL PRODUCTIVITY AS IT RELATES TO THE ABANDONED MILWAUKEE ROAD ROW AS A RECREATIONAL TRAIL

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DEPARTMENT OF NATURAL RESOURCES

Department of Natural Resources

AGRICULTURAL PRODUCTIVITY AS IT RELATES TO THE ABANDONED MILWAUKEE ROAD ROW AS A RECREATIONAL TRAIL

Introduction Purpose, and Report Organization

The preservation and protection of agricultural lands from conversion to other uses has been a topic of great interest. Nationally food and fiber production is a vital concern as well as a major policy issue. One only has to be reminded of recent shortages around the world, to show the international importance of the issue.

The purpose of this report is to review the agricultural productivity of Minnesota in general, and the southeastern part of the state in particular. This is done in the hope that some direction might be given to answer the question "Should the State of Minnesota acquire the abandoned Milwaukee Road ROW as a recreational trail?" We are guided by the principle that, if all other factors are equal, the DNR should avoid utilizing prime agriculture lands for recreational facilities.

In addition to this introductory section, this report will consist of three more sections: Statewide Agricultural Productivity, Important Farmlands along the abandoned Milwaukee Road ROW and Conclusions and Recommendations. The section on statewide agricultural suitability is composed largely of excerpts from a recent State Planning Agency (SPA) report.[1] The next section on Houston and Fillmore counties is based on two map reports from the Soil Conservation Service.[2,3] The final section attempts to integrate these findings into a form useful to decision-makers pondering the use of the abandoned ROW.

[1]Minnesota State Planning Agency, Minnesota Cropland Resources, (St. Paul: Environmental Planning, 1979).

[2]U.S. Department of Agriculture, Important Farmlands of Houston County, Minnesota, (Soil Conservation Service, 1978).

[3]U.S. Department of Agricultural, Important Farmland of Fillmore County, Minnesota, (Soil Conservation Service, 1978).

TABLE 2

Percentage Distribution of Abandoned Milwaukee Road ROW in Soil Conservation Service Land Classification.

ROW Segments	Linear Distance (miles)	Prime	Important	Other	Total
Spring Valley to Wycoff	8	95.5%	4.5%		100.0
Wycoff to Fountain	7	97.9%	2.1%		100.0
Fountain to Lanesboro	12	10.5%	21.1%	68.4%	100.0
Lanesboro to Whalan	5	28.6%		71.4%	100.0
Whalan to Peterson	9	3.4%	6.9%	89.7%	100.0
Peterson to Rushford	5	50.0%		50.%	100.0
Rushford to Houston	12	79.0%		21.0%	100.0
Houston to Hokah	12	61.8%		38.3%	100.0
Hokah to La Crescent Junction	2	40.0%	60%		100.0
TOTAL PERCENTAGES	72 miles	52%	7.7%	40.3%	100.0

Statewide Agricultural Productivity

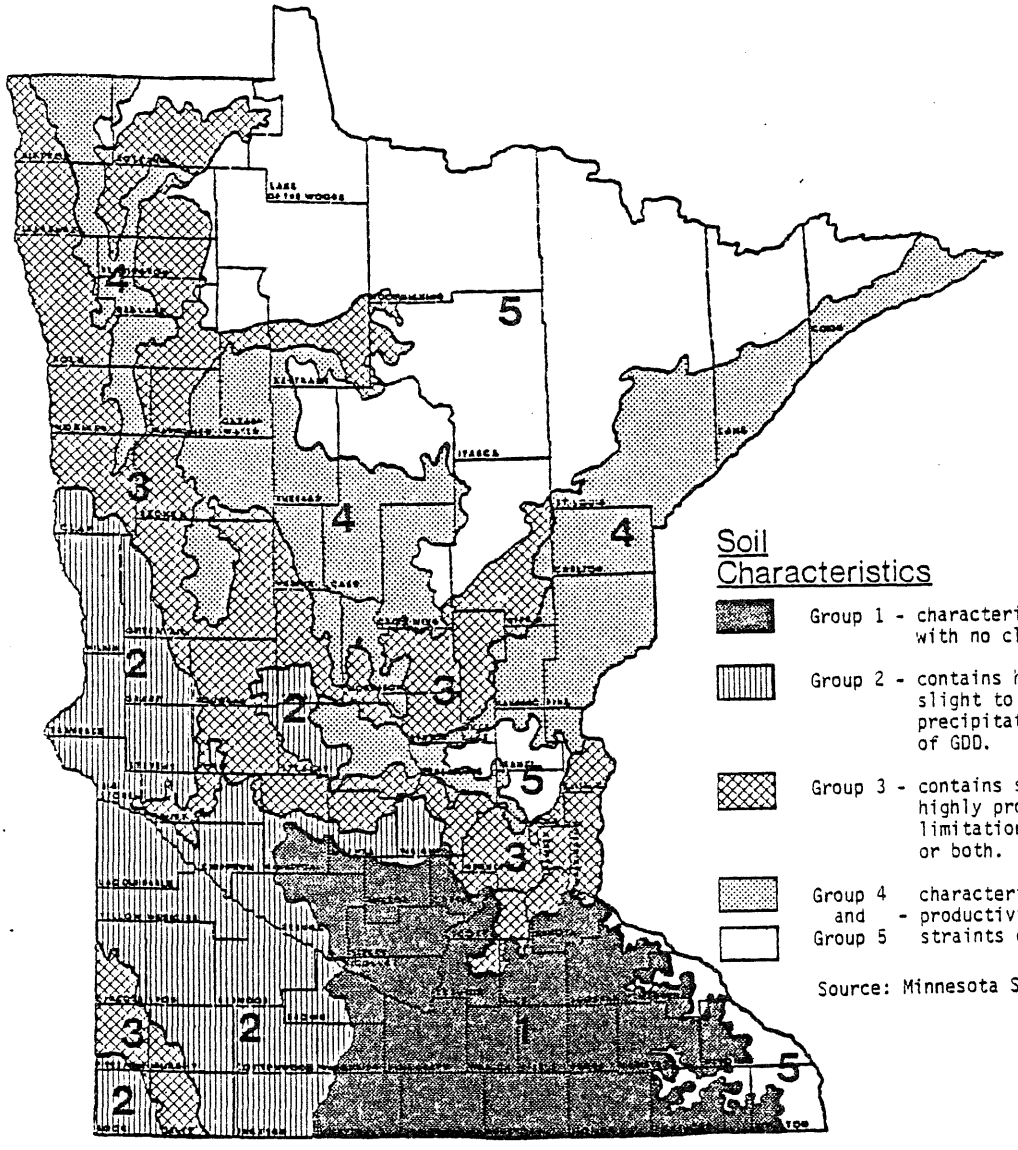
The central purpose of the Minnesota Cropland Resources study was to rank Minnesota soils by their agricultural productivity using a mathematical model. In addition to soil characteristics and climatic data, the State Planning Agency staff included both ownership and cultural limitations information to generate a total soil productivity rating for Minnesota. Because this report is only interested in the land's inherent agricultural productivity, those limitations were not considered and are not addressed herein.

Statewide Pattern

Map 1, Soil Characteristics, is a generalized representation of the statewide pattern of agricultural productivity, based on inherent soil capability only. Soil texture (whether loamy, clayey, sandy, or rocky), natural wetness or drainage condition, soil color, (an indication of organic matter content), slope, rooting zone thickness and available phosphorus and potassium are the factors considered for the representation.

The SPA report, Minnesota Cropland Resources, describes this statewide pattern as follows.

> The soils with the highest inherent capability and scores, Soil Group 1, (SG-1), are located primarily in southern Minnesota and along the Dakota border through the Red River Valley. They lie on topographically flat or gently sloping terrain and are, for the most part, loams and clay-loams developed originally under prairie vegetation. Typical loam soils in south-central Minnesota are the Clarion, Nicollet and Webster series. In the Red River Valley, where lacustrine clay-loams occur, typical series include the Rockwell, Colvin and Fargo soils. Also included in SG-1 are the alluvial deposits that are found in many of the river valleys throughout the state. In the heart of south-central Minnesota's corn belt, SG-1 soils routinely produce over 100 bushels of corn per acre in years of optimal climate conditions.
>
> The SG-2 soils are loams and sandy loams in areas with moderate slope problems. They occur in a belt to the north and east of soils in SG-1 and in the extreme southwest corner of the state. A thin belt of deep loams also occurs in a linear pattern beginning near St. Cloud and extending northeastward parallel with Lake Superior to near Grand Marais. In the southwest corner of Minnesota representative soils are the Moody and Crofton series. In the southeast, Hayden, Waukegan and Marshan soils are found.


Soil
Characteristics
Group 1 - characterized by highly productive soils with no climate limitations.
Group 2 - contains highly productive soils under slight to moderate limitations of precipitation and/or slight constraints of GDD.
Group 3 - contains soils that are moderately to highly productive under low to moderate limitations of either GDD or precipitation or both.
Group 4 and Group 5 - characterized by low to moderately low soil productivity with moderate to severe constraints of GDD, precipitation, or both.
Source: Minnesota State Planning Agency (1979)

Map 1

The SG-3 soils are often associated with or adjacent to those in SG-2. They are usually situated on strongly sloping topography and include loams and sandy loams, such as the Rockwood series. Both the SG-2 and SG-3 soils developed under forest vegetation and, consequently, are lower in organic content than SG-1 soils.

Shallow soils, droughty sands and peats on topography ranging from strong relief to outwash plains characterize the north and northeastern parts of Minnesota. Most of these SG-4 and SG-5 soils developed in bogs and/or under mixed coniferous deciduous forests. The soils are marginal for crop production when compared with the rest of Minnesota, but some of the sands, could be managed for agriculture if irrigated. Peats can also be intensively managed for speciality crops. Extreme northeastern Minnesota contains many areas where bedrock is near or at the surface due to the southward extensions of the Laurentian Shield. Bedrock is also found near the surface in the stream-dissected region of southeastern Minnesota. In north central Minnesota the many outwash plains provided a setting for the development of peat or sandy soils, the latter typified by the Marquette and Menahga series. Some of the best soils in north central and northeastern Minnesota are found along rivers where alluvium forms a rich soil matrix. A few of these riverine soils are cultivated, particularly along the Little and Big Fork Rivers and in the St. Louis River Valley.

Table 1 snows the number of acres in each of the soil groups displayed in MAP 1. At this stage in the ranking process, it will be recalled, soils are assigned to soil group membership on the basis of physical and chemical characteristics taken from the Minnesota Soil Altas. Climatic effects on productivity were not considered. This fact accounts for the high acreage in SG-1, 17.9 million acres, or 32.7% of all the soils in the state. The top three soil groups include nearly 60% of state soils, while the poorer soils in SG-4 and SG-5 account for only about 35%, with the balance in water.

TABLE 1

Soil Group Acreages

Soil Group	Acres in Millions	Percent
1	17.9	32.7%
2	9.4	17.2
3	5.2	9.5
4	3.8	7.0
5	15.5	28.2
Water	3.0	5.5
TOTAL	54.8	100.0%

It is clear from the foregoing discussion that the general pattern of inherent soil productivity conforms to what we might expect: the better soils tend to occur in the south and west and the poorer soils are found in the north and northeast. A line drawn on a map of Minnesota beginning in Faribault County on the Iowa border and extending north and northeastward into Cook County in the Arrowhead Region would pass from some of the best soils in the state through increasingly less productive soils to end in a low productivity area. There are significant exceptions to this general pattern. For example, an important region of SG-1 soils extends through the Red River Valley all the way to the Canadian border. In western Stearns, eastern Polk and parts of Todd and Douglas Counties, just east of the Alexandria Moraine, an area of loamy soils called the Osakis Till Plain occurs that has high productivity. Nearer the Twin Cities lies the Anoka Sand Plain, an outwash plain that when irrigated produces high yields of corn and truck garden produce. Other anomalies include the variegated soils of the southeast stream-dissected region and the previously mentioned belt of loams along Lake Superior. Most of these exceptions to the general pattern of soil productivity provide opportunities for cultivation when intensively managed.

Influence of Climate on Statewide Pattern

Climate is the most important modifying factor that can be applied to the general soil productivity patterns of the state. Minnesota is characterized by significant differences in temperature and rainfall in several distinct climatic zones. Each of these zones offers different potentials on constraints for crop production. This pattern is described in detail in Minnesota Cropland Resources.

In general, southeastern Minnesota, the area with the combination of highest average annual precipitation and greatest growing season heat, is the only area where climate does not alter the productivity ratings of the soils.

Crop production is limited to some extent in the rest of the state, with the limitations increasing to the north and east. In some areas the constraints are composite limitations of both precipitation and heat availability, but either factor alone may also limit crop production.

Climate limits both the choice of crops to be grown and, for any crop, imposes limits on the yields that can be expected. For example, corn and soybeans are planted in the south while small grains are planted in the north. But even within the cornbelt, yields on similar soils decrease as one travels from southeast to northwest.

These patterns are quantified in Table 2, Soil/Climate Productivity Group Acreages. When contrasted with the acreages in Table 1, the following changes are evident.

1) The highest productivity group contains 5.4 million acres or 10 percent of the state, substantially less than the 17.0 million acres, 33 percent of the state, shown in Table 1.

2) Groups 3 and 4 more than double in size in Table 2, going from 9.5 percent and 7.0 percent to 21 percent and 14.7 percent respectively.

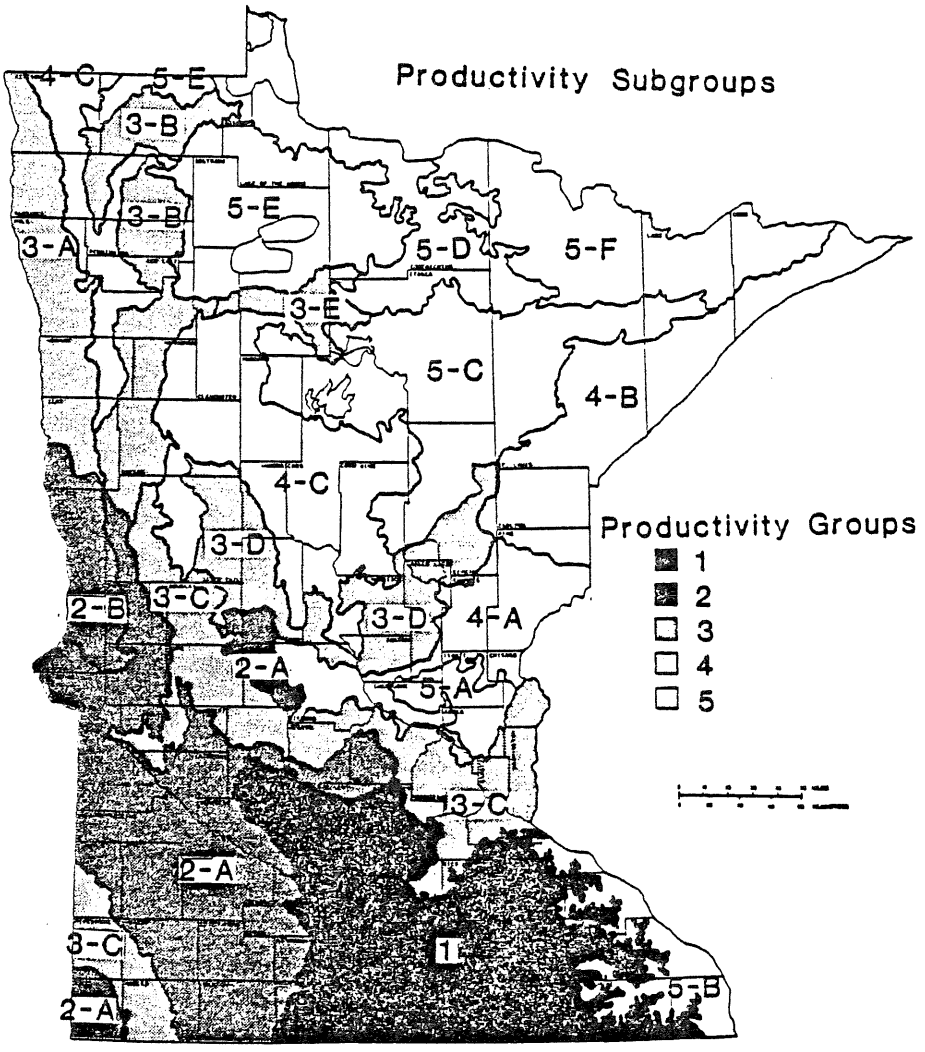
TABLE 2

Soil/Climate Productivity Group Acreages

Productivity Group (PG)	Acres in Millions	Percent of State
1	5.4	9.8
2	9.7	17.8
3	11.5	21.0
4	8.0	14.6
5	17.2	31.3
Water	3.0	5.5
TOTAL	54.8	100.0%

Map 2, Productivity Subgroups, gives a generalized picture of inherent soils productivity as modified by topography and climate. The major categories correspond to the productivity groups in Table 2. Subgroups are defined as follows:

Map 2


Productivity Subgroups
4-C
5-E
3-B
3-B
5-E
3-A
5-D
5-F
3-E
5-C
4-B
4-C
3-D
2-B
3-C
3-D
4FA
2-A
5-A
3-C
2-A
3-C
1
5-B
2-A
Productivity Groups
1
2
3
4
5

Productivity Group 1

This subgroup is principally comprised of deep organically rich loam and clay loam soils that are found on undulating to gently rolling terrain. These soils are naturally or artifically well drained. The wet and warm climatic conditions of this subgroup pose few limitations on crop selection or production.

Productivity Group 2

A. Deep loams, rich in organic matter, are the common soils in this subgroup. They are generally found on undulating to gently rolling topography and are naturally or artifically well drained. The climate, somewhat dryer than in PG-1, is the principal limiting factor on crop production.

B. Deep, organically rich loams and clays are the principal soils found in this subgroup. They are situated on nearly level terrain and are naturally wet but in general have been artifically drained. Lower levels of precipitation and shorter growing season limit production and some crop choice.

Productivity Group 3

A. Deep clays found on nearly level terrain are the common soils of this subgroup. Most of these organically rich soils are wet but have undergone artificial drainage. A cooler growing season than in PG-2 and low levels of precipitation generally limit production to small grains and forage crops.

B. Deep, organically rich loams found on level to undulating terrain are the representative soils of this subgroup. They may be naturally or artifically well drained. A short growing season and low levels of precipitation limit production to small grains and forage crops.

C. Deep, organically rich loams situated in rolling to hilly terrain are the principal soil types found in this subgroup. The crop production on these naturally well drained soils is primarily limited by steep slopes. A cooler and dryer climate for the soils in the northwest sector of this subgroup will impose additional limitations on production.

D. Shallow loams and sandy loams, low in organic matter and found on undulating to gently rolling terrain, are the common soils of this subgroup. Crop production is limited by the shallow and sandy features of these soils and by the cool growing season that covers the subgroup.

E. Deep, naturally well drained loams are the principal soil types found in this subgroup. These soils, low in organic matter because they developed under forest vegetation, are situated on undulating to rolling topography. A short cold growing season limits crop selection and production.

Productivity Group 4

A. Shallow loams and gravelly loams, low in organic matter and siutated on rolling to hilly topography, are the principal soil types of this subgroup. The textural features of these soils and their location on steep slopes are the principal limiting factors on crop production. Compared with B and C below, the climate is more favorable.

B. Loams, low in organic matter and situated on undulating to rolling terrain, are the common soils in this subgroup. A shorter growing season than in 4-A is the primary limiting factor on crop choice and production.

C. Shallow, sandy loams and gravelly sands situated on level to undulating terrain are representative of this subgroup. These textural features as well as a short growing season and low levels of precipitation limit crop production.

Productivity Group 5

A. Shallow, droughty sands and peats are the representative soil types of this subgroup. The textural features of this soils and the need for intensive field management practices (i.e., drainage and irrigation) are the principal limiting factors on crop production.

B. The steep bluffs and shallow soils in the stream-dissected region of southeastern Minnesota comprise this subgroup. Crop production on these soils is severely limited by steep slopes and the presence of bedrock near or at the surface.

C. This subgroup is comprised of many soil types: shallow loams, sandy loams, sands, and peats on topography ranging from level to strongly rolling. Adverse textural features, lack of organic matter, slope and a short cold growing season limit crop production.

D. Poorly drained clay soils are characteristic of this subgroup. The general lack of artificial drainage systems and a short cold growing season severely limit crop production and crop choice.

E. Peat and marsh are the principal representatives of this subgroup. Neither of these is suited for crop production without employing intensive management practices. A short cold growing season also imposes severe limitations on crop production.

F. Shallow sands and sandy loams over the bedrock of the Laurentain Shield in northeastern Minnesota are the representation soils of this subgroup. Crop production is inhibited because of the steep complex slopes, presence of bedrock near or at the surface and the cold short growing season.

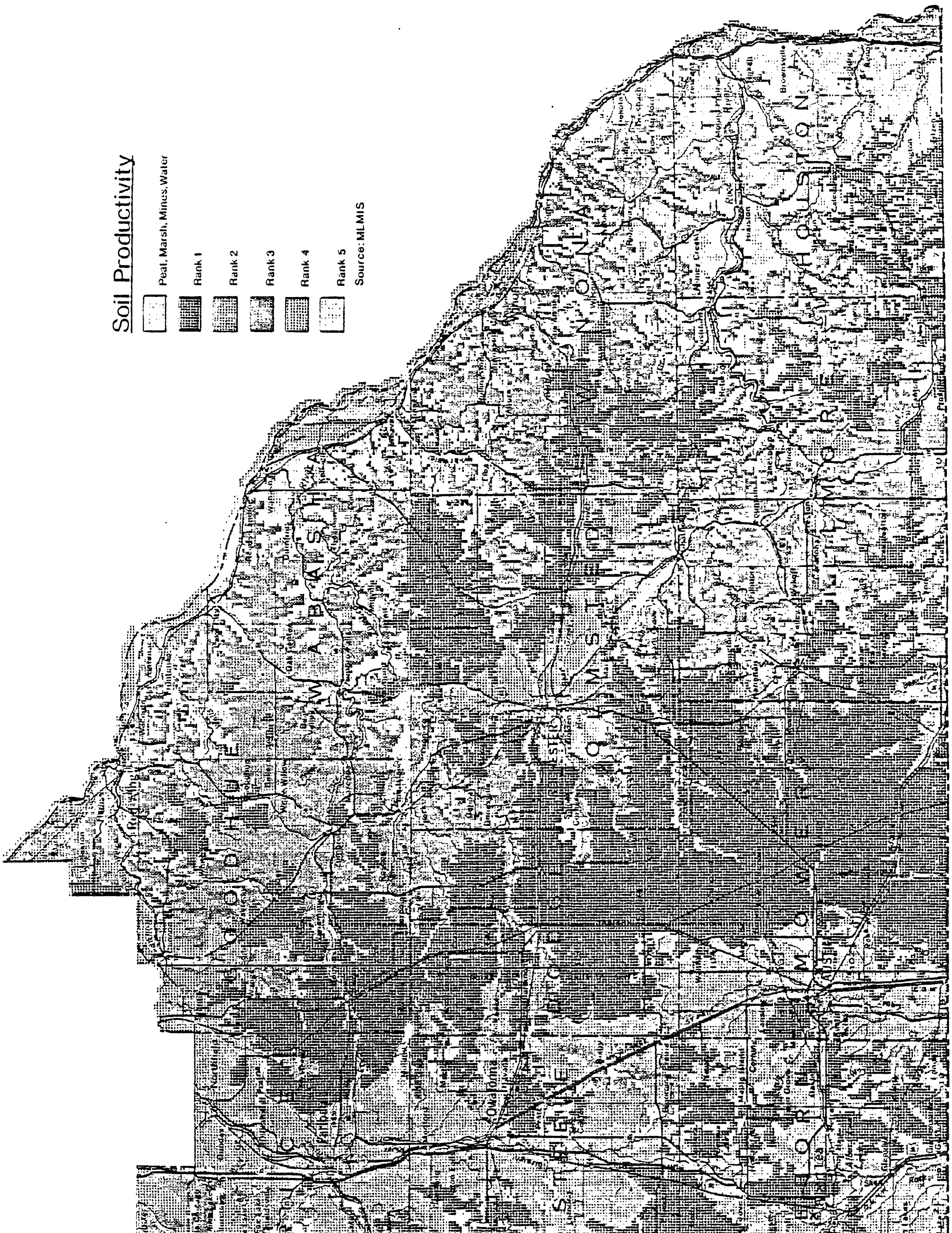
Map 3, Soil Ranking for Agricultural Production in Region 10, provides a more detailed regional picture of the statewide patterns discussed above.

In a general way, the soils in the five soil/climate groups of MAP III can be matched with characteristic levels of yields. There is considerable overlapping of yields between one group and the next group because of the variability of soil productivity factors and the large number of individual soil types in each group. Yields are not the proof of the accuracy or value of the soil productivity model exercise; expected yields do not provide an indication of the meaning of the productivity groups displayed in MAP III.

By identifying typical soils from each of the five productivity groups it was possible to derive expected yields for them from data contained in soil series interpretations. Expected yields on PG-1 soils exceed 90 bushels/acre of corn in good years and some of these soils produce considerably more than that. Representative soil series from PG-2 have expected yields ranging from about 70 to 95 bushels/acre of corn. The PG-3 soils are expected to produce 50 to 75 bushels/acre and soils in PG-4 from 35 to 55 bushels/acre of corn. The least productive soils, PH-5, generally are expected to yield less than 30 bushels/acre. The yield statistics have more credibility for soils in the southern half of the state than elsewhere because of lapses in county survey coverage in parts of the centeral and northern Minnesota. In the Red River Valley however, reliable estimates are also available. Expected yields of spring wheat on the PG-2 and PG-3 soils of the valley range from 40 to 45 bushels/acre and from 35 to 40 bushels/acre, respectively.

Important Farmlands Along the Abandoned Milwaukee Road ROW

The policy of the United States Department of Agriculture and the Soil Conservation Service (SCS) is to help federal, state, and local governments recognize the importance of protecting agricultural lands. The SCS feels that actions which put high quality farmland out of production and into irreversible nonagricultural usage should be carried out only if they are clearly in the public interest.


Soil Productivity
Peat, Marsh, Mines, Water
Rank 1
Rank 2
Rank 3
Rank 4
Rank 5
Source: MLMIS

Map 3

As a part of this effort, SCS developed an inventory of important farmlands. A major purpose is to help people know the extent and location of land that is best suited for food and fiber production.

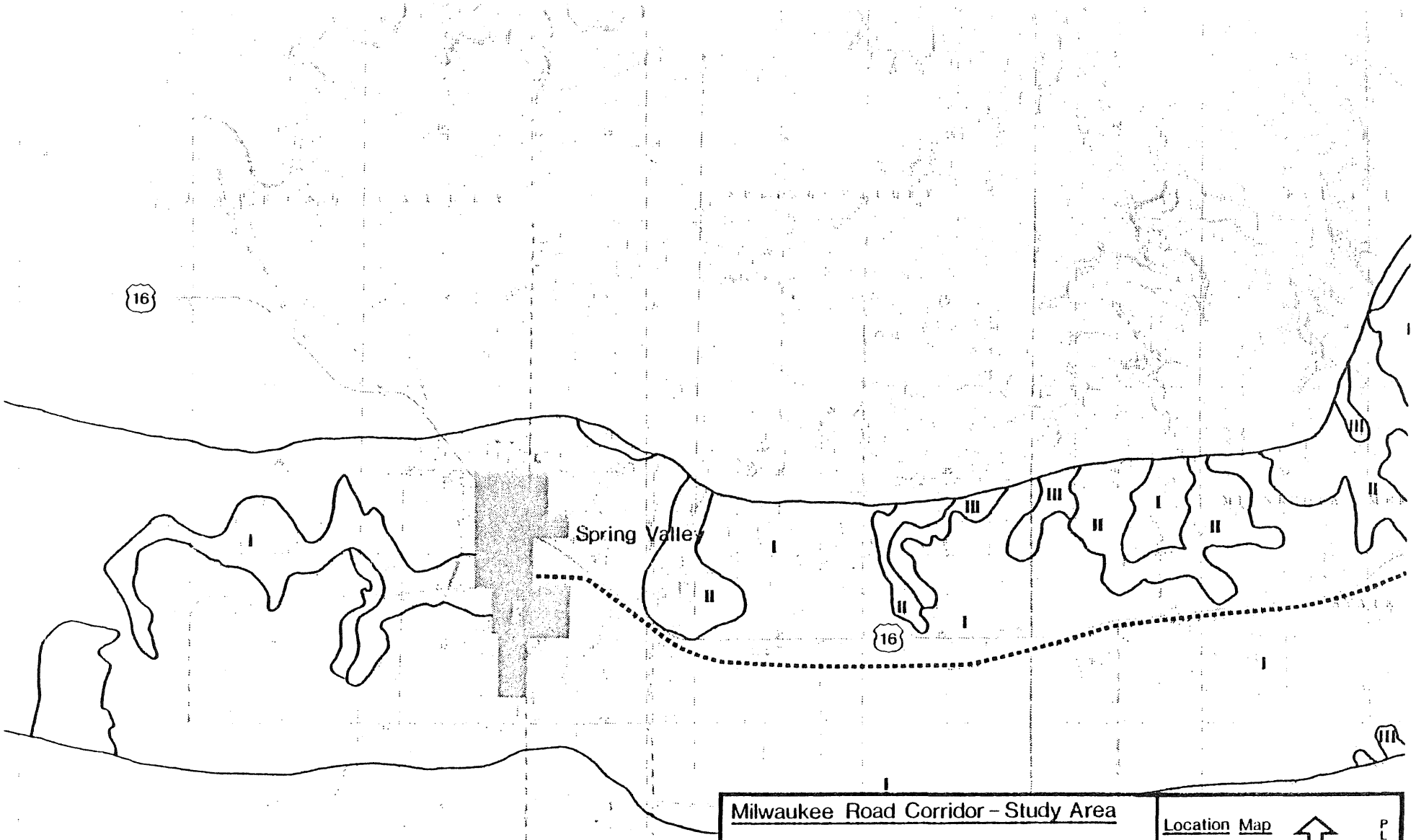
County maps for the counties of southeastern Minnesota (Region 10) have been developed showing important farmlands. The maps are based primarily on soil characteristics and the SCS capability system. Mapping was done at the quarter-quarter section level (40 acre cells). They are designed to show different catergories of farmland -- prime, unique and farmland of statewide importance.

Prime farmland has soil qualities, growing season and the adequate moisture needed to produce sustained high yields of crops economically when treated and managed with modern farming methods. It will produce the most with the least amount of energy and is most responsive to management. It may have a few limitations, such as moderate susceptibility to wind and water erosion. But on prime farmland, these can be overcome easily with soil and water conservation practices.

The amount of ROW contiguous to prime land between Spring Valley and the La Crescent Junction totaled approximately 33.5 miles (linear), or 400 acres (area), or 52% of the total ROW land outside of city limits between those two points (see Maps 3A-I for the location of different soil catagories along the ROW and Table 3 for a listing of percentages between the different cities along the entire ROW).

Unique farmlands are lands other than prime land which are being used for the production of specific high value specialty crops, such as vegetables, berries, sod, or orchards. It has the soil quality and capability to produce sustained high yield under the intensive management needs for these types of farming. No unique farmland was identified contiguous to the ROW.

Additional farmlands of statewide importance are lands with some limitations, such as steep slopes, wetness, or droughtiness, which need to be overcome with comprehensive soil and water conservation practices. They still, however, have



Milwaukee Road Corridor – Study Area

I Prime Farmlands

II Additional Farmlands of Statewide Importance

III Other Land

[Source Important Farmland Maps, UofM Ext Service]

Important Farmlands

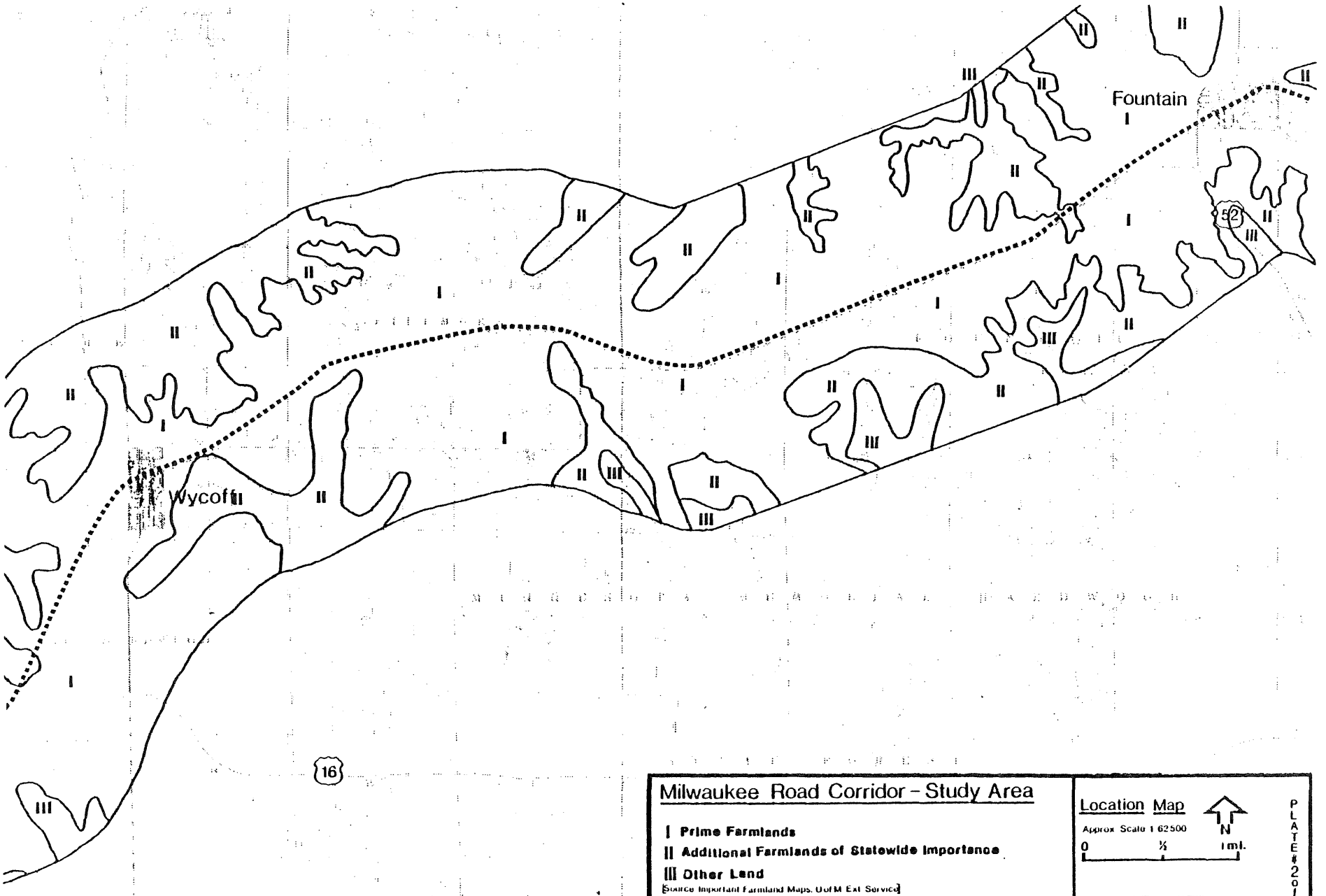
Location Map

Approx. Scale 1:62500

0 ½ 1mi.

N

PLATE #10 of 9



Milwaukee Road Corridor – Study Area

I Prime Farmlands

II Additional Farmlands of Statewide Importance

III Other Land

[Source Important Farmland Maps, U of M Ext Service]

Location Map

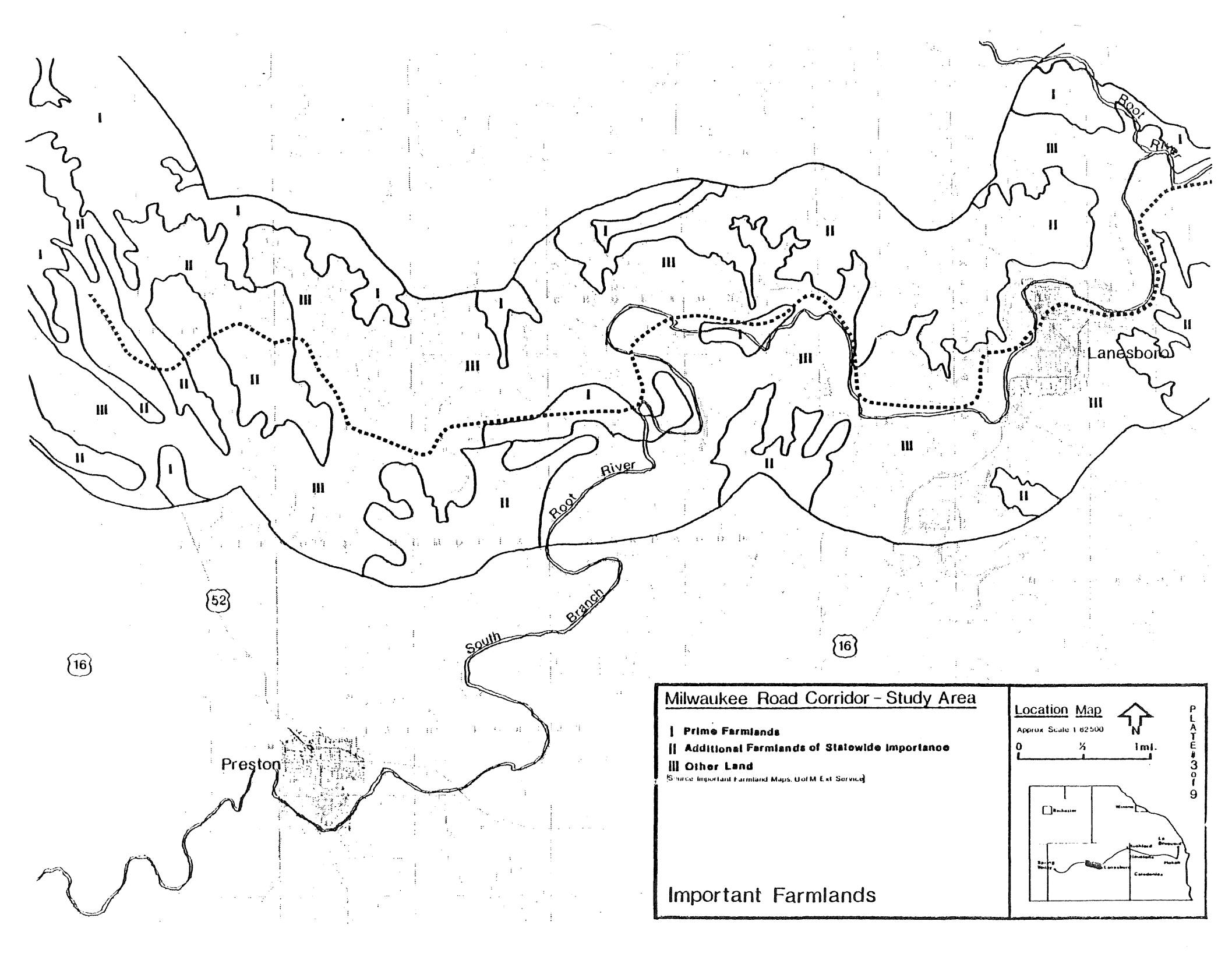
Approx Scale 1 62500

N

0 ½ 1 mi.

PLATE #2019

Important Farmlands



Milwaukee Road Corridor - Study Area

I Prime Farmlands

II Additional Farmlands of Statewide Importance

III Other Land

(Source: Important Farmland Maps, U of M Ext Service)

Important Farmlands

Location Map

Approx. Scale 1:62500

N

0 ½ 1 mi.

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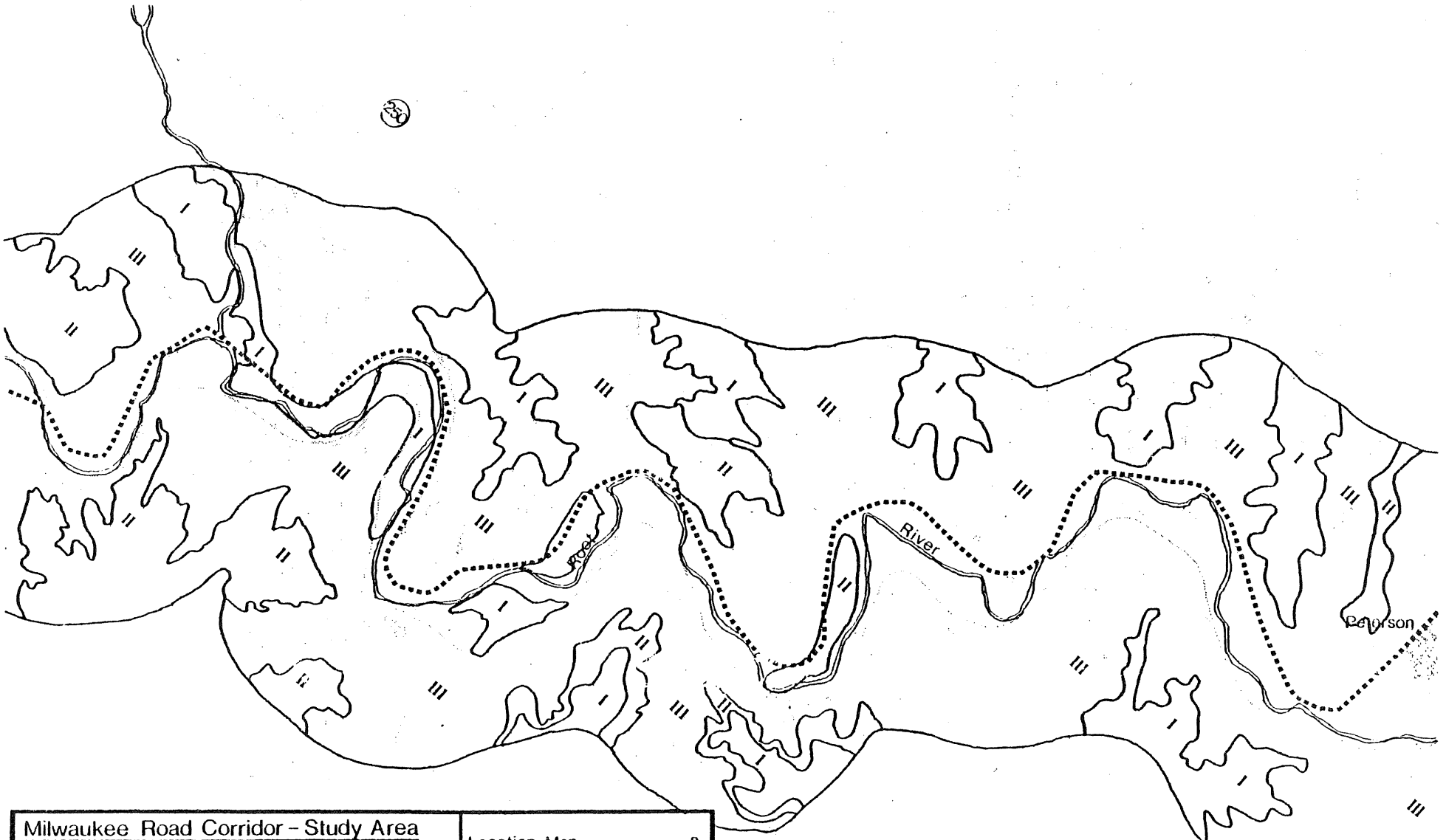


Milwaukee Road Corridor - Study Area

I **Prime Farmlands**

II **Additional Farmlands of Statewide Importance**

III **Other Land**

(Source: Important Farmland Maps, UofM Ext Service)

Location Map

Approx Scale 1:62500

0 ½ 1 mi.

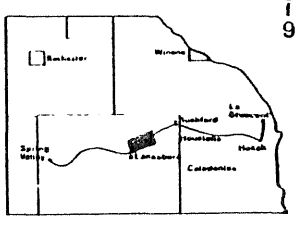


PLATE 4 of 9

Important Farmlands

Milwaukee Road Corridor - Study Area

I Prime Farmlands

II Additional Farmlands of Statewide Importance

III Other Land

Source Important Farmland Maps, U of M Ext Service

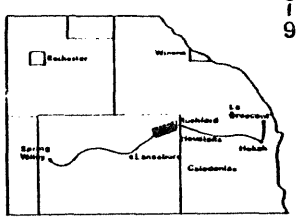
Important Farmlands

Location Map

Approx Scale 1 62500

N

0 ½ 1 mi.



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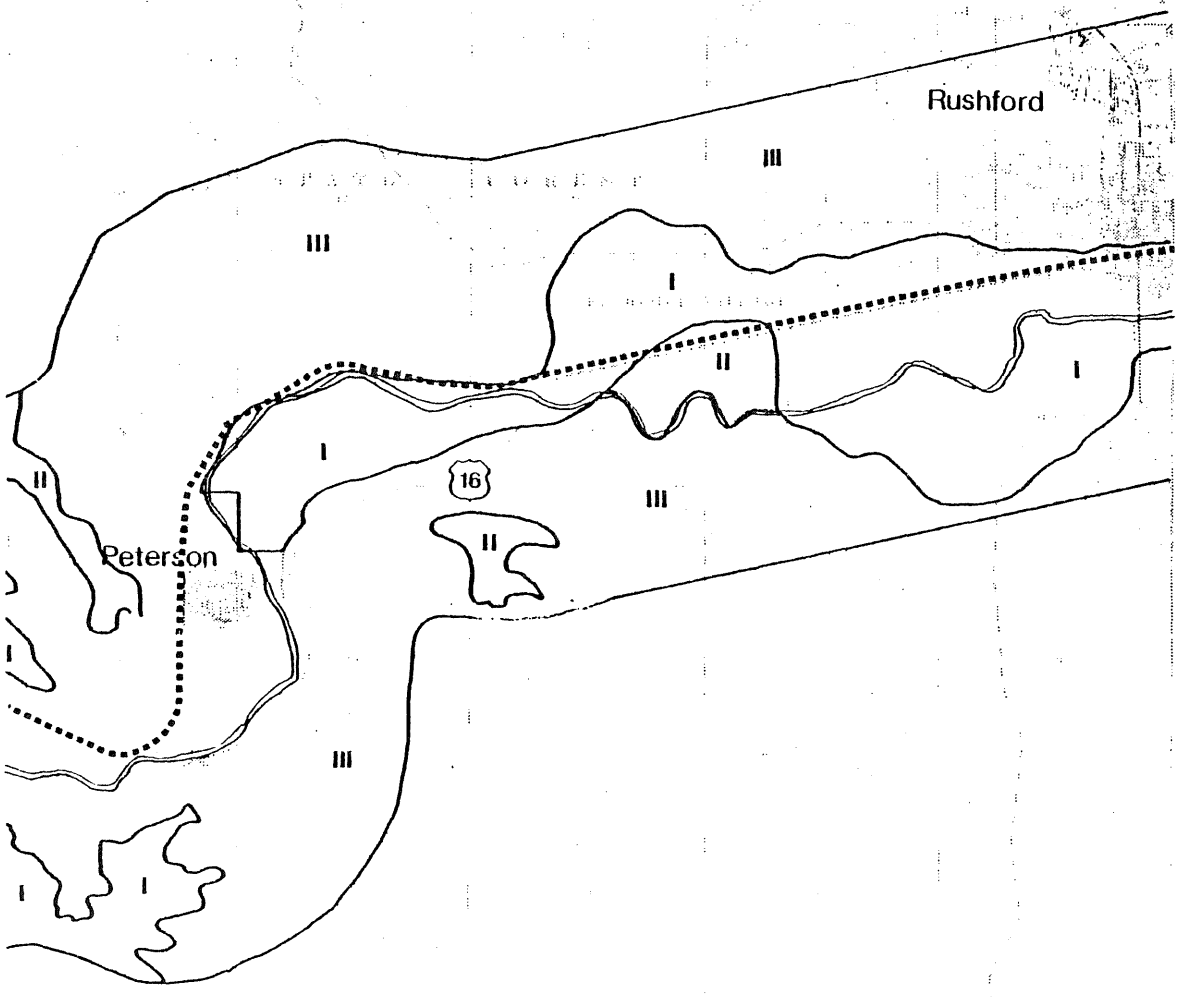

Milwaukee Road Corridor – Study Area

I Prime Farmlands

II Additional Farmlands of Statewide Importance

III Other Land

[Source Important Farmland Maps, U.S.D.A. Soil Conservation Service]

Important Farmlands

Location Map

Approx. Scale 1:62500

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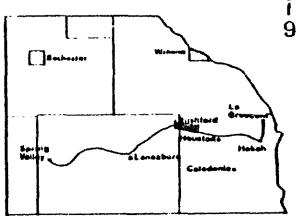

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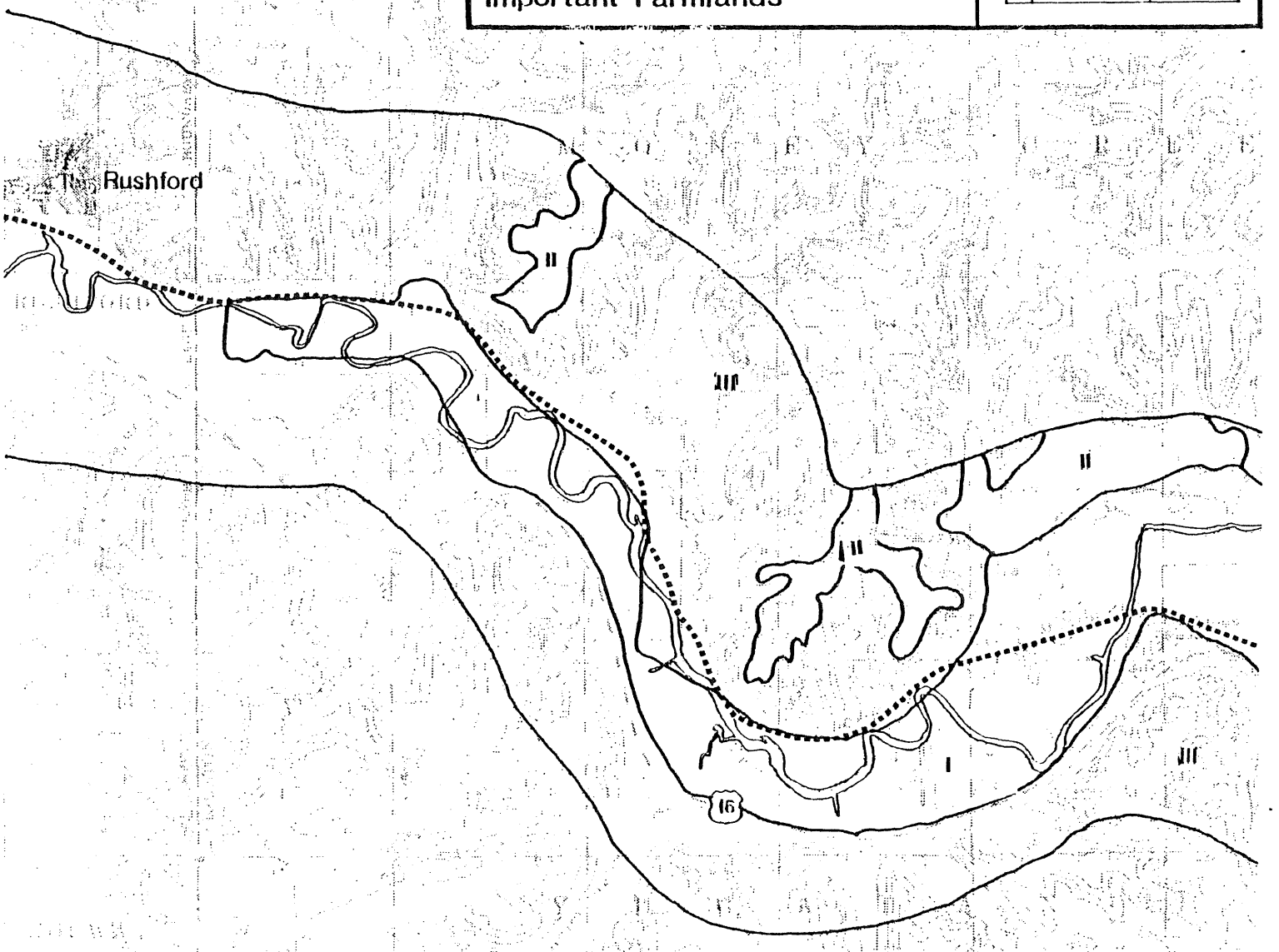


Milwaukee Road Corridor – Study Area

I **Prime Farmlands**
II **Additional Farmlands of Statewide Importance**
III **Other Land**
(Source Important Farmland Maps, U of M Ext Service)

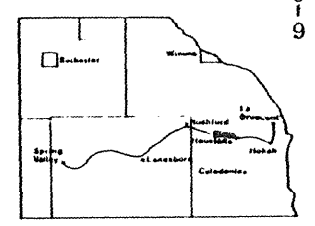
Important Farmlands

Location Map

Approx Scale 1:62500

N

0 ½ 1mi.



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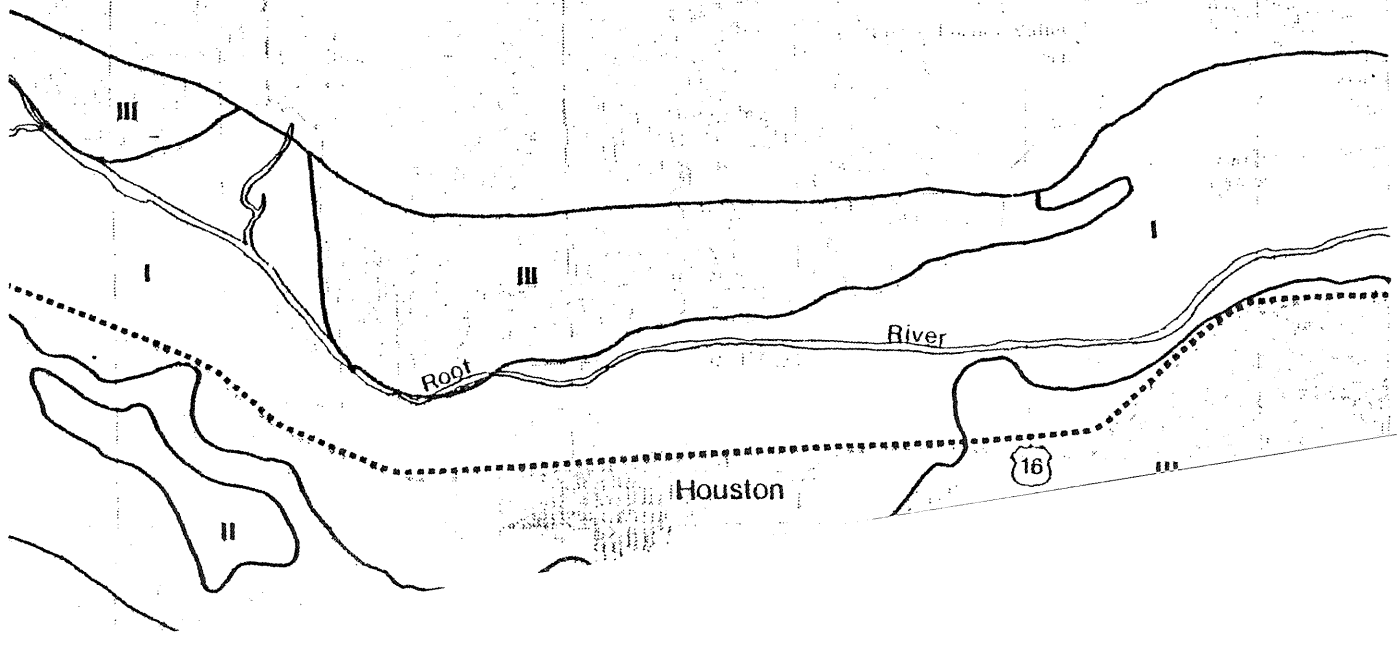


Milwaukee Road Corridor – Study Area

I **Prime Farmlands**
II **Additional Farmlands of Statewide Importance**
III **Other Land**
[Source: Important Farmland Maps, U of M Ext Service]

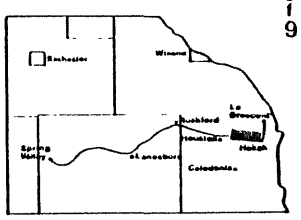
Important Farmlands

Location Map

Approx Scale 1:62500

N

0 ½ 1 mi.



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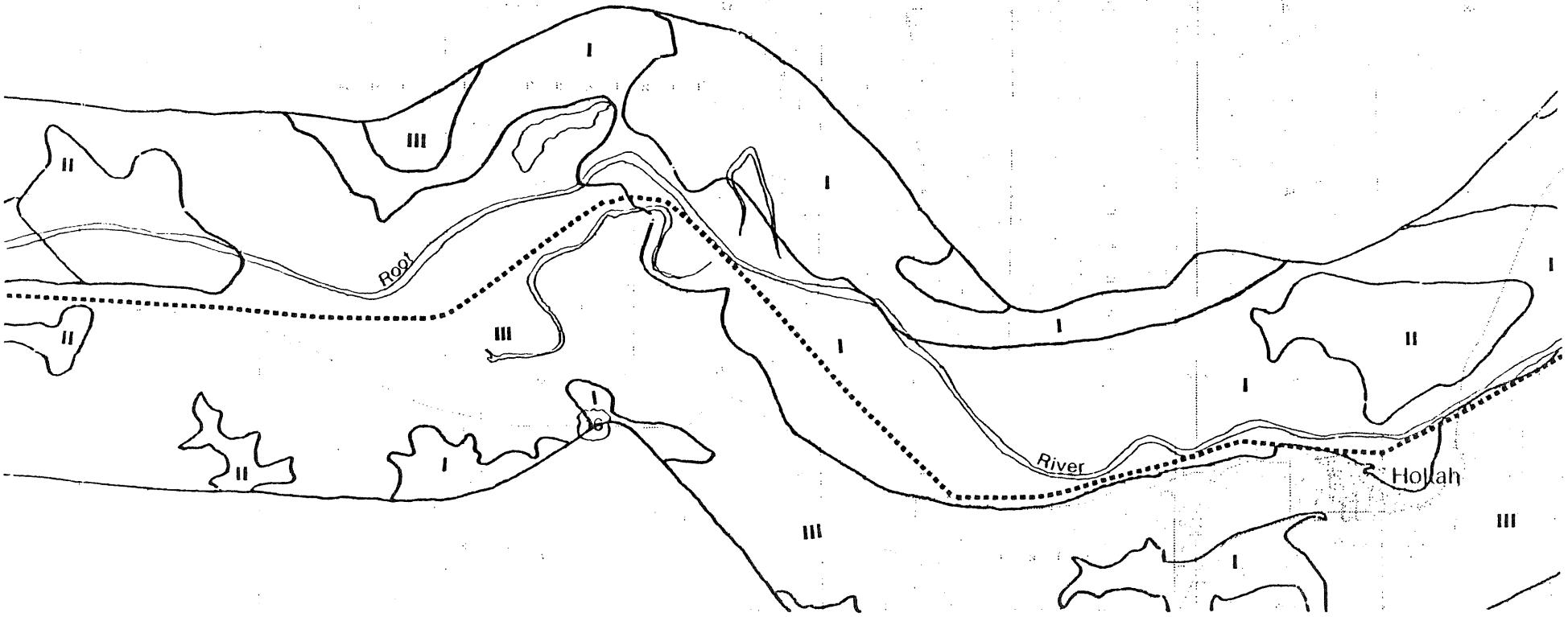

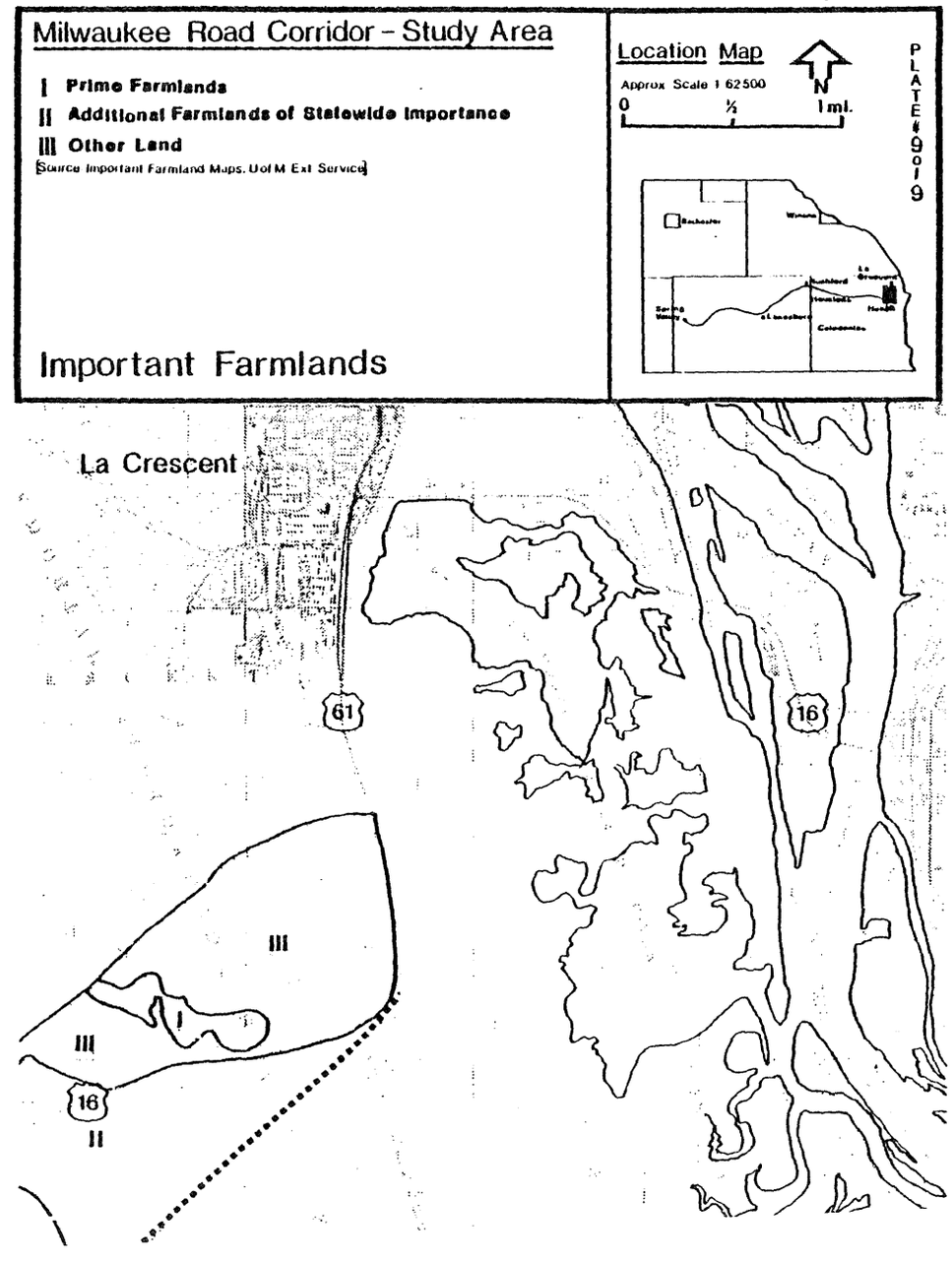
Milwaukee Road Corridor - Study Area
I Prime Farmlands
II Additional Farmlands of Statewide Importance
III Other Land
Source Important Farmland Maps. U of M Ext Service
Location Map
Approx Scale 1 62500
0 ½ 1 mi.
N
PLATE #9019
Important Farmlands
La Crescent
61
16
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II

the capability to be highly productive. The amount of ROW contiguous to additional farmlands of statewide importance totaled 5 miles, or 60 acres, or 7.7% of the total ROW land outside of the city limits.

The remainder of the land does not qualify in one of the previous categories, primarily because of steep slopes or persistent wetness. It has serious limitations to production. The amount of ROW contiguous to the remainder of the land totaled approximately 26 miles or 312 acres, or 40.3 percent of the total land outside of the city limits.

TABLE 3

Percentage Distribution of Abandoned Milwaukee Road ROW in Soil Conservation Service Land Classifications

ROW Segments	Prime	Important	Other	Total
Spring Valley to Wycoff	95.5%	4.5%	--	100.0%
Wycoff to Fountain	97.9	2.1	--	100.0
Fountain to Lanesboro	10.5	21.1	68.4	100.0
Lanesboro to Whalan	28.6	--	71.4	100.0
Whalan to Peterson	3.4	6.9	89.7	100.0
Peterson to Rushford	50.0	0	50.0	100.0
Rushford to Houston	79.0	0	21.0	100.0
Houston to Hokah	61.7	0	38.3	100.0
Hokah to La Crescent Junction	40.0	60.0	0	100.0
TOTAL PERCENTAGES	52.0%	7.7%	40.3%	100.0%

Conclusions and Recommendations

We have seen from the statewide analysis that southern and western Minnesota generally contain the state's most productive soils based solely on inherent soil characteristics. We have also seen that southeastern Minnesota in general has a favorable combination of average annual precipitation and growing degree days. When these two factors are merged, we find that south-central Minnesota has the most productive agricultural lands in the state. Finally, from the maps, it is obvious that soil conditions vary a great deal. This is particularly true in southeastern Minnesota which is unglaciated. When the Milwaukee Road ROW itself is considered, we find that roughly 60% of the total ROW adjoins either prime or additional lands of state importance. The remaining 40% falls into an "other" category. Table 3 showed that a great deal of the prime land could be avoided by only developing to the east of Fountain.

What about the trail consideration then? Prime farmlands should be avoided where possible. Assuming a need for a recreational trail, the best area for an agricultural productivity point of view appears to be from Fountain to Rushford. If this stretch were chosen approximately 17.7% would be prime, 10.2% would be additional farmland of statewide interest, and finally 72.1% would be other.