

DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY

Environmental maps to municipal governments - Evaluation
of response to a communication strategy used in Allegheny
County, Pennsylvania

by

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Environmental maps to municipal governments--
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Abstract

The Greater Pittsburgh Regional Studies project was created for the chief purpose of preparing and disseminating geological and hydrological information useful to land-use and resource decision making. Dissemination of information was made difficult and complex by the fact that in Pennsylvania land-use control is largely by zoning, and zoning is a function of individual municipalities, rather than counties or the state. In the six counties of the Greater Pittsburgh Region, there are more than 400 such cities, boroughs, and townships, and the problem was how to insert information into the decision-making processes of these many units. Limited staff and funding defined the information-dissemination method. Environmental maps and reports were mailed unsolicited directly to municipalities, without personal contact. The present study was designed to evaluate the effectiveness of this dissemination strategy, but the results of the study also provide insight to the impact of the maps on municipal decision making and the effectiveness with which categories of municipalities respond to environmental problems.

The evaluation is based on a particular set of maps that concerned only Allegheny County. A random selection of 48 of the 129 municipalities in the county were investigated, and interviews with personnel of these municipalities were made in the field.

The chief conclusions reached are:

- (1) The direct-mailing strategy is conditionally successful. Maps largely were distributed internally by municipal secretaries to personnel interested in land use, chiefly managers, mayors, and engineers. In some municipalities, the maps were used consistently, but in most, use was sporadic.
- (2) Municipalities with more consistent map use and concern in matters of their environment generally were those with areas greater than 3 square miles and (or) 1970 populations greater than 10,000. Exclusive of the City of Pittsburgh, such municipalities are only 58 of the 129 municipalities in Allegheny County, but include more than 90 percent of the area and 70 percent of population outside the city. The direct-mailing strategy to all 129 municipalities therefore appears wasteful. Mailings restricted to the 58 and the City probably would have had essentially the same effect as the broadcast mailings.
- (3) Though smaller municipalities are less likely to make effective use of maps received by mail, there are a number of exceptions in the county.
- (4) Categories of effective users defined in this evaluation probably can be applied, with care, to the other counties in the Greater Pittsburgh region and elsewhere in Pennsylvania.
- (5) Direct personal contact with municipal personnel during this evaluation often furthered internal distribution and probably increased the future effectiveness of map use by those administrators and engineers interviewed.

- (6) This demonstrates that personal contact need not be by the geologists and hydrologists who prepared the maps. The liaison function can be performed by planners with additional environmental training, or by other qualified "map translators".
 - (7) If personal contact is not generally applicable, maps should be mailed directly to municipal administrators and technical consultants, to extend use of materials and to overcome internal barriers to the flow of information that are evident in many municipalities.
 - (8) At the municipal level, there is much interest in seminars or workshops for discussion of map products and for education in the implementation of their information.
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Introduction

Between 1971 and 1976, the Greater Pittsburgh Regional Studies (GPRS), an experimental series of investigations of environmental geology and hydrology, were conducted by the U.S. Geological Survey (USGS) in the southwestern Pennsylvania counties of Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland (fig. 1), an area totalling about 4,500 square miles. The investigations included important contributions by the Pennsylvania Bureau of Topographic and Geologic Survey, support and advice from the Appalachian Regional Commission (ARC), and cooperation by the Southwestern Pennsylvania Regional Planning Commission (SPRPC).

The initial purpose of GPRS was an intensive, relatively short-term effort to: (1) gather, compile, and correlate existing information on the geology and hydrology; (2) identify inadequacies in the information framework and rectify those inadequacies amenable to short-term effort; (3) utilize this basic information to prepare maps and reports useful to land, water, and mineral resource planning by a spectrum of potential users, ranging from those with relevant technical training to those without technical background and orientation; and (4) disseminate the derivative information of the maps and reports to potential users by the most effective means available.

About 150 maps and reports were prepared and were distributed by the only means consistent with limited staff and funding, unsolicited direct mailing to potential users. The mailing list included several categories of potential users, which for present purposes largely can be grouped into three: (1) a technical user group, chiefly geologists and engineers in private and public employment; (2) planners, decision-makers, and others with Federal, State, and County governments and the SPRPC; and (3) municipal governments.

Because GPRS staff were in frequent contact with representative persons in the first two groups through meetings, conferences, and less formal communications, the general responses of the groups to the direct-mailing strategy soon became known; it was largely favorable.

However, reactions of most of the third group, municipal governments, on receipt of maps and reports remained unknown, for responses or acknowledgements were few. In the 6 counties of the Greater Pittsburgh region there are 412 municipalities, 129 in Allegheny County alone, so it was impossible to investigate adequately the reactions

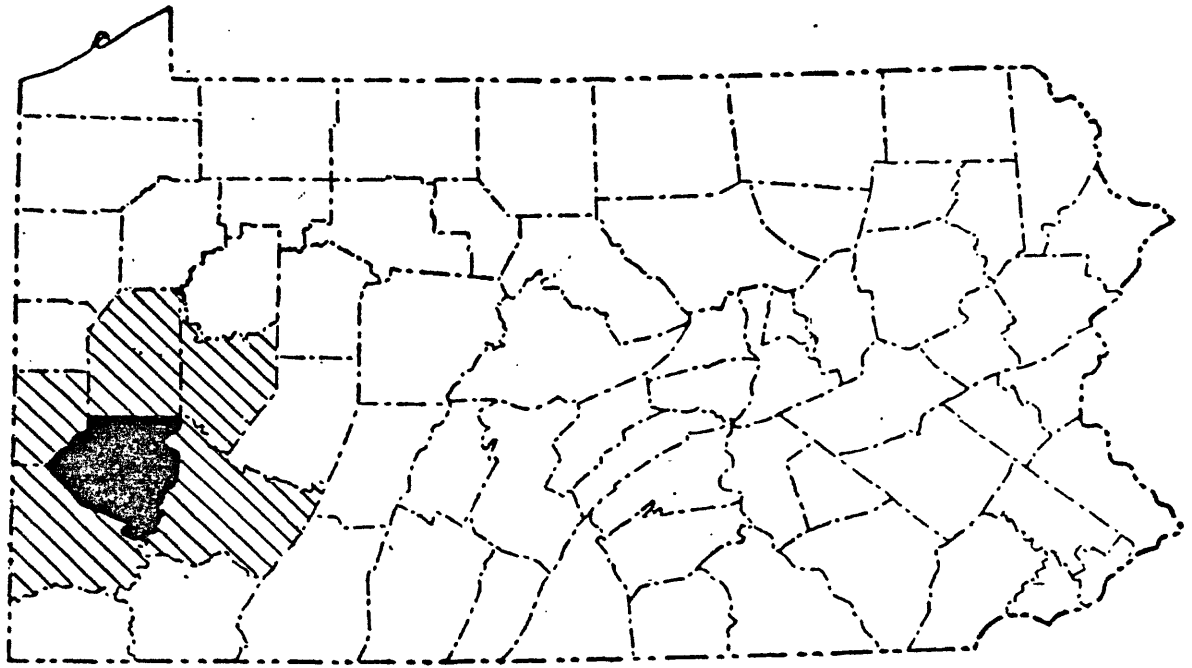


Figure 1.--County outline map of Pennsylvania showing location of Greater Pittsburgh region. Diagonal lines--clockwise from north, Butler, Armstrong, Westmoreland, Washington, and Beaver Counties; black -- Allegheny County.

of all individual municipalities. This present study therefore was designed to sample and evaluate effectiveness of the direct-mailing information-dissemination strategy relative to municipal government.

It is the purpose of this report to describe the results of the study. Only those GPRS maps relative directly to this evaluation are described and no attempt is made to evaluate the maps themselves or GPRS as a whole. The study focused on Allegheny County municipalities only.

Previous work and acknowledgements

Under the sponsorship of the ARC, during 1973 and 1974 Peter Wissel, Robert O'Connor, and Beverly Cigler (1976) of the Center for the Study of Environmental Policy of the Pennsylvania State University (CSEP) studied the perceptions and attitudes of municipal decision makers and others in the Greater Pittsburgh region, relative to geological and hydrological information.

The CSEP methodology included preparation of questionnaires for use during personal interviews, testing of the questionnaires in areas adjacent to the region, selection of a sample of those with whom interviews were requested, interviewing personally those selected, and analyzing the results of the interviews. Structured personal interviews were conducted with 109 elected municipal and county officials and 44 governmental and consulting planners, and interviewed less formally were 50 governmental administrators and technical persons. Each personal interview had the potential results of more than 500 pieces of information, so the questionnaires were designed for manipulation by computer.

Less complex questionnaires asking for information on land-use priorities and land regulations also were prepared by CSEP and were distributed by mail in the spring of 1974. Of 417 questionnaires mailed (411 to cities, boroughs, and townships and 6 to counties), 251 were completed and returned. The questionnaires included 12 items of environmental concern to be ranked for local priority by the municipal engineer:

- Slope stability and landslides
- Mineral resources (coal, sand and gravel, oil and gas, limestone, etc.)
- Problems from deep mining, including subsidence
- Problems from surface mining
- Suitability of land for specific purposes
- Soil Thickness and characteristics
- Chemical Characteristics of rocks and soils
- Availability of water
- Quality of water
- Floods
- Effects of ground water on slopes, soil characteristics
- Disposal of liquid and solid wastes.

At the time of preparation for the present evaluation (1975) the report of the CSEP study was not in final form, but the CSEP investigators kindly sent us a copy of their draft.

Additional background information was freely made available to us by the Department of Planning and Development, County of Allegheny (ACDPD), largely through Frank Bunda, William C. Morrison, and William R. Adams, Jr. Included were lists of ordinances in force in the municipalities and lists of municipal personnel.

Without the insights supplied by CSEP and the factual information on local conditions and capabilities from ACDPD, much of our effort surely would have been dissipated without adequate return.

In the preparation for this evaluation many other persons also contributed ideas and information, too many to cite and thank all individually. However, particularly helpful were the contributions of Robert M. Beall and Pauline F. Silsley, U.S. Geological Survey; Harry F. Ferguson, Corps of Engineers, U.S. Army, and Jonathan Green, Green International, Inc.

Persons in municipal government gave freely of their time for interviews by the senior author. Because anonymity of those interviewed is desirable, they also are not cited, but their cooperation is gratefully acknowledged. Two persons, both geologists, however deserve special thanks: Robert M. Freas, Dravo Corporation and member of the Planning Commission, Borough of Bethel Park; and Derek B. Tatlock, The Peoples Natural Gas Company and member of the Planning Commission, Township of McCandless.

The significance of municipal governments and the communication problem

In Pennsylvania, the principal method of land-use control is zoning, which may be described as the official determination that specific parcels of land are restricted to certain development purposes, such as industrial, commercial, and residential, and a variety of sub-variants of such categories, for example, single-family versus multi-family residential. All of Pennsylvania is subdivided into incorporated civil divisions, municipalities with legally recognized boundaries (except for a small part of one county in the northwestern part of the State), and the power to zone land resides with these individual cities, boroughs, and townships.

In contrast, counties and the State control land use only in areas to which they have title or otherwise act as proprietors, such as in parks and forest preserves. If environmental scientists wish their maps and reports to be considered during significant land-use decision making, it therefore is the municipal level that must be reached. Insertion of environmental maps and reports at State, regional, or county planning levels carries no assurance that any such information will eventually reach and influence land-use decisions of municipal governments, a discouraging conclusion reached early on by GPRS personnel and confirmed by the CSEP study (Wissel and others, 1976, p. 7-10).

General characteristics of Allegheny County Municipalities

Exclusive of counties, which are not considered municipalities for the purpose of the present discussion, there are six municipal classes in Pennsylvania. Philadelphia in the southeastern part of the state is the only city of the 1st class, and Pittsburgh is one of only two cities of the 2d class. All other municipalities incorporated as cities are of the 3d class, and in Allegheny County there are 3: Clairton, Duquesne, and McKeesport. Boroughs, the most numerous class of municipality in the County, total 81, not including 2 that are only partly within the county. The remaining two classes are townships of the 1st class, 26 in Allegheny County, and townships of the 2d class, 16 in the county.

Table 1. Allegheny County municipalities grouped into sample sets by ranges in area and population

1. Set number	2. Area range (square miles) Population range (1970 census)	3. Municipalities (alphabetically by Municipal class)	4. Municipalities in set Municipalities in sample
I.	less than 1 1,000 to 5,000	Boroughs (23): Aspinwall Ben Avon Blawnox Breckenridge Chalfant Cheswick Dravosburg East McKeesport East Pittsburgh Elizabeth Emaworth Heidelberg Ingram Leetsdale Oakdale Pitcairn Rankin Verona Versailles Wall West Homestead Whitaker Wilmerding Townships of the 1st class (1): Baldwin	24 5
II.	less than 1 5,000 to 20,000	Boroughs (10): Avalon Braddock Dormont Edgewood Etna Homestead Millvale Mt. Oliver Sharpsburg Springdale	10 4
III.	less than 1 to 5 less than 1,000	Boroughs (9): Ben Avon Heights Bradford Woods Glenfield Haysville Osborna Rosslyn Farms Sewickley Hills Thornburg West Elizabeth Townships of the 1st class (2): Aleppo South Versailles	11 3
IV.	1 to 5 1,000 to 5,000	Boroughs (5): Braddock Hills Churchill Edgeworth Liberty Lincoln Townships of the 1st class (6): Crescent East Deer Leet Neville Reserve Springdale Township of the 2d class (1): Kilbuck	12 4
V.	1 to 5 5,000 to 10,000	Boroughs (12): Bridgeville Coraopolis Crafton Forest Hills Glassport Green Tree Oakmont Port Vue Sewickley Tarentum Turtle Creek West View Township of the 1st class (1): Wilkins	13 6
VI.	1 to 5 10,000 to 20,000	Cities of the 3d class (2): Clairton Duquesne Boroughs (10): Bellevue Brentwood Carnegie Castle Shannon McKees Rocks Munhall North Braddock Pleasant Hills Swissvale Whitehall Township of the 1st class (1): Stowe	13 4
VII.	1 to 10 more than 20,000	City of the 3d class (1): McKeesport Boroughs (2): Baldwin Wilkinsburg Townships of the 1st class (2): Mt. Lebanon Scott	5 3
VIII.	5 to 10 less than 1,000 to 5,000	Boroughs (3): Bell Acres Fox Chapel Sewickley Heights Townships of the 2d class (3): Frazer Ohio Harmer	6 4
IX.	5 to 10 5,000 to 10,000	Borough (1): White Oak Townships of the 1st class (2): Kennedy O'Hara Township of the 2d class (1): South Park	4 2
X.	5 to 10 10,000 to 20,000	Townships of the 1st class (3): Harrison North Versailles Upper St. Clair	3 2
XI.	10 to 20 1,000 to 5,000	Townships of the 2d class (4): Pawn Forward Marshall Pine	4 1
XII.	10 to 20 5,000 to 10,000	Boroughs (2): Franklin Park Jefferson Township of the 1st class (1): Collier Townships of the 2d class (2): Indiana Richland	5 2
XIII.	10 to 20 10,000 to 20,000	Townships of the 1st class (2): Elizabeth Robinson Township of the 2d class (1): Hampton	3 2
XIV.	10 to 20 more than 20,000	Boroughs (3): Bethel Park Monroeville West Mifflin Townships of the 1st class (4): McCandless Penn Hills Ross Shaler	7 3
XV.	more than 20 1,000 to 10,000	Township of the 1st class (1): South Fayette Townships of the 2d class (2): Findlay North Fayette	3 1
XVI.	more than 20 more than 10,000	Borough (1): Plum Townships of the 2d class (2): Moon West Deer	3 2

1. Does not include City of Pittsburgh and Boroughs of McDonald and Trafford.

Totals 126
48

Each municipal class had a different elected governmental composition until recently, but changes in municipal charters have resulted in new governmental composition for some municipalities.

Some less populous municipalities with deficient tax bases have no full-time government. According to ACDPD (written commun., 1975), 98 municipalities in Allegheny County (all the cities, 57 boroughs, 24 townships of the 1st class, and 13 townships of the 2d class) have at least one full-time administrator, whereas 29 (24 boroughs, 2 townships of the 1st class, and 3 townships of the 2d class) are administered only on a part-time basis, largely by their unpaid or partly paid elected officials.

Historically, cities in the county were relatively large and boroughs were smaller centers of population, and cities and boroughs mostly were separated by areas with lower density of population that were incorporated as townships. During the present century, suburban development, boundary changes by annexation and subdivision, and other factors have blurred somewhat these area and population distinctions between municipal classes, but many municipalities still fit this general mold. Municipalities grouped by area and 1970 population in table 1 show that the 3 cities of the 3d class are less than 10 square miles in area and all have more than 10,000 population. Sixty-nine of 81 boroughs are less than 5 square miles in area, and 59 of 81 are less than 10,000 in population. Townships of the 1st class in general are moderately large in area (13 of 26 are more than 10 square miles and all but 1 are less than 20 square miles) and population (12 of 26 have more than 10,000 people), and townships of the 2d class generally are larger in area (11 of 16 are more than 10 square miles and 4 are more than 20 square miles) but smaller in population (13 of 16 have fewer than 10,000 people).

In contrast, the City of Pittsburgh encompasses 55.1 square miles and in 1970 had a population of about 520,000, both the largest area and the greatest population in the county. The second most populous municipality is a township of the 1st class, Penn Hills, with about 63,000 people in 19.0 square miles. In 1970, there were 13 municipalities with populations in excess of 20,000, and these illustrate the blurring of distinctions between municipal classes: 2 cities (Pittsburgh and McKeesport) 6 boroughs; and 5 townships of the 1st class. The total population of Allegheny County in 1970 was about 1,605,000 and its total area is 728 square miles.

The basis of the evaluation

During 1974, maps of susceptibility to landsliding and land modified by man were prepared for Allegheny County (fig. 1) by the USGS in cooperation with the ARC, under the general direction of the second author of the present report. The maps were at the scale of 1:24,000 (1 inch equals 2,000 feet; 1 centimeter equals 240 meters) and were prepared on the 7½-minute quadrangle format. Copies of the maps that contained each Allegheny County municipality were assembled into municipal sets, along with quadrangle maps of flood-prone areas prepared by the USGS in cooperation with Federal Insurance Administration. The sets were enclosed in open-top covering envelopes that identified the maps as products of GPRS, envelopes of the same style that had been used to enclose GPRS maps and reports distributed earlier.

In conformance with the direct-mailing dissemination strategy adopted earlier, in October and December 1974 the packaged sets of maps were mailed to the secretaries (by title only) of each municipality in the county, accompanied by a memorandum from the Project Director-GPRS to "Municipal planners and engineers, Allegheny County" with the following general content, here somewhat abbreviated:

Under the sponsorship of the Appalachian Regional Commission, U.S. Geological Survey personnel have prepared maps showing landslides and relative susceptibility to landsliding of all of Allegheny County. The map or maps covering your community are enclosed. Also prepared were maps of man-modified land. Where recognizable on aerial photographs taken in 1973, mining-related and other features are shown no matter when the features were created. Developmental features shown, such as housing developments, largely are those that have been made between 1969 and 1973. Maps of flood-prone areas show occasionally flooded areas largely along streams with upstream drainage areas of 25 square miles or more. Floods obviously occur along streams with drainage areas less than 25 square miles, so the absence of areas designated as flood prone along lesser streams on the maps does not necessarily mean that there is no potential flood hazard. More detailed flood information on mainstem rivers and some tributaries is available from: U.S. Army Corps of Engineers, Pittsburgh District.

It was recognized that these maps might have particular appeal at the municipal level, owing to relatively large map scale and to the orientation provided by the packaging of the maps into municipal sets. They thus appeared a most suitable focus for an investigation of municipal reactions to the receipt of maps and reports. In brief, it was proposed to find out what happened to the maps after they were received, with whom they finally reposed, and, if possible, what uses were made of them.

The subject maps are listed and examples are shown in Appendix I.

Methods of study

The method selected was a series of face-to-face interviews with those in municipal government, and almost all interviews were conducted during April-July 1975 by the first author alone. There were four basic parts to the work: (1) preparation of suitable questions to ask during interviews; (2) selection of the municipalities to be sampled by interview; (3) the interviews themselves; and (4) analysis of results.

The rationale and content of the questionnaire developed are discussed in Appendix II. The maps that were the basis for the evaluation concerned only Allegheny County, automatically limiting geographic scope. Time forbade treatment of all or even most of the 129 municipalities of the county, so it was concluded to develop a priority list of the Allegheny County municipalities, then work down the list within the time available. Based on the sample sets shown in table 1, the priority list was established as described in Appendix III, and the first 48 municipalities of the list ultimately were contacted. Interview methodology and guidelines are discussed in Appendix IV.

Results

Limitations.--It is likely that the results treated in the following discussion contain some inadvertent and unrecognized distortions, mostly as results of limitations common to most surveys using interview techniques. Chief sources of distortions may be:

- (1) Questions may have been misunderstood by some persons interviewed, and some responses may have been misunderstood by the interviewer, perhaps largely owing to individual differences in meanings of words or phrases.

- (2) Some results necessarily are based on summary impressions rather than on direct and firm responses, and impressions may be influenced by subconscious bias.
- (3) There is a tendency for persons interviewed to want to please by saying what the person believes the interviewer wants to hear.
- (4) Some interviewees may have pleaded no knowledge of environmental problems or may otherwise have biased their responses, fearing unfavorable comparison with neighboring municipalities.
- (5) The few municipalities sampled in some of the smaller sets (notably sample sets XI and XV) may not be representative of their sets.
- (6) Information gained from some municipalities was considered incomplete.
- (7) At the time of the study, the interviewer (the first author) was well versed in aspects of land-use planning and techniques for public contact. However, her training in geology was modest and her geological experience very limited. Had she been an experienced geologist she might have arrived at somewhat different perceptions relative to the capabilities of some municipal interviewees to apply the subject maps and other environmental information.

The following results and conclusions drawn therefrom should not therefore be considered precise. Rather, they are general guides to which there may be numbers of exceptions.

Types of contact.--We concluded that an unannounced visit to the municipal building or office was the best way to initiate contact, because it might be too easy for persons contacted first by telephone to misunderstand our purpose and so deny an interview or make an appointment too far ahead for our limited time. This approach was successful in most municipalities, but in some, municipal business is conducted at home and telephone calls were needed just to locate personnel. In others, municipal offices were closed, so telephone calls were required to learn office hours or set appointments.

All in all, 154 contacts were made with personnel of the 48 municipalities sampled, most contacts were in person (table 2, col. 3), and multiple personal contacts in an individual municipality commonly resulted in multiple interviews in that municipality. Numbers of post-interview telephone contacts were made to flesh out incomplete information or clarify responses.

Persons interviewed.--In most of the 48 municipalities, the first person contacted was the municipal secretary. Owing to differing and overlapping functions of personnel in different municipalities, the distinction between a secretary and a manager can be somewhat obscure, as was demonstrated by two cases current at the time of investigation: in one the secretary was being considered for appointment to the position of manager; in another, the secretary had requested a change in position title because of assignments and extent of duties. Where a municipal secretary, no matter the title, plainly had management powers, the first contact commonly developed into an interview (table 2, col. 4; table 3, col. 2).

Table 2.--Character of contacts and interviews, persons interviewed, and use of maps within municipalities.

[illegible]

- 1/ Some totals exceed 48 because of multiple contacts with single individuals and interviews with two persons in many municipalities; in two municipalities 3 persons were interviewed.
2/ Replacement maps were supplied to municipalities where maps had been misplaced.
3/ Total exceeds number of municipalities owing to multiple primary users.
4/ 77 (column 10) divided by 48 (column 2).
5/ No response from one municipality in Set III.

Table 3.--Persons interviewed, by municipal class.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	Secretary	Manager or Mayor	Councilman or Municipal Commissioner or Supervisor	Planning Commission Member	Public Works Supervisor	Engineer	Other	Totals	Percent of sample
Cities and Boroughs	19	12	6	2	2	7	1 Building Inspector	49	66%
1st Class Townships	7	3	1	1	1	2	1 Zoning Officer	16	22
2nd Class Townships	4	4	0	0	0	1	0	9	12
Totals	30	19	7	3	3	10	2	74	
Percent of sample:	41%	26%	9%	4%	4%	14%	3%		100%

Referrals from municipal secretaries for interviews with other municipal personnel were diverse (table 3). In cities and boroughs 37 percent (18 of 49) of the interviews were with mayors, managers, or members of Councils or boards. In townships, such representation was 28 percent (7 of 25). In townships of the 2d class, comprising only 12 percent of all interviews, 8 of 9 interviews were with municipal secretaries or managers.

There was a tendency for broader, more diverse referral for interviews in municipalities with relatively small areas such as in sample sets I through VI, than in those with larger areas, such as those in sets X through XVI (table 2, column 4). In the former, 11 managers or mayors were interviewed in a total of 42 interviews, and these represent 58 percent of all managers or mayors interviewed. By comparison, cities and boroughs have 12 (or 63 percent) of the managers or mayors interviewed, which parallelism doubtless reflects the fact that most of the municipalities in sets I through VI are boroughs or cities (table 1; table 3).

Managers and mayors together form the largest single category of persons interviewed, exclusive of municipal secretaries, because they either received the subject maps from the secretaries or were most concerned in land-use matters and therefore were the chief targets for referrals by the secretaries. This suggests that future mailings of environmental information might be addressed specifically to such persons. They are both users and internal disseminators of maps and other information, so they represent a communication link for potentially increased use at the municipal level.

Municipal engineers commonly are private consultants to the municipalities and accounted for 10 of the interviews (table 2, col. 4). However, in a majority of the municipalities sampled, we found that environmental information is not forwarded to engineers from municipal offices, because secretaries or administrators assume that the engineers have their own sources for such information.

One bias was introduced by the authors. Of the 3 planning commission members interviewed (table 3), 2 were professional geologists voluntarily serving their municipalities of residence. When their municipalities fell within the portion of the priority list to be sampled, the geologists were approached directly. Thus, in a sample of 48 municipalities only 1 planning commission member was interviewed as a result of a referral by a municipal secretary. Only one municipality of the 48 sampled has a professional planner; appointed just prior to the present evaluation, he was not interviewed.

Completeness of information from interviews.--Information from 38 of the 48 municipalities was considered wholly adequate for our purpose. Information from the 10 other municipalities (table 2, col. 5) ranged from marginally adequate downward to fragmentary in the one case in which it proved impossible to arrange an appointment for a personal interview (table 2, col. 3, sample set XV).

Disposition of and primary users of maps.--Personnel of all 48 municipalities acknowledged that the subject maps had been received, but the maps had been misplaced in 6 municipalities (table 2, col. 6) and had not been located at the time of last contact of this study. In 6 other municipalities, the maps were filed away (in one as too valuable to show anyone), in one the maps were "given away" to persons not identified, and in 4 the maps were shown to others, then filed. In 31 municipalities the maps were distributed by the secretary to others in the municipal government (table 2, col. 7). This internal distribution parallels the CSEP finding that items of a technical nature mostly will be passed on to the person(s) the secretary considers most suitable (Peter Wissel, oral commun., 1975).

Persons in municipal government who are the holders of the subject maps, or have ready access to them and who have used them at least once, are termed primary users for present purposes (table 2, col. 9), and the number of primary users is considered an indicator of frequency of map use. The mean number of primary users in municipalities in each sample set (table 2, col. 11) was plotted against 1970 population density (fig. 2), and the general field suggests that the potential number of primary users is greater in municipalities with lower population densities. Plots of primary users versus area, 1970 population, and 1960-70 population growth also were made. All were diffuse without strong trends; they are not included as illustrations.

In municipalities with smaller areas, represented by sample sets I through VI, 7 of 29, or 24 percent of primary users (table 2, cols. 9 and 10) are managers or mayors, in comparison to the remainder of the sets in which 9 of 48, or 19 percent, of primary users are managers or mayors. This difference may reflect the fact that many small-area municipalities operate under restricted budgets that may prevent hiring of technical expertise. The manager or mayor therefore becomes the primary resource for technical matters and perforce may lay claim to technical expertise that he may not actually possess. A similar managerial effect is evident in sample set VII, where 2 of 3 interviews were with managers or mayors (table 2, col. 4) and 2 of 3 primary users are also managers or mayors (cols. 9 and 10).

Although use of the maps by some municipalities was relatively frequent, it was largely internal. Only in 5 municipalities were the maps considered to be readily accessible to private citizens (table 2, col. 12).

Municipal awareness of environmental matters.--Questions were asked in an attempt to evaluate municipal awareness and concern (table 4). Reports of recent environmental problems range from less than the mean in sample sets I through V (col. 7) to more than the mean in sets X through XIV and XVI. To a degree this may reflect area, for the greater the area, the greater the potential for incidents of land-sliding and other problems. However, it also is believed a measure of ability and willingness, to recognize that there is a problem.

No strong relations are evident between groups of related sample sets and the presence of grading ordinances or perceptions of adequacy of ordinances and their enforcement (table 4, cols. 8-11), although there is a general tendency for more populous municipalities to have ordinances in force. Most grading ordinances were taken directly from a model ordinance prepared by the County government. The ordinance adopted by at least one municipality, however, contained provisions appreciably more stringent than did the model.

A hypothetical costly landslide was used to elicit response to the question of responsibility for environmental problems. Answers showed no strong relations among sets (table 4, cols. 12 and 13). Rather, responses seemed to be more influenced by personal background and political philosophy than by municipal setting. One strong result was that most municipalities did not assume general responsibility for repair, replacement, or restitution, even though municipal permits are required for development activities that commonly lead to environmental problems (table 4, col. 13). Not reflected in the table 4 data, however, is a trend toward at least some involvement in special cases. For example, two industrial municipalities are providing materials and labor to individual landowners lacking financial means for repair of damage owing to subsidence over abandoned mines.

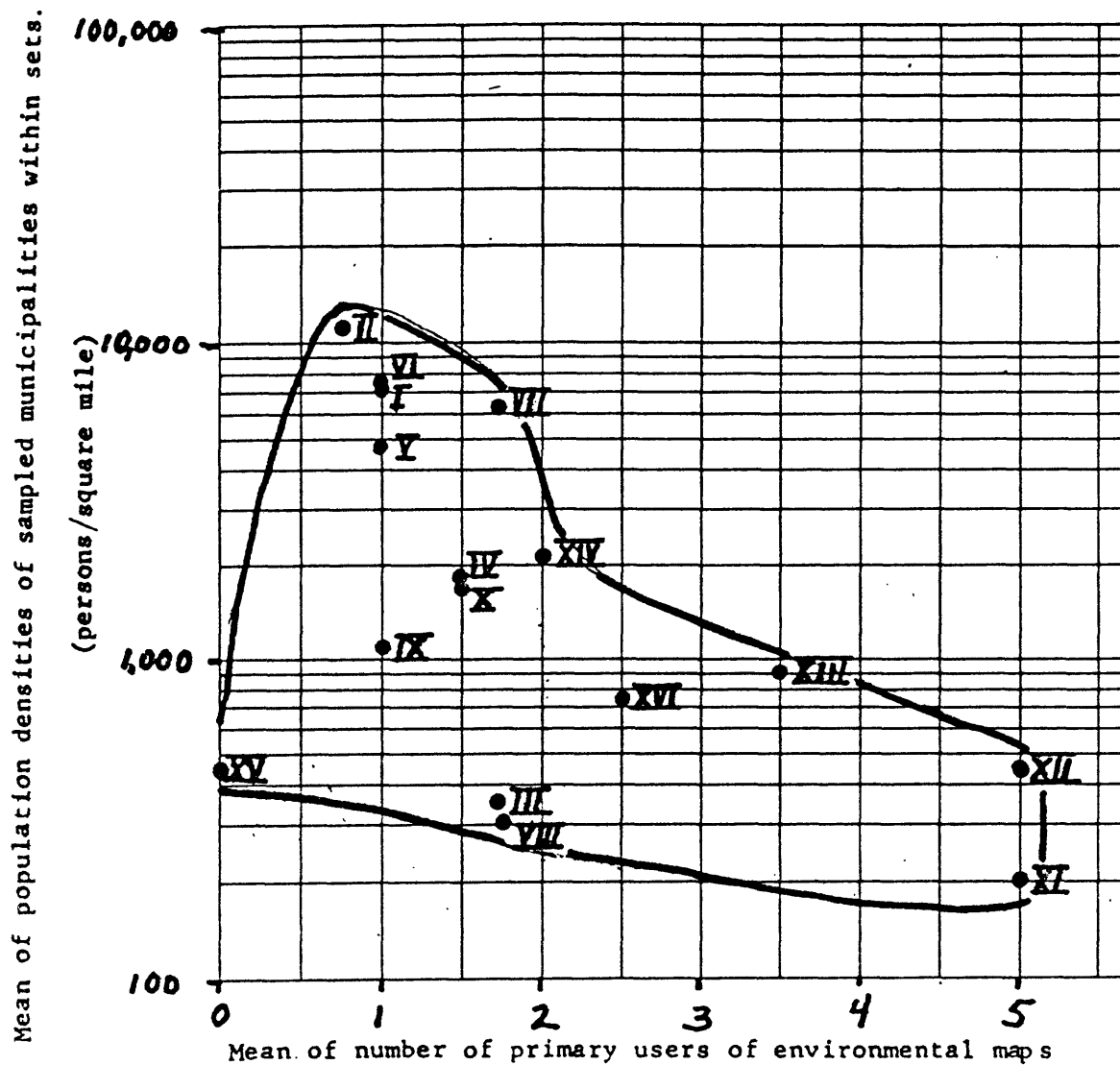


Figure 2.--Relation of 1970 population density (table 8, col. 6) to numbers of primary users of environmental maps (table 2, col. 11).

Table 4.--Recent environmental problems reported, grading ordinance evaluated, and responsibility perceived by interviewee; municipal involvement in environmental matters.

1.	Recent environmental problems (as related by interviewee)										Municipal grading ordinances				Responsibility for slope failures (as example of environmental problem)				Authors' assessment of municipal involvement in environmental matters.					16. Sample set (table 1)
	3. Landslides		4. Hydrological problems reported	5. Mining-related problems reported	6. Total environmental problems reported	7. Mean number reported per municipality	8. Adopted and in force?	9. Considered adequate?	10. Adequately enforced?	11. Amendment anticipated?	12. Does municipality consider where of responsibility lies?	13. Whose responsibility?		14. Percent of municipalities		15. Weighted totals								
	Reported causes	Total landslides reported										Other governmental units	Primarily land developer	2 years	5 years longer									
I	5	1	2	1	4	2	0	-	-	-	3	-	2	-	1	80	20	-	-	-	120	I		
II	4	1	-	1	4	2	1	-	-	1	2	-	2	-	1	50	25	25	-	-	-	100	II	
III	3	1	-	2	0	4	1	-	-	-	1	1	2	-	1	67	-	33	-	-	-	170	III	
IV	4	1	2	-	2	1	5	1	1	-	1	1	1	1	1	50	-	25	25	-	-	230	IV	
V	6	3	3	-	6	2	10	1	4	-	6	-	13	2	3	17	33	50	-	-	-	250	V	
VI	4	3	3	-	8	2	12	4	4	-	3	-	-	1	1	25	25	-	50	-	-	280	VI	
VII	3	1	2	1	5	2	1	8	2	1	1	2	-	1	1	-	-	67	33	-	-	330	VII	
VIII	4	2	-	-	3	1	1	5	1	1	1	-	-	1	-	25	25	25	25	-	-	250	VIII	
IX	2	2	-	-	2	0	1	3	1	1	1	2	-	(n.r.)	(n.r.)	-	50	-	-	50	50	350	IX	
X	2	1	1	1	3	0	1	4	2	1	1	-	-	1	-	50	-	-	-	-	-	300	X	
XI	1	1	1	-	1	1	0	2	2	(n.r.)	(n.r.)	-	-	-	-	-	-	-	100	-	-	400	XI	
XII	2	2	-	-	2	2	0	4	2	2	2	-	-	2	-	-	-	-	50	50	450	XII		
XIII	2	2	-	-	2	1	2	5	2	1	1	-	1	1	-	50	-	-	50	-	-	250	XIII	
XIV	3	3	2	-	8	1	1	10	3	3	3	-	3	-	2	-	33	-	33	33	370	XIV		
XV	1	(n.r.)	(n.r.)	(n.r.)	(n.r.)	(n.r.)	(n.r.)	(n.r.)	(n.r.)	(n.r.)	(n.r.)	-	(n.r.)	(n.r.)	(n.r.)	100	-	-	-	-	-	100	XV	
XVI	2	1	1	-	3	0	1	4	2	0	1	15	-	-	-	-	100	-	-	-	-	200	XVI	
Totals	48	25	17	4	55	20	14	89	27	20	2	12	4	4	27	3	9	12	9	2	4	8		
Means															30									

n.r.--no response or inadequate information.

1/ Causes not reported for all landslides reported.

2/ Incomplete responses in some sets.

3/ 89 (column 6) divided by 47 (48 $\sqrt{\text{column 2}}$ less 1
for unresponsive municipality in set XV).

4/ Includes an ordinance too new for objective response.

5/ Land developers responsibility for 5 years;
State responsibility thereafter.

6/ "2 to 5 years"

7/ Arrived at by multiplying indicated percentages by
column-head numbers, then summing the results to nearest 10.
Example in column 14, sample set I--
 $(80 \times 1) + (20 \times 2) = 120$.

The assessment of municipal involvement, willingness to respond, in environmental matters (table 4, cols. 14 and 15) is somewhat subjective because it is based on a general overview of responses in table 4. Weighted totals of sample sets I through V and XV and XVI are below the mean involvement rating for all sets, whereas all other sets are at the mean or above (table 4, col. 15). This suggests a tendency for increased involvement with increased area, at least up to a point. In addition, 4 of 7 sample sets that are above the mean involvement rating have populations greater than 10,000 and only 1 has a population less than 5,000, suggesting that larger populations in general may be indicative of greater environmental involvement.

Municipal acceptance of environmental maps and reports.-- Acceptance of the subject maps for various purposes is weighted in table 5, column 3. The basic question asked was "Have you used the maps for . . . ?". The requirement for establishing eligibility for the Federal Flood Insurance Program resulted in a high degree of acceptance for that purpose. Relatively strong acceptance for planning for susceptibility to landsliding and general engineering purposes also is indicated. However, these statistics may partly reflect recent well publicized incidents of landsliding.

Columns 4 and 5 of table 5 compare responses by sample set to total possible positive responses and result in the percentages of column 6. The overall acceptance mean is 52 percent. Low acceptance, less than the mean, probably reflects a variety of factors, in sets I, II, and IV: small area; areas largely built up in older communities; depressed economy; and high population density. Set III differs in that the municipalities in the random selection are low in density (mean, 350 persons per square mile) and modifications of land have not yet posed widespread problems, perhaps influencing some officials to a complacency detrimental to environmental planning.

On the other hand, there was a polarity of attitudes in set IX, a 2 municipality sample, where one municipal interviewee took an extremely negative position toward outside agencies and engineers, in fact, very likely against all non-residents, whereas the interviewee in the other municipality indicated general acceptance of the maps. Similarly, in set XIII, one municipality tends toward maximum involvement of technical expertise, whereas in the other, the zoning officer was quite aware that a coal company engaged in surface (strip) mining had placed a large sign near the site indicating that the earth moving was related to construction of a shopping center.

In some sample sets, for example, VII and XIII, acceptance of the maps (table 5, cols. 3 to 6) may appear incompatible with the numbers of primary users in the same sets (table 2, cols. 9, 10, and 11). However, this is largely because of the broad definition of primary user adopted herein.

Acceptance and use of maps other than the subject maps was not dealt with at length during the interviews. In general such acceptance appears to parallel acceptance of the subject maps (table 5, col. 7).

An attempt was made to find whether municipalities had external interests or relations beyond their boundaries, and the results were a mixture (table 5, col. 8). Bearing in mind the numbers of municipalities sampled in the various sets, individual interviewees indicating a regional interest are irregularly distributed throughout. However, some services formerly organized on municipal lines in many cases now are based on two or more municipalities, for example, school, judicial, water-supply and, less commonly, law-enforcement functions. A few larger municipalities have formed joint planning and development groups with their neighbors, and multi-municipal government leagues are a recent innovation.

Table 5.--Acceptance of maps, regional relations, interest in seminars.

1. Sample set (table 1)	2. Municipalities sampled	Acceptance of GPRS maps for municipal use.											7. Local maps at larger scale available	8. Regional interest indicated by official Municipality participates in multi- municipal organizations	9.		10. Sample set (table 1)				
		3. Flood Insurance Program eligibility Zoning purposes Engineering Purposes Subdivision planning and review Planned Unit Development or (PUD) planning for specific areas: Areas susceptible to landsliding Areas prone to flooding Areas modified by man General planning purposes	4. Total number of positive responses	5. Maximum possible number of positive responses	6. Percent (total number/maximum possible)	User of other USGS, SCS, etc. products Request for larger scale	Interest in area seminar on use of USGS products ^{1/}	Yes	No												
I	5	2	-	1	-	-	2	2	1	-	8	45	18	-	-	-	-	1	0	5	I
II	4	2	-	1	-	-	2	2	1	-	8	36	22	-	-	-	2	4	2	2	II
III	3	1	1	-	1	-	3	1	1	-	8	27	30	-	-	-	2	2	2	0	III
IV	4	2	1	3	1	2	1	1	1	1	13	36	36	1	1	-	2	1	1	3	IV
V	6	5	3	5	3	4	3	5	3	2	33	45	73	5	4	1	1	-	5	0	V
VI	4	4	1	3	1	1	3	3	2	1	19	36	53	3	2	-	2	3	3	1	VI
VII	3	3	3	3	3	3	3	3	3	3	27	27	100	2	1	-	1	1	3	0	VII
VIII	4	3	-	2	1	2	2	2	2	1	15	36	42	1	1	-	2	-	2	0	VIII
IX	2	1	-	1	-	1	1	1	1	-	6	18	33	1	1	-	-	-	1	1	IX
X	2	2	1	1	1	1	1	1	1	1	10	18	56	1	1	-	1	-	1	1	X
XI	1	1	1	1	1	1	1	1	1	1	9	9	100	1	1	-	1	1	1	0	XI
XII	2	2	2	2	2	2	2	2	2	2	18	18	100	2	2	1	2	2	1	1	XII
XIII	2	1	1	1	1	1	1	1	1	1	9	18	50	1	1	-	1	-	1	1	XIII
XIV	3	3	3	2	3	3	2	2	2	2	22	27	81	2	2	-	3	2	3	0	XIV
XV	1	-	-	-	-	-	-	-	-	-	0	9	0	-	-	-	-	-	0	0	XV
XVI	2	2	-	2	2	2	2	2	2	1	15	18	83	2	2	2	1	-	1	1	XVI
Totals	48	34	17	28	20	23	29	29	24	16	220	423	52	22	19	4	21	17	27	16	

1/ Totals ~~that~~ do not equal number of municipalities sampled, because some municipalities did not respond to this question.

Acceptance of the subject maps (table 5, col. 6) parallels outward-looking attitudes (col. 8) in larger more populous municipalities (sets XII and XIV most notable), whereas there is no strong parallelism in communities that generally are smaller in area.

An idea for enhancing use of environmental maps and reports at the municipal level is to conduct seminars or workshops to which representatives from municipalities would be invited. Responses relative to this possibility (table 5, col. 9) indicate that municipalities with relatively small areas and large populations in general are most positive to the suggested seminars. With the exception of the wholly positive responses from sets XI and XIV, municipalities relatively large in area yielded a mixture of responses, perhaps a reflection of greater technical capability; some may doubt that they would profit from such additional explanation or instruction.

Municipal receptivity to earth-science information.--Estimates of municipal receptivity to environmental information (table 6) are based in part on the information in preceding tables, but also are to some degree a result of impressions rather than firm responses. General level of interest overall was at the mean (table 6, col. 3), whereas below the mean were the overall predisposition toward use of earth-science information (col. 4) and estimate of past use of environmental maps (col. 6). Overall degree of map comprehension (col. 5) and the estimate of future map use (col. 7) were above the mean.

The last parameter, frequency of future use (table 6, col. 7) appears in conflict with past use (col. 6), but we believe this difference to be valid, reflecting one of the most interesting and perhaps valuable outgrowths of the present study. Briefly stated, if the geologists and hydrologists who produced environmental maps also made municipal contact, then their time would become entirely devoted to this task, owing to the large number of municipalities, thus making it impossible for them to prepare additional maps and reports. The experience of the present study shows that it would not be necessary for contacts to be made by those who prepared the maps. Rather, the fact that the first author, functioning as a map translator, appeared in person and discussed the subject maps knowledgeably may have no heightened interest and understanding that more general future use of the maps is predictable.

The trend toward increased use of maps following personal contact is reversed only in one set (set X), in which the individual interviewed in one municipality had used the subject map of flood-prone areas for insurance eligibility, but appeared disinclined to make use of the maps in the future.

The five factors are summarized in column 8 of table 6, which is labelled for present purposes "receptivity," here considered indicative of both willingness and capability to use earth-science information in environmental matters. In general, receptivity appears superior in municipalities with moderate to large areas and, with the exception of set XI, moderate to large populations.

Barriers to use of environmental maps.--When asked why maps were little used or had not been used, interviewees gave a variety of responses that fall into three broad categories detailed in table 7. In general, physical conditions appeared the most common barriers (col. 7), followed by, with decreasing influence, attitudes (col. 10) and institutional factors (col. 27). Physical conditions were perceived as barriers in municipalities with relatively high population density, as shown by high response percentages in sets I, II, V, and VII, but they were also important to some municipalities with lesser densities, such as in set VIII (col. 7). Attitudes as barriers (col. 19) appear to have no firm preferred trend, perhaps reflecting individual rather than municipal perceptions.

Table 7.--Perceptions of barriers to use of environmental maps.

1.	2.	Physical conditions					Attitudes												Institutional factors							Summary		30.	
		3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.		29.
Sample set (table 1)	Municipalities sampled	Large areas are public land, such as parks, highways, etc. Available land has severe known physical limitations Municipality is largely built up Total Percent✓					Maps & reports viewed as threat to land values and tax base Isolationist position or unique problems Distrust of federal, state, and county governments Priorities of greater concern, such as increasing tax base Lack of agreement regarding hazards Tradition of industrial or commercial emphasis Distrust of technical information No interested staff or decision maker identified Lack of foresight, often because of low population density Preference for local maps at larger scale Total Percent✓												Lack of funds or ineligibility for grants of funds Limited engineering assistance or technical staff Ineffective internal distribution channels Ill-advised leadership Economically depressed community, thus diminished capability Decreasing population, thus decreasing tax base Total Percent✓							Total Percent✓		Sample set (table 1)	
I	5	1	3	5	9	60	3	4	3	4	1	1	3	4	1	-	24	48	3	-	2	1	1	4	11	37	44	46	I
II	4	2	1	4	7	56	2	2	3	3	-	3	3	2	2	1	21	53	3	3	3	2	1	3	15	63	43	57	II
III	3	2	-	-	2	22	-	1	-	-	1	-	-	1	2	-	55	17	1	1	1	1	-	1	5	26	12	21	III
IV	4	2	4	2	8	68	1	4	-	3	1	3	1	1	1	-	15	38	1	-	1	1	1	1	5	21	28	37	IV
V	6	1	5	4	10	56	3	-	-	4	4	-	-	-	-	5	16	27	-	-	2	-	-	-	2	6	28	25	V
VI	4	1	1	2	4	32	2	2	1	3	1	2	2	1	1	1	16	40	1	1	2	1	-	3	8	33	28	37	VI
VII	3	2	3	2	7	77	2	-	-	3	1	1	1	-	-	3	11	37	1	-	2	-	2	2	7	29	25	44	VII
VIII	4	-	3	4	7	54	3	-	1	3	2	-	1	2	3	1	16	40	1	2	2	-	-	1	6	25	29	38	VIII
IX	2	1	2	2	5	83	-	1	-	1	-	-	1	-	-	1	4	20	-	-	-	-	-	-	0	0	9	24	IX
X	2	1	2	-	3	50	1	-	-	1	2	-	-	1	1	1	7	35	-	-	1	-	-	1	2	17	12	32	X
XI	1	-	1	-	1	33	-	1	-	-	-	-	-	-	-	-	1	10	-	-	-	-	-	-	0	0	2	11	XI
XII	2	-	2	-	2	33	-	-	-	-	-	-	-	-	-	2	2	10	-	-	-	-	-	-	0	0	4	11	XII
XIII	2	1	2	-	3	50	1	1	1	1	1	1	1	1	1	-	9	45	-	-	1	1	-	-	2	17	14	37	XIII
XIV	3	-	3	2	5	56	1	-	-	1	1	1	1	-	1	1	7	23	-	1	1	-	-	-	2	11	14	25	XIV
XV	1	-	-	-	0	0	-	-	-	-	-	-	-	1	-	-	1	10	-	-	1	-	-	-	1	17	2	11	XV
XVI	2	1	2	-	3	50	2	2	-	2	2	2	1	1	1	2	15	75	-	1	1	-	-	-	2	17	20	53	XVI
Totals	48	15	34	27	76	-	21	18	9	29	17	14	15	15	14	18	170	-	11	9	20	7	5	16	68	-	314	-	
Means	3	.9	2.1	1.7	4.8	53	1.3	1.1	.6	1.8	1.1	.9	.9	.9	.9	1.1	10.6	35	.7	.6	1.3	.4	.3	1.0	4.3	24	19.6	32	

^{1/} Total perceptions divided by maximum possible perceptions. For example, there are 3 physical conditions listed and in set I there are 5 sampled municipalities, so maximum possible perceptions are 15. Similarly for set I the maximum possible humanistic perceptions are 50 and the maximum possible institutional perceptions are 30.

Interviewees who considered institutional factors as significant barriers largely were in municipalities with areas less than 10 square miles (table 7, col. 27). Population growth or decline of sample sets between 1960 and 1970 is plotted against perceptions of institutional barriers in figure 3. The resulting field, possibly excepting set XVI, suggests strongly that population decline or only modest population growth are indicators of such perceptions. Population decline commonly parallels a declining tax base, and modest population growth may be accompanied by an increased tax base inadequate to respond to a greater increase in demand for services. In either case, the result is diminished institutional capabilities.

The perceptions of barriers by sample set are summarized by equal weight in table 7, column 29. Fewest barriers were perceived in municipalities with large areas and small to moderate populations (set XI, XIII, and XV) and most were seen in municipalities with small areas (set I and II) and largest areas (set XVI).

In figure 4, perceptions of barriers by categories are plotted against population density. Although the plots for individual categories are diffuse, the field for each suggests a general trend for increased barrier perception with increased density. The trend is sharpened by the shaded area in which fields of all three categories overlap. Twenty points of 48 (3 plots of each of the 16 sample sets) fall within the triple overlap, suggesting that there is a certain consistency in viewing barriers; if municipalities saw relatively few barriers in one category, then they were likely to see few in other categories, and vice versa.

Effectiveness of the dissemination strategy

From the results of interviews, it was plain that the subject maps had been used, but the degree and effectiveness of such use was not always clear. This problem is approached indirectly in table 8, wherein five of the results shown in earlier tables are shown by sample sets. We believe these may be the most telling in defining effectiveness. By table 8 column:

- (8) Map utilization.--The mean number of primary map users per sampled municipality (table 2, col. 11) is an indicator of frequency of use, although the manner of use is not well defined.
- (9) Problem recognition.--The mean number of reported recent problems (table 4, col. 7), although subject to area and other variations, is a measure of the ability to recognize that a problem exists.
- (10) Involvement.--This assessment (table 4, col. 15) is considered a measure of willingness to respond to problems.
- (11) Receptivity.--This summarized parameter (table 6, col. 8) is considered indicative of both willingness and capability to use earth-science information in resolving environmental problems.
- (12) Barriers to use.--The four preceding parameters are positive attributes, whereas the perception of barriers is a negative attribute for present purposes, indicative perhaps of a tendency to find excuses for not doing something. Accordingly, the values in this column are converted to a positive tendency to minimize barriers by subtracting from 100 the values in column 29 of table 7.

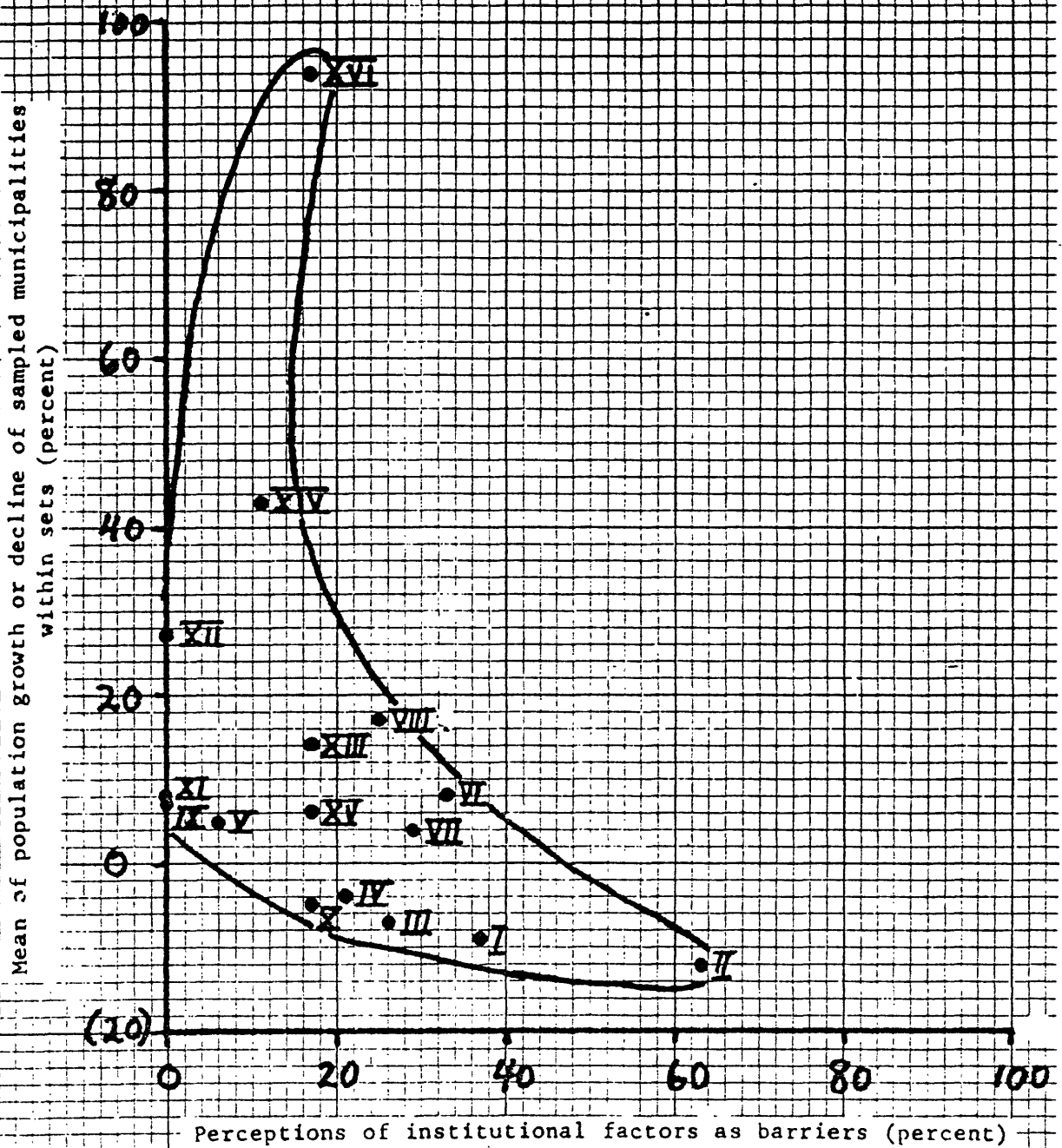


Figure 3.--Relation of 1960 population growth or decline to perceptions of institutional factors as barriers to use of environmental maps. From table 7, column 27 and table 8, column 7.

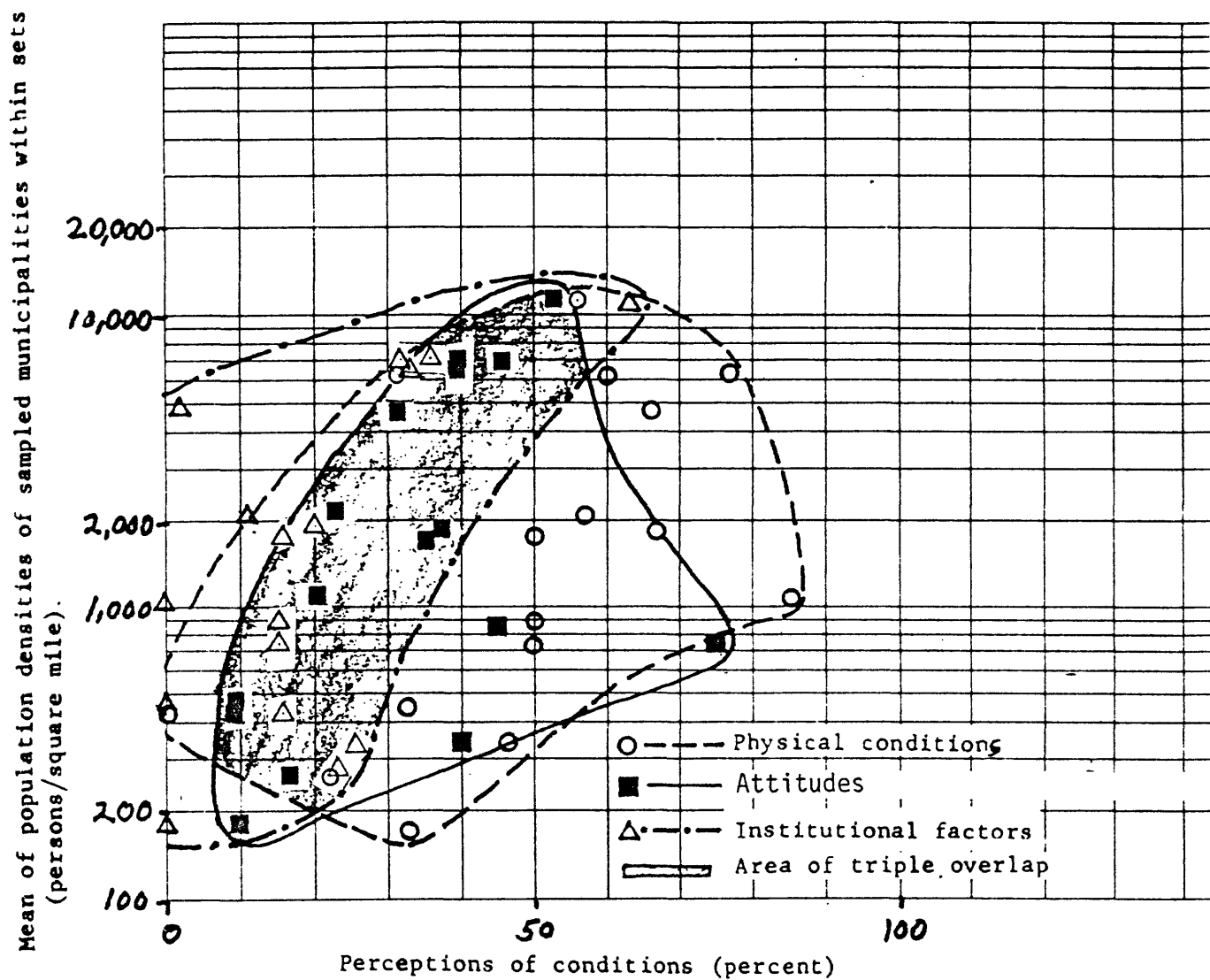


Figure 4.--Relation of 1970 population density (table 8, col. 6) to perceptions of physical, attitudinal, and institutional conditions as barriers to the use of environmental maps (table 7, cols. 7, 19, and 27).

Table 8.--Mean geographic and demographic characteristics of sampled municipalities by set; estimate of effectiveness of the map-dissemination strategy.

1. Sample set (table 1)	2. Municipalities in set	3. Municipalities sampled	4. Mean area of municipalities sampled (square miles)	5. Mean 1970 population of municipalities sampled	6. Mean of 1970 population densities of municipalities sampled	7. Mean of 1960-1970 population growth (decline) of municipalities sampled (percent)	Municipal characteristics that can reflect potential for effective use of environmental maps.					14. Summary of effectiveness of the dissemination strategy. $x = 20$; $x = 10$; blank = 0 Categories of effectiveness (approximations-- see table 9 and text)	15. Sample set (table 1)
							8. Map utilization	9. Problem Recognition	10. Involvement	11. Receptivity	12. Barriers to use		
							Primary users of environmental maps, per municipality (table 2, column 11) Mean number Greater than average--X; less than average--blank	Recent environmental problems recognized by municipality (table 4, column 7) Mean number More than average--X; less than average--blank	Degree of municipal involvement in environmental matters (table 4, column 15) Weighted totals Superior--X; average--x; inferior--blank ^{2/}	Degree of interest in, and willingness to use environmental information (table 6, column 8) Mean of weighted totals Superior--X; average--x; inferior--blank	Perception of fewest physical, attitudinal, and institutional barriers to use of environmental maps Percent (100 minus values in column 29, table 9) Fewer than average--X; average--x; more than average--blank		
I	24	5	.4	2,900	7,100	(9)	1.0	1.2	120	150	54	0 F(2)	I
II	10	4	.6	6,600	12,000	(12)	0.8	1.8	180	180	43	0 F(2)	II
III	11	3	2.4	700	350	(7)	1.7 X	1.3	170	220	79 X	40 F(2)	III
IV	12	4	1.6	3,100	1,900	(4)	1.5	1.3	230	290 X	63	10 F(1)	IV
V	13	6	1.7	7,400	4,900	5	1.0	1.7	230	270	75 X	20 F(1)	V
VI	13	4	2.0	14,300	7,400	(8)	1.0	3.0 X	280 X	360 X	63	50 D	VI
VII	5	3	4.6	28,900	6,300	(4)	1.7 X	2.7 X	330 X	390 X	56	80 B	VII
VIII	6	4	7.4	2,500	300	17	1.8 X	1.3	250 X	210	62	30 E	VIII
IX	4	2	7.8	8,700	1,100	7	1.0	1.5	350 X	300 X	76 X	50 E	IX
X	3	2	7.7	13,900	1,800	(5)	1.5	2.0 X	300 X	310 X	68 X	60 A	X
XI ^{1/}	1	1	15.5	2,900	200	8	5.0 X	2.0 X	400 X	480 X	89 X	100 C	XI
XII	2	1	14.7	6,600	450	27	5.0 X	2.0 X	450 X	400 X	89 X	100 C	XII
XIII	3	2	16.1	14,000	900	14	3.5 X	2.5 X	250 X	270	63	50 A	XIII
XIV	7	3	14.2	30,000	2,100	43	2.0 X	3.3 X	370 X	380 X	75 X	100 A	XIV
XV ^{1/}	3	1	21.2	9,400	450	6	0	--	100	100	89 X	20 E	XV
XVI	3	2	26.9	20,100	750	94	2.5 X	2.0 X	200	330 X	47	60 B	XVI
Total	126	48											
Means	3	3.0	3,600	1,200	4	1.6	1.9	250	290	68	48		

1/ Because only 1 municipality was sampled in each of sets XI and XV and in order to preserve anonymity of municipalities sampled, geographic and demographic means for all municipalities in these sets are shown in columns 4 through 7.

2/ If all rankings of responses in tables 5 and 7 were distributed evenly across the ranges, weighted totals (col. 10) and mean of weighted totals (col. 11) would be 300. Results are considered superior if they exceed 300; average if they are equal to or less than 300, but equal to or greater than the actual means (bottom row); inferior if they are less than the means.

In column 13 of table 8, the five parameters are summarized into ratings by sample set that are believed estimates of the effectiveness of the free-mailing dissemination strategy for providing environmental information to most municipalities of each sample set.

In general, the parameters in column 8 through 12 of table 8 are straight line functions. That is, for example, problem recognition (col. 9) increases as receptivity (col. 11) increases as shown by the somewhat diffuse field of figure 5, and municipal involvement (col. 10) increases as receptivity (col. 11) increases, as is illustrated somewhat more sharply in figure 6.

Plotted versus area, 1970 population, population density, and 1960 to 1970 population growth or decline (table 8, cols. 4 through 7), each of the five parameters (cols. 8 through 12) develop somewhat different fields. Shown, for example, are the plots for receptivity versus these area and demographic descriptors. In figure 7 the field suggests that receptivity is greatest in municipalities with areas between about 10 and 20 square miles. The field of figure 8 suggests only that some municipalities with populations less than about 15,000 are not particularly receptive, whereas other municipalities of any population may be receptive.

The semilog plot of figure 9 is somewhat diffuse, but its field suggests that population densities between about 600 and 5,000 persons per square mile may be generally favorable for municipal receptivity. The field of receptivity versus population growth or decline (fig. 10) suggests little, in contrast with growth or decline versus institutional barriers (fig. 3), which has a well defined trend.

Similar plots for the other parameters are not shown; they largely are more diffuse than the receptivity plots.

In figures 11, 12, 13, and 14, respectively, shaded fields indicate the areas, populations, population densities, and growth rates that appear to have the strongest correlation with sample sets that have effectiveness rankings of 50 or more (table 8, col. 13).

Figure 11 suggests that the dissemination strategy is likely to be effective in municipalities with mean areas greater than about 7.5 square miles and less than about 19 square miles. It also suggests that some municipalities between about 3 square miles and 7.5 square miles and more than about 19 square miles in area may respond to the strategy by making effective use of maps.

In figure 12 there appears a good correlation that effective response in municipalities larger than 10,000 in population is appreciably more likely than in municipalities with fewer than 10,000 people.

It is interesting to note that the plot of mean population densities versus "effectiveness" in figure 13 does not show as strong a trend as does population density versus, for example, mean number of primary users (fig. 2). From figure 13, one can say only that direct mailing to municipalities with population densities less than about 3,000 persons per square mile may be somewhat more effective than to those with greater densities; in short, population density alone is not sufficiently selective as an indicator. It is also noteworthy that the sample sets that fall in the population-density shaded field, with the exception of set XVI, are exactly those that fall in the mean-area "general effectiveness" shaded field (fig. 11).

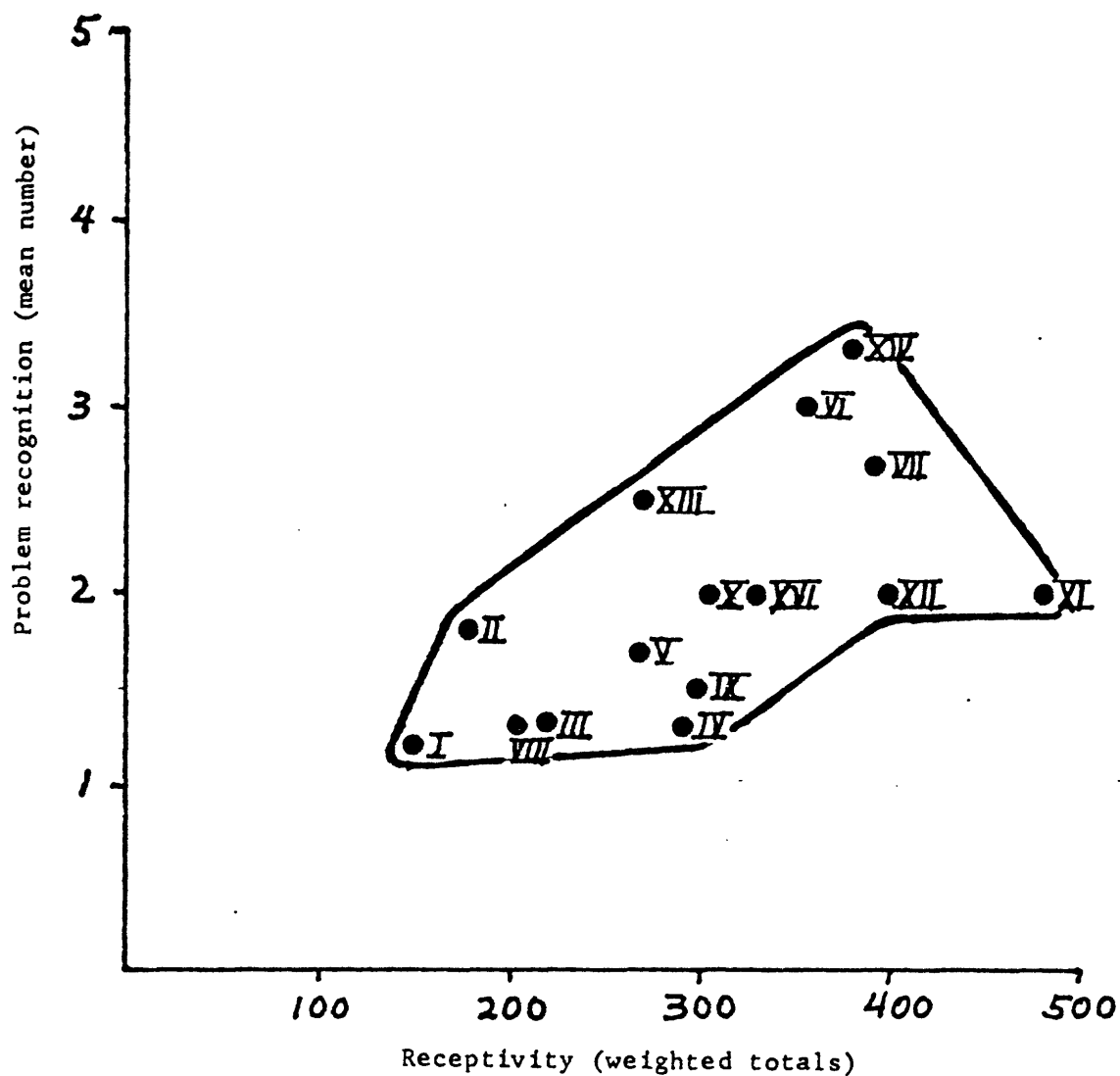


Figure 5.--Relation of municipal receptivity to environmental information to municipal recognition of environmental problems (table 8, cols. 9 and 11).

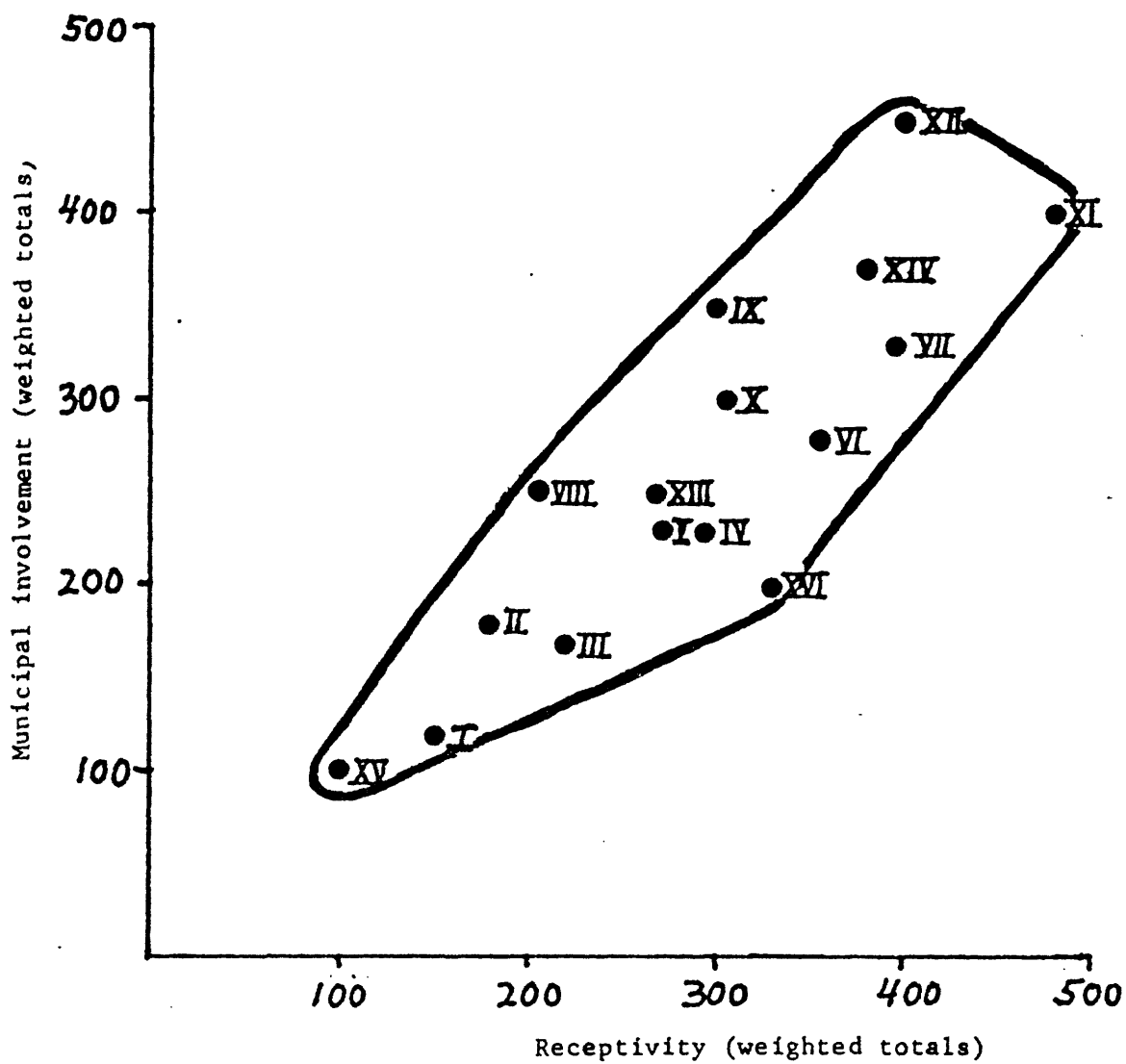


Figure 6.--Relation of municipal receptivity to environmental information to municipal involvement in environmental matters (table 8, cols. 10 and 11).

Mean area of sampled municipalities within sets (square miles)

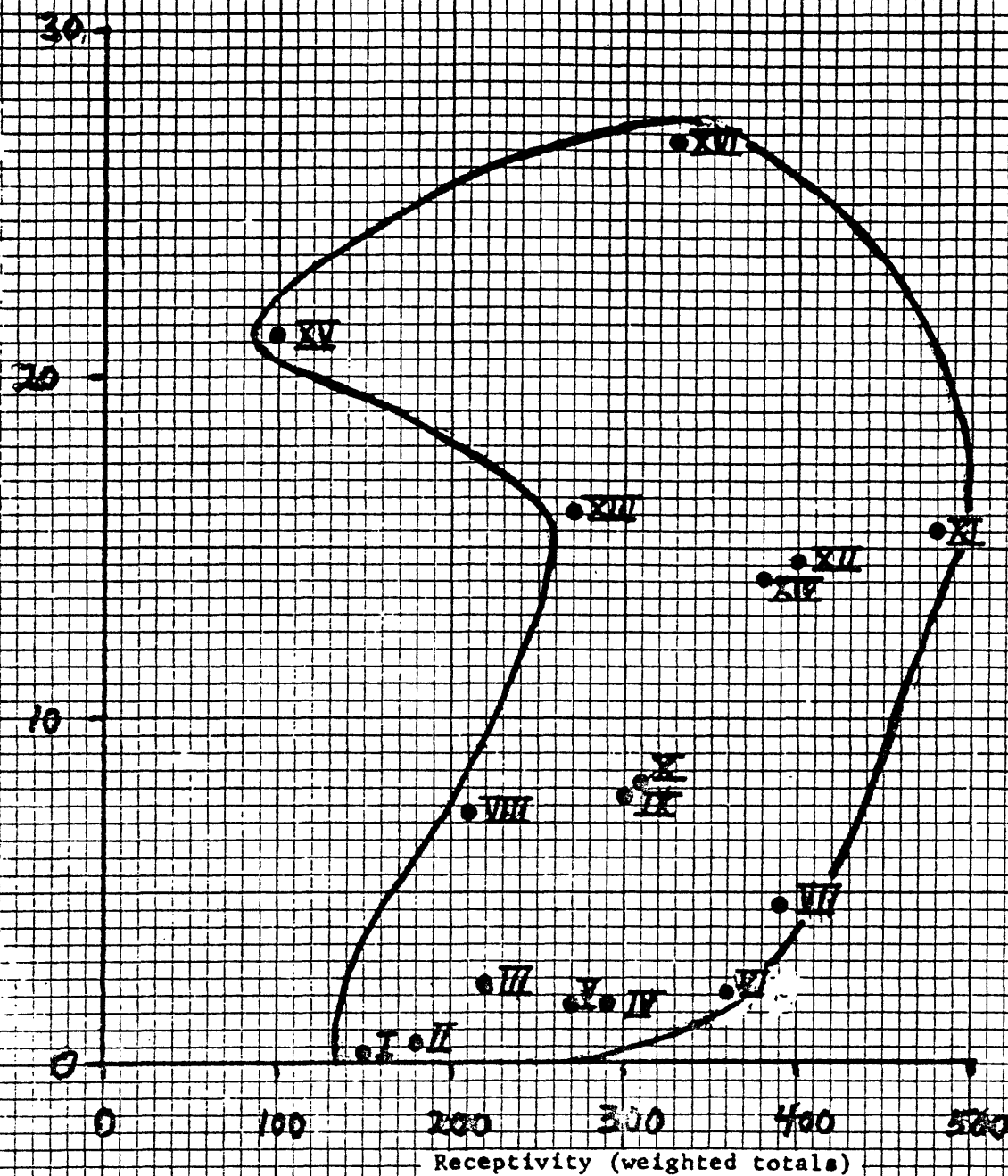


Figure 7.--Relation of area to municipal receptivity to environmental information (table 8, cols. 4 and 11).

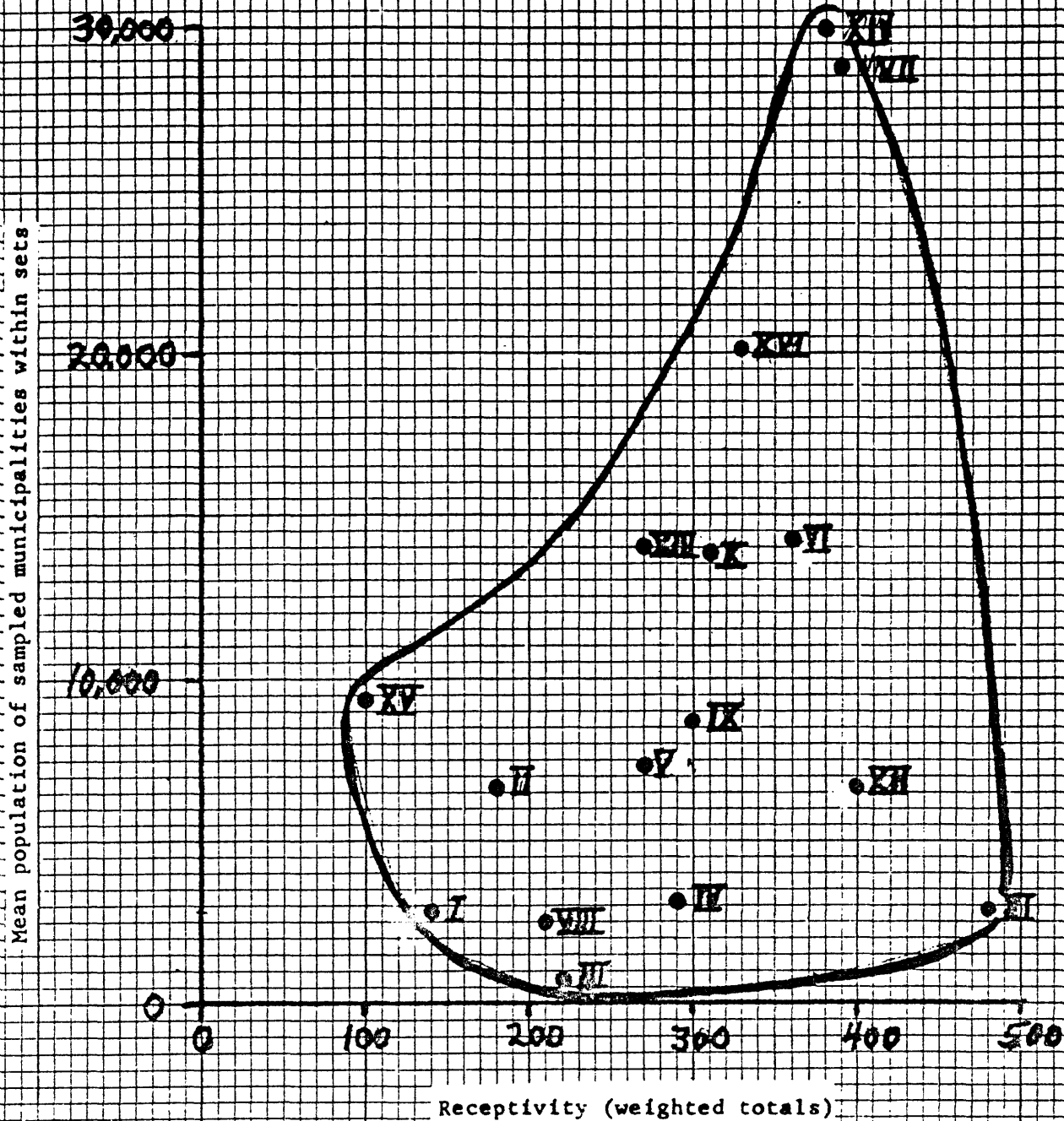


Figure 8.--Relation of 1970 population to municipal receptivity to environmental information (table 8, cols. 5 and 11).

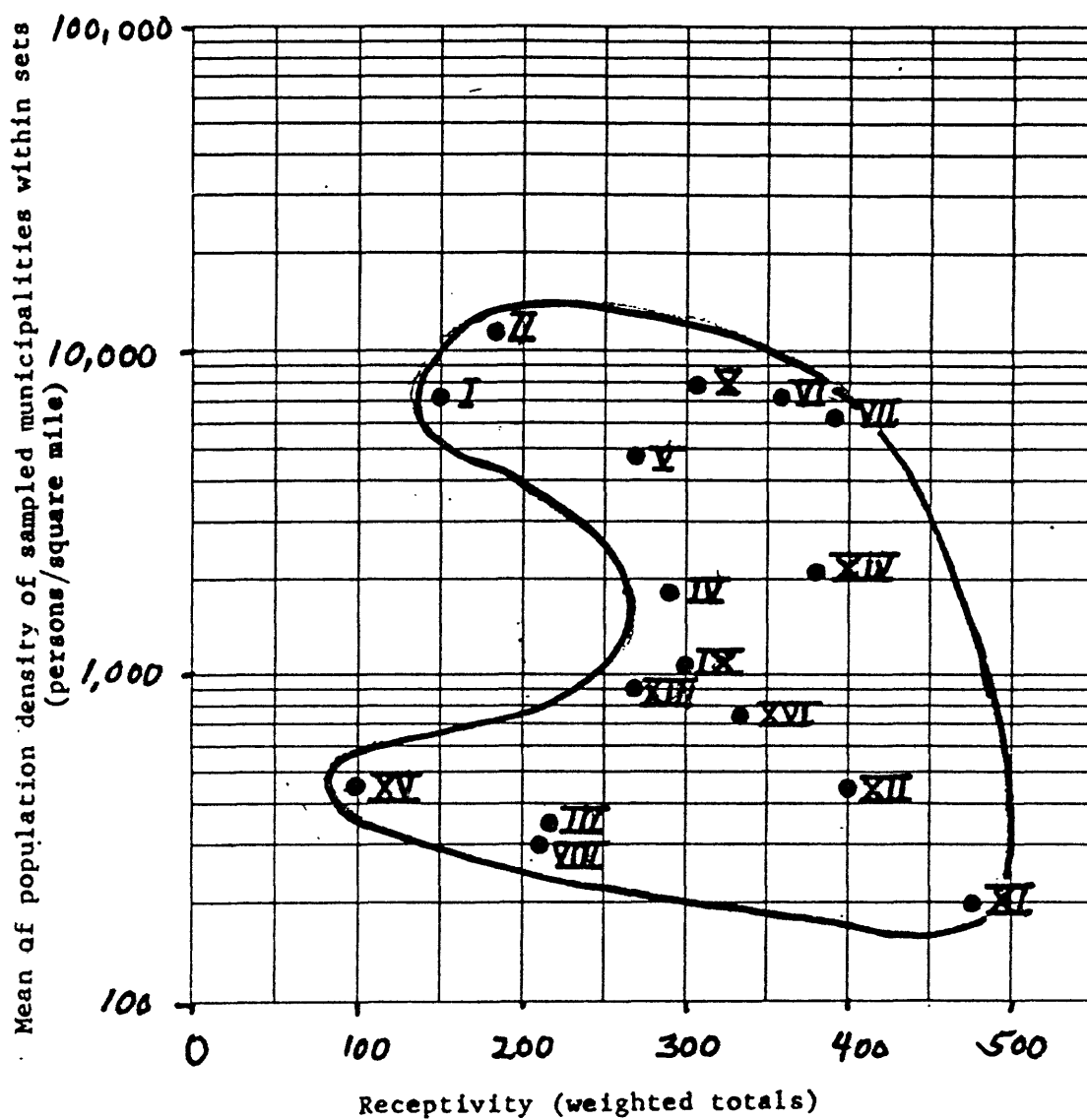


Figure 9.--Relation of 1970 population density to municipal receptivity to environmental information (table 8, cols. 6 and 11).

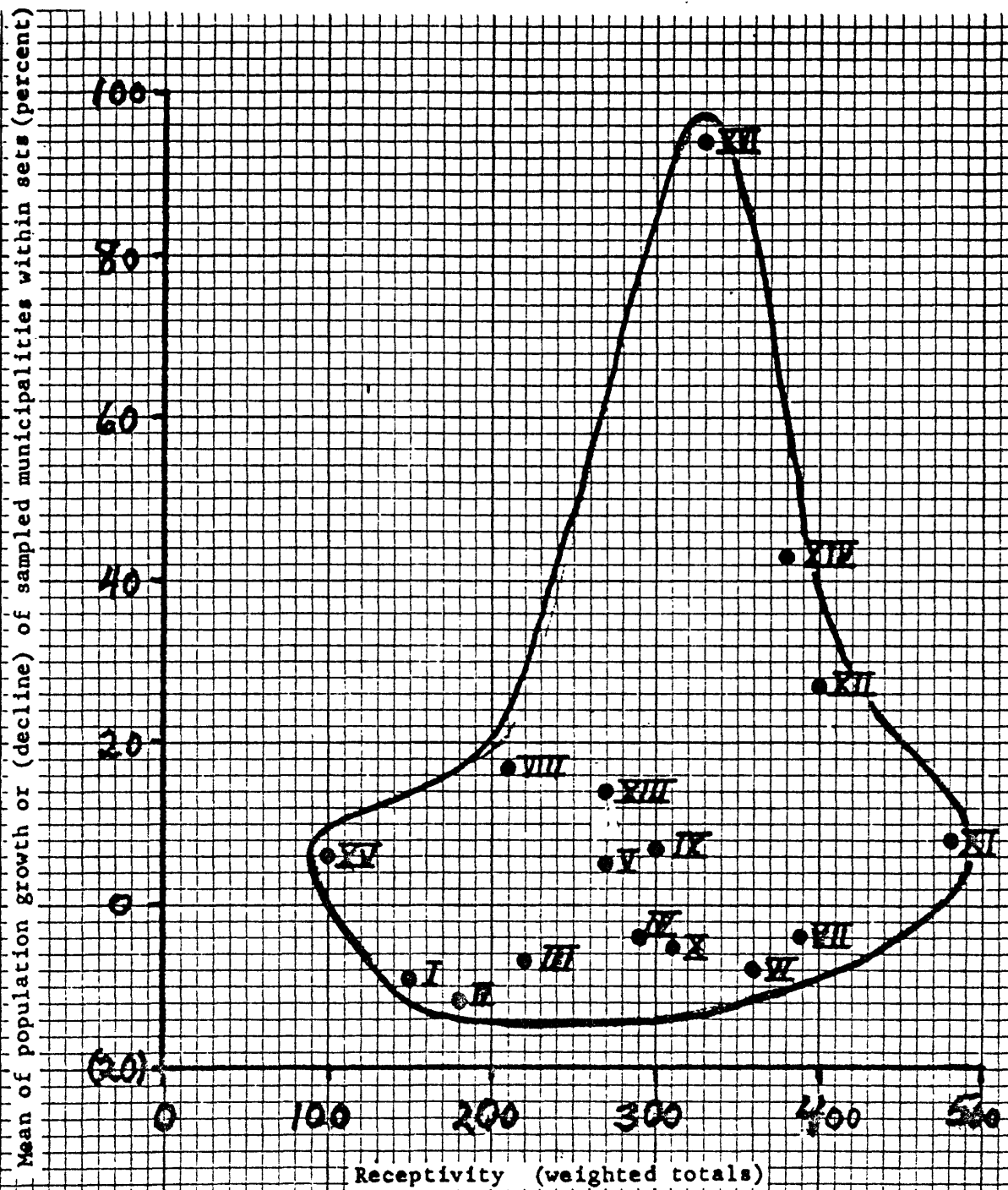


Figure 10.--Relation of 1960 to 1970 population growth or decline to municipal receptivity to environmental information (table 8, cols. 7 and 11).

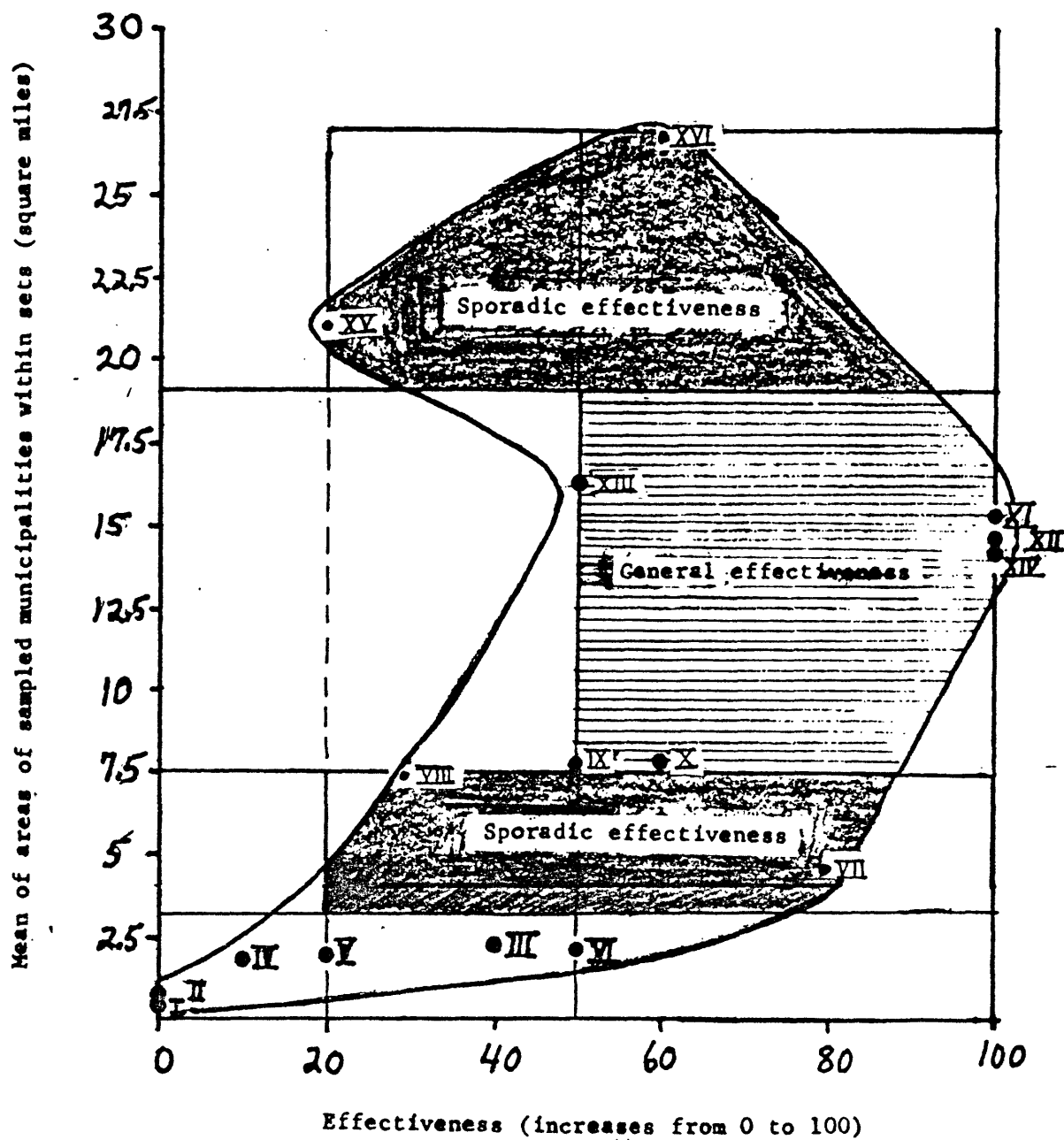


Figure 11.--Relation of effectiveness of mailings to area (table 8, cols. 4 and 13). All 6 sets with mean areas between 7.5 and 19 square miles are ranked 50 or more; 1 of 2 sets with mean areas less than 7.5 square miles but more than 3 square miles and 1 of 2 sets with mean areas greater than 19 square miles are ranked 50 or more; 5 of 6 sets with mean areas less than 3 square miles are ranked less than 50.

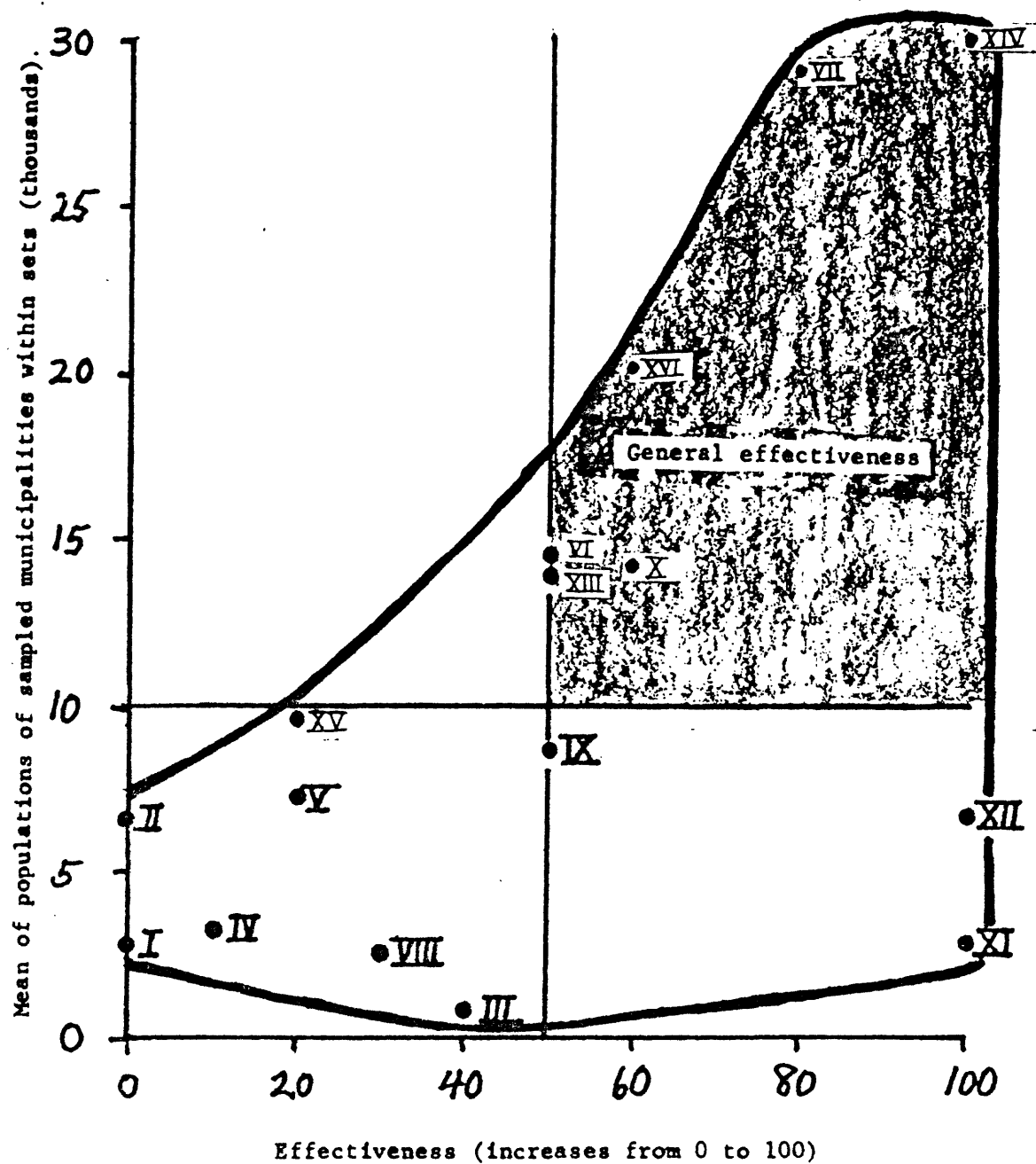


Figure 12.--Relation of effectiveness of mailings to 1970 population (table 8, cols. 5 and 13). All sets with mean populations greater than 10,000 are ranked 50 or more; only 3 of 10 sets with mean populations less than 10,000 are ranked 50 or more.

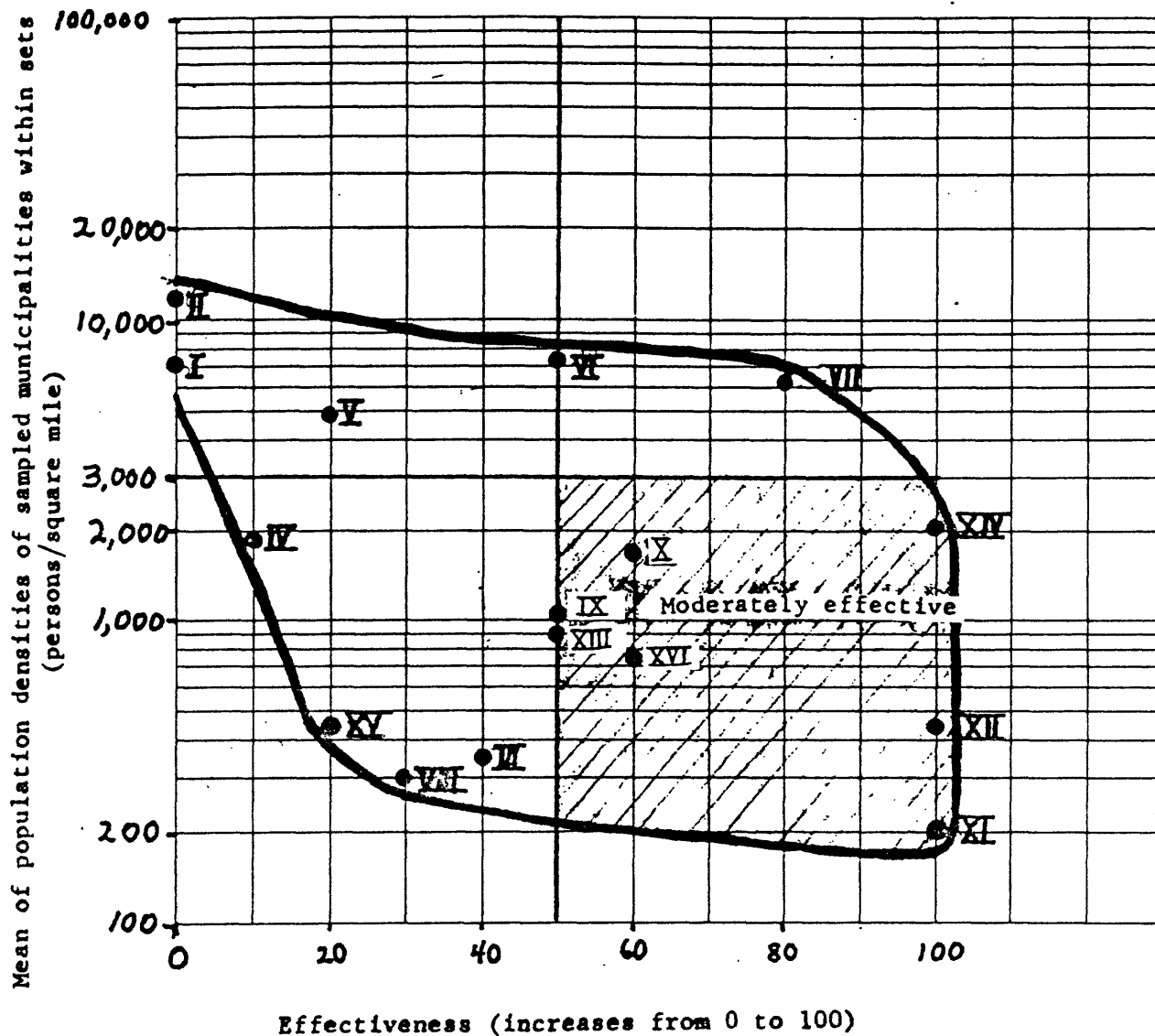


Figure 13.--Relation of effectiveness of mailings to 1970 population density (table 8, cols. 6 and 13). 7 of 11 sets with population density less than 3,000 are ranked 50 or more; 2 of 5 sets with population density more than 3,000 are ranked 50 or more.

The result from figure 14 is not surprising. Although the plot is somewhat diffuse, it suggests clearly that municipalities with steady or growing populations are more likely to react with effective use of environmental maps mailed directly than are municipalities with declining populations. Sets plotting in the growth-or-decline shaded field also closely match those in the mean-area "general effectiveness" shaded field (fig. 11).

Because map acceptance was not used directly in developing the effectiveness ratings for mailings to different sample sets, map acceptance by interviewees from the sets (table 5, col. 6) provides a somewhat independent means of testing the validity of the effectiveness ratings. Logic would dictate that acceptance and effectiveness are parallel, and this is shown to be generally true in figure 15. Only sample set V appears anomalous; if it were excluded, the resulting field would be narrow and almost straight, as shown by the dashed line.

From these plots, it becomes possible to regroup Allegheny County municipalities into large categories of generally different responses to the mailing strategy, using the simplest and most readily available parameters, area and population. The population-density (fig. 13) and growth-or-decline (fig. 14) plots are not used, for their results coincide largely with the result of the mean-area plot (fig. 11). Six categories suggest themselves, in generally decreasing order of estimated "effectiveness" from A through F, with category F divisible into two parts. The categories and the Allegheny County municipalities they include are described and listed in table 9,

The new categories are compared to sample sets used in the study in columns 13 and 14 of table 8. Relative to subcategories F(1) and F(2), however, it must be pointed out that mailings to a few municipalities in these sets are known to have been effective exceptions, and the subdivision into F(1) and F(2) places most known exceptions in F(1). Discrepancies between rankings and categories are results of graphic generalization (fig. 11 through 14) that reduces to some extent biases that may have developed owing to the small sizes of some of our selected sample sets and other factors. Moreover, the discrepancies suggest that, for example, there probably is little significant difference between effectiveness of mailings to some municipalities in category A and many in category C, or between those to some municipalities in category C and many in category E. However, it is reasonable to suggest that there will be a significant difference between effectiveness of mailings to most municipalities in category A and those to most municipalities in category E, or between most in categories A through E and most in category F.

Table 10 relates the newly devised categories to the overall area and population of Allegheny County. It is encouraging to note that the municipalities that are likely to react to the direct-mailing strategy with at least some significant degree of effectiveness (categories A through D) include almost 3/4 of the land area and more than 2/3 of the population, although they are appreciably fewer than 1/2 the total number. With the addition of category E, coverage includes municipalities with more than 9/10 of the area and almost 3/4 of the population.

Geographic variations.--Allegheny County is divided into three segments, customarily labelled "North Hills, East Hills, and South Hills", by the courses of the Allegheny, Monongahela, and Ohio Rivers, and a "West Hills" segment sometimes is separated from the South Hills along ill-defined boundaries. One hoped-for result of the present study was to find whether there were significant variations between county segments in frequency of map use, receptivity, or other insights. One reason for suspecting

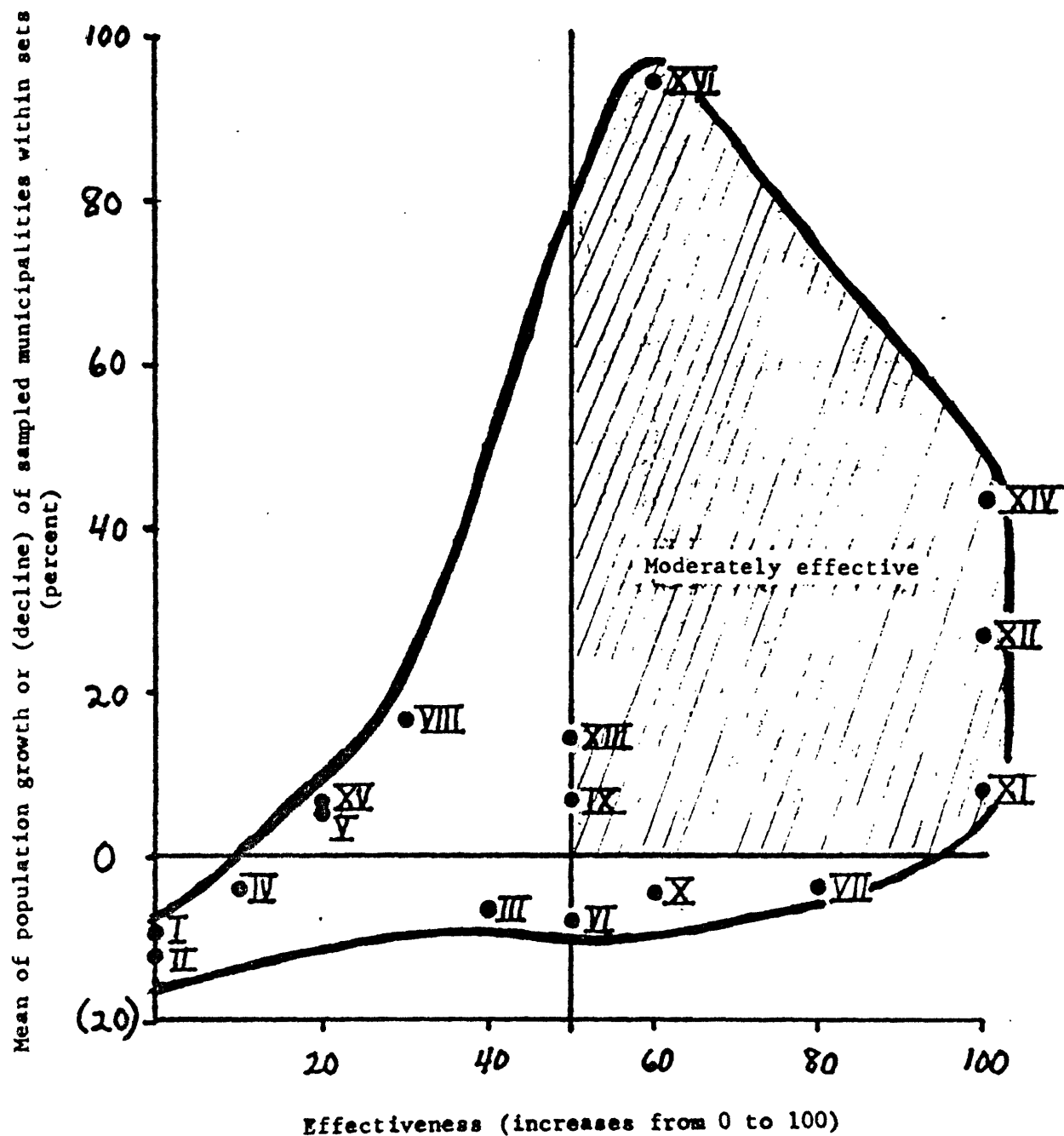


Figure 14.--Relation of effectiveness of mailings to 1960-70 population growth or decline (table 8, cols 7 and 13). 6 of 9 growing sets are ranked 50 or more; 3 of 7 declining sets are ranked 50 or more.

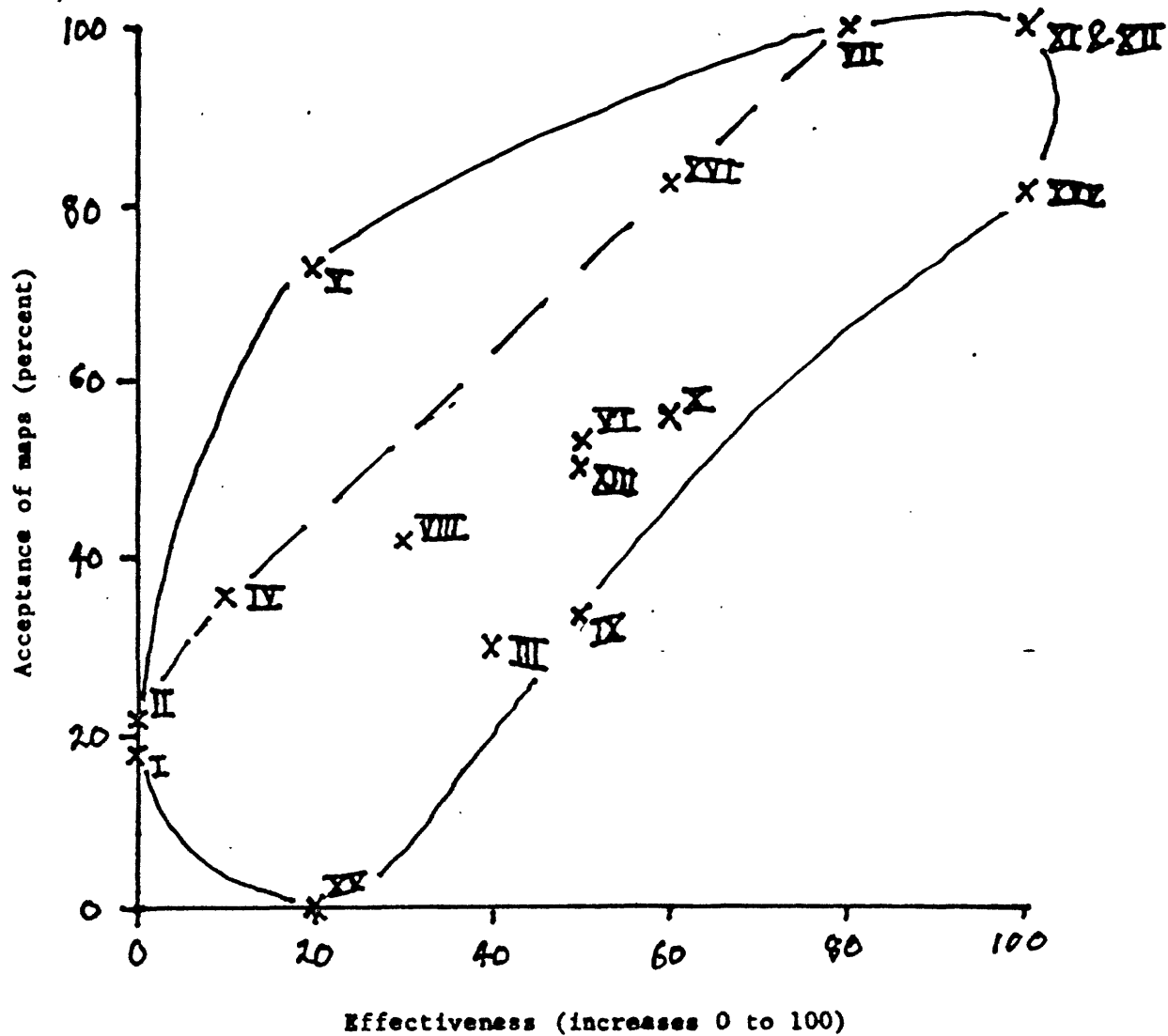


Figure 15.--Relation of effectiveness of mailings (table 8. col. 13) to acceptance of GPRS maps for municipal use (table 5, col. 6).

Municipal category	Effectiveness	Area and population descriptors	Municipalities in category (numbers)	Municipalities (alphabetically by municipal class)
A.	Most municipalities Generally effective	Area between 7.5 and 19 square miles; population more than 10,000.	11	Boroughs (2): Bethel Park West Mifflin Townships of the 1st class (8): Elizabeth McCandless North Versailles Penn Hills Robinson Ross Shaler Upper St. Clair Township of the 2nd class (1): Hampton
B.	Most municipalities; moderately to generally effective	Area between 3 and 7.5 square miles or more than 19 square miles; population more than 10,000.	9	City of the 3d class (1): McKeesport Boroughs (3): Baldwin Monroeville Plum Townships of the 1st class (3): Harrison Mount Lebanon Scott Townships of the 2d class (2): Moon West Deer
C.	Most municipalities Moderately effective; some generally effective	Area between 7.5 and 19 square miles; population less than 10,000.	12	Boroughs (3): Fox Chapel Franklin Park Jefferson Township of the 1st class (1): Collier Townships of the 2nd class (8): Fawn Forward Frazer Indiana Marshall Pine Richland South Park
D.	Most municipalities slightly to moderately effective, some generally effective	Area less than 3 square miles; population more than 10,000.	15	Cities of the 3d class (2): Clairton Duquesne Boroughs (12) Bellevue Brentwood Carnegie Castle Shannon Dormont McKees Rocks Munhall North Braddock Pleasant Hills Swissvale Whitehall Wilkinsburg Township of the 1st class (1): Stowe
E.	Most municipalities slightly or sporadically effective; some moderately to generally effective	Area between 3 and 7.5 square miles or more than 19 square miles; population more less than 10,000.	11	Boroughs (4): Bell Acres Lincoln Sewickley Heights White Oak Townships of the 1st class (3): Kennedy O'Hara South Fayette Townships of the 2nd class (4): Findlay Harmer North Fayette Ohio
F(1)	Most municipalities generally ineffective; some moderately to generally effective	Area equal to or more than 1 to 3 square miles; population less than 10,000.	27	Boroughs (17): Braddock Hills Bridgeville Churchill Coraopolis Crafton Edgeworth Forest Hills Glaspport Green Tree Liberty Oakmont Port Vue Sewickley Sewickley Hills Tarentum Turtle Creek West View Townships of the 1st class (9): Aleppo Crescent East Deer Leet Neville Reserve South Versailles Springdale Wilkins Township of the 2d class (1): Kilbuck
F(2)	Most municipalities generally ineffective; very few moderately to generally effective	Area less than 1 square mile; population less than 10,000.	41	Boroughs (40): Aspinwall Avalon Ben Avon Ben Avon Heights Blawnox Brackenridge Braddock Bradford Woods Chalfant Cheswick Dravosburg East McKeesport East Pittsburgh Edgewood Elizabeth Emsworth Etna Glenfield Haysville Heidelberg Homestead Ingram Leetsdale Millvale Mt. Oliver Oakdale Osborne Pitcairn Rankin Rosslyn Farms Sharpsburg Springdale Thornburg Verona Versailles Wall West Elizabeth West Homestead Whitaker Wilmerding Township of the 1st class (1): Baldwin

1/ Excluding City of Pittsburgh and Boroughs of McDonald and Trafford.

Table 10.--Summary of categories of effectiveness by numbers, area, and 1970 population.

Municipal category (effectiveness decreases downward)	By category						Cumulative					
	Municipalities ^{1/}			Total area			Municipalities ^{1/}			Total area		
	Number	Percent	Square miles	Percent	Number	Percent	Number	Percent	Square miles	Percent	Number	Percent
A.	11	8.7	152.9	22.7	248,114	22.9	11	8.7	152.9	22.7	248,114	22.9
B.	9	7.1	131.5	19.6	219,930	20.3	20	15.9	284.4	42.3	468,044	43.2
C.	12	9.5	167.7	24.9	63,723	5.9	32	25.4	452.1	67.2	531,767	49.0
D.	15	11.9	27.8	4.1	204,389	18.9	47	37.3	479.9	71.4	736,156	67.9
E.	11	8.7	129.1	19.2	54,920	5.1	58	46.0	609.0	90.6	790,446	72.9
F(1)	27	21.4	41.6	6.2	129,947	12.0	85	67.4	650.6	96.8	920,393	84.9
F(2)	41	32.5	21.8	3.2	163,829	15.1	126 ^{1/}	100.0	672.4 ^{1/}	100.0	1,084,202 ^{1/}	100.0

^{1/}Excluding City of Pittsburgh and Boroughs of McDonald and Trafford.

Complete Allegheny County totals are: Municipalities - 129; area - 727.9 square miles; population - 1,605,133.

Categories of effectiveness (table 10)	2. Armstrong County			3. Beaver ^{1/} County			4. Butler County			5. Washington County			6. Westmoreland ^{2/} County			7. 5 Counties (cols. 2 to 6)			8. Allegheny ^{3/} County			9. 6 Counties ^{4/} Grtr. Pgh. Reg. (cols. 2 to 6, 8)		
	Municipalities (number)	Area (percent)	1970 Population (percent)	Municipalities (number)	Area (percent)	1970 Population (percent)	Municipalities (number)	Area (percent)	1970 Population (percent)	Municipalities (number)	Area (percent)	1970 Population (percent)	Municipalities (number)	Area (percent)	1970 Population (percent)	Municipalities (number)	Area (percent)	1970 Population (percent)	Municipalities (number)	Area (percent)	1970 Population (percent)	Municipalities (number)	Area (percent)	1970 Population (percent)
A	0	0	0	2	7	12	0	0	0	1	2	5	1	1	4	4	2	5	11	23	23	15	5	14
A and B	0	0	0	3	8	23	1	3	13	1	2	5	11	44	53	16	14	28	20	42	43	36	18	36
A through C	9	21	22	10	31	35	3	6	15	9	14	22	12	45	54	43	24	36	32	67	49	75	31	43
A through D	9	21	22	12	32	48	4	7	30	11	15	37	15	46	65	51	25	48	47	71	68	98	32	58
A through E	25	97	61	26	96	70	36	98	83	39	98	77	28	98	80	154	97	76	58	91	73	212	96	74
A through F(1)	29	99	63	32	98	82	42	99	88	46	99	86	31	98	82	180	99	82	85	97	85	265	98	84
A through F(2) (totals)	45	100	100	53	100	100	56	100	100	66	100	100	63	100	100	283	100	100	126	100	100	409	100	100
Total area ^{5/} (square miles)	652.0		439.9(440.0)		793.8		856.7		1,024.2		3766.6(3,766.7)		672.4(727.9)		4,439.0(4,494.6)									
Total 1970 population (X 1,000)	76		207(208)		128		211		377		999(1,000)		1,085(1,605)		2,084(2,605)									

1/ Data for Borough of Ellwood City not included because the municipality is largely in Lawrence County.

2/ Data for Borough of New Stanton, formed in 1968, not separated owing to lack of some information.

3/ Data for City of Pittsburgh, a special case, and Boroughs of McDonald and Trafford not included; the latter municipalities are largely in adjacent counties.

4/ Data reflect exceptions noted in footnotes 1, 2, and 3.

5/ Totals in parentheses include municipalities that were excluded from calculations.

that there might be such variations is that the known distribution of environmental problems also has some geographic variation. For example, though much of the county has been undermined for coal, the North Hills are somewhat less affected than are other segments.

Although some geographic variation was indicated by our study, it was not strong and is not detailed here. We believe it largely was the result of our sample-selection technique, which, as noted in appendix III, resulted in some geographic bias and which, in hindsight, would have been better designed for this particular purpose by introduction of geographic subsets at the sample-selection stage.

No attempt has been made to analyze responses of municipalities relative to their topographic positions, for example, valley-floor versus ridge-top locations, largely because many municipalities are highly varied in their topography and so are not readily categorized relative to topography. However, it is worthy of note that most municipalities that are small in area (table 9, category F(2) are in valley bottoms and adjacent lower valley walls, and it is largely in these municipalities that mailings of the subject maps had the least impact. In view of the long and well known history of flooding in the county, this would appear contrary to logic. Possible reasons for the apparent paradox are that environmental problems in these municipalities are ~~either~~ the least of worries, as compared to economic or social problems, and that the municipalities are resigned to the dislocations that results from the relatively frequent recurrence of flooding, which is viewed as inevitable.

Significance of categories as descriptors of municipal governments.--The current evaluation basically is a special study of communications; how the maps moved from GPRS to and through municipal governmental channels. The steps culminating in the ratings of table 8 and categories of table 9, although indirect in some cases, therefore can be considered a measure of something more than the effectiveness of the dissemination strategy alone. Rather they also may be indicators of the degree of effectiveness with which municipalities deal with environmental problems in general. In short, if handling of the subject maps in sampled municipal governments in category A was generally effective, then it is reasonable to suggest that other, perhaps unrelated, environmental information also will be applied by most category A municipalities with a generally parallel degree of effectiveness. The same suggestion also applies to the other categories.

Extrapolation of categories to other areas.--It is not known whether the categories based on area and population of municipalities developed during the current study are applicable in other States with different governmental styles and characteristics. However, it does appear that the categories may have application elsewhere in Pennsylvania.

In table 11, municipalities in the five counties that border on Allegheny County (and which with Allegheny County comprise the Greater Pittsburgh region--fig. 1) are summarized by our derived categories and compared to Allegheny County. The most significant difference is in municipalities included in categories of effectiveness A through D. Allegheny County municipalities in these categories include more than 2/3 of both land and population (table 11, col. 8), whereas A through D municipalities in the five counties average only 1/4 of the land area and less than 1/2 the population (col. 7).

If municipalities of categories A through E are grouped, however, then little difference appears between counties; almost all the land area of each county and the bulk of the population are included, although the proportion of Armstrong County population included is somewhat lower than in other counties.

Table 12.--Comparison of probable effectiveness of mailings, Greater Pittsburgh region counties.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
categories of effectiveness	Ranges of effectiveness of mailings to most municipalities	Means of ranges	Armstrong County	Beaver County	Butler County	Washington County	Westmoreland County	5 Counties (cols. 4-8)	Allegheny County	6 Counties Grtr. Pgh. Reg. (cols. 4-8, 10)
			Municipalities (percent)	Municipalities (percent)	Municipalities (percent)	Municipalities (percent)	Municipalities (percent)	Municipalities (percent)	Municipalities (percent)	Municipalities (percent)
			Weighted Values ^{2/}	Weighted Values ^{2/}	Weighted Values ^{2/}	Weighted Values ^{2/}	Weighted Values ^{2/}	Weighted Values ^{2/}	Weighted Values ^{2/}	Weighted Values ^{2/}
A	60-100	80	0	0	0	2	2	2	9	4
B	50-90	70	0	2	2	0	16	4	7	5
C	40-80	60	20	13	4	12	2	10	10	10
D	30-70	50	0	4	2	3	5	3	12	5
E	20-60	40	36	26	57	42	20	36	9	28
F(1)	10-50	30	9	11	10	11	5	9	21	13
F(2)	0-40	20	35	40	25	30	50	36	32	35
Totals			100	100	100	100	100	100	100	100
Summary			36.1	36.1	35.6	36.4	36.0	36.2	40.4	37.3
effective-ness value										

1/ Overall range from 0 (completely ineffective) to 100 (completely effective).

Large overlaps acknowledge imprecision of category assignments.

2/ Means of ranges (col. 3) X percentages of municipalities X 10⁻²

The A through D comparison, and other relations that can be developed from table 11, suggest that environmental maps mailed to municipalities in the neighboring counties are less likely to be used than are maps mailed to most Allegheny County municipalities. This conclusion is directly parallel to one drawn by CSEP investigators during their study of the region. They found that perceptions and capabilities relative to environmental matters in municipalities of the 5 surrounding counties were generally similar from county to county, whereas perceptions in Allegheny County municipalities on the average were heightened and capabilities were greater (Wissel and others, 1976, p. 11, 14).

This parallelism suggests that categories of effectiveness developed in Allegheny County not only have a potential transfer value as guides to the probable effectiveness of mailings to and handling in individual municipalities, but that the categories also may be used as a tool to estimate the overall effectiveness in environmental matters of other municipal groups in Pennsylvania, by county or other regional grouping.

One summary method for comparing such groups is shown in table 12, using the same 6 counties compared in table 11. In column 2 of table 12 a scale of effectiveness is applied to each category, assuming an overall range of 0, completely ineffective, to 100, completely effective. Because the categories are not precise, each is assigned a part of the range allowing appreciable overlap. For example, the category A range, 60-100, overlaps the category D range, 30-70, suggesting that some category D municipalities are as effective as some category A municipalities, which is quite likely. Beneath each county name, municipalities entered as real numbers in table 12 are converted to percentages of county totals of municipalities. These percentages are then applied to the mean of the scale range for each category. For example, under Armstrong County, 20 percent of the mean of 60 for category C is 12.0. The weighted values for each category are totalled at the bottom to yield a county score. This manipulation quantifies the parallelism to the CSEP results, for Allegheny County scores 40.4 versus the very limited range of 35.6 to 36.2 for the other 5 counties.

Transfer of the category concept to other counties and municipalities, however, should be done with some circumspection. For example, of the 6 counties considered, Butler County has an unusual cadastral situation that results in very low area and population in categories A through D (table 11, col. 4). Most Butler County townships were established and surveyed as roughly square blocks about 5 miles on each side. Relatively low rural population and areas of about 25 square miles thus combine to place 32 of the 56 municipalities in the county in category E. Had the chosen township dimensions rather been 4 by 4 miles, many municipalities would have fallen in category C. Municipal boundaries in the other five counties were established with little attempt at such regularity. By way of contrast, all but 2 of Butler County's 31 townships range from 21.0 to 26.9 square miles in area, but the 28 townships in Armstrong County, for example, are well distributed through an area range of 1.0 to 45.2 square miles, and 12 of the 28 fall in categories other than E.

Summary of findings

The prime purpose of this study was to evaluate the effectiveness of direct-mailing dissemination strategy as a means of inserting environmental maps information into planning and decision-making processes at the municipal level. The overall conclusion reached is conditionally positive. The subject maps were received and largely were distributed or displayed internally. It had been speculated that many maps might have been discarded, but on the contrary, even when no immediate use for the

subject maps was perceived, only rarely were the maps misplaced or given away (table 2, cols. 6 and 7). In a number of municipalities, the maps were used by a variety of people (table 2, col. 9) for a variety of purposes (table 5, col. 3). Although the strategy can be considered as having been generally effective in fewer than 1/2 of the municipalities sampled, these responsive municipalities are representative of municipal categories that include most of the area and population of Allegheny County (table 10). Answers to broad questions raised were:

- (a) Face-to-face conferences are judged to have a very positive effect on use of environmental maps at the municipal level. It is not necessary that this form of contact be made by geologists or hydrologists, but rather, very effective contact can be made by persons with training in the use of the maps and who have planning backgrounds similar to some of the prospective users.
- (b) Municipal area and population are reliable general guides to the potential for effective dissemination of environmental information by mail, as is indicated by the categories developed from table 8 and related illustrations and shown in table 9. However, it is plain that there are exceptions to the categories which currently can only be identified by closer contact and experience. A financial parameter, such as per capita income, might also assist in identifying exceptions, for wealthy communities of any size probably can be expected to have capabilities to some degree enhanced over less fortunate areas.
- (c) The area and population categories for defining effectiveness probably are applicable, with care, to Pennsylvania (tables 11 and 12 and related discussion), and may be applicable to other areas with institutionally strong municipal governments. Results are inadequate for meaningful speculation as to whether the categories would have some validity where counties are strong, such as in Kentucky.
- (d) Municipalities with relatively high technical capabilities, as demonstrated by their possession of municipal maps and plans, also are those more likely to use environmental maps disseminated under the unsolicited free-mailing strategy and other environmental information. Municipalities without maps of their own are least likely to be receptive to maps from other sources.
- (e) Most Cities of the 3d class and Townships of the 1st class are responsive to the free mailing strategy, and in general they appear to use maps and other information to good effect. However, these classes of municipalities are relatively homogeneous by area and population parameters, which appear to be more reliable guides than municipal class alone. Boroughs and Townships of the 2d class are less homogeneous municipal classes and have wide ranges in responsiveness to map mailings and, probably, in their capabilities in most environmental matters.
- (f) Although municipal history and traditions were not plumbed in depth during the present study, it appears reasonable to judge that older, more settled municipalities with small areas and strong industrial traditions in general are not effective targets for environmental maps. Recently developed or currently developing municipalities appear the most responsive (table 7).

- (g) The experience of the present study is that personal interviews did elicit some requests for services that were beyond the scope of capability of the USGS in general and GPRS in particular. However, it was found that such requests (for example, for a site study of a specific landslide) could be refused without creating antipathy by explanation of the scope and capabilities of the USGS, by referring requestors to publications and other sources of information and referring requestors to other government agencies known to be involved and responsive or to consulting firms known to be competent. This relatively easy acceptance of refusal probably can be in part related to the unfortunate fact that municipal governments are accustomed to finding higher levels of government to some degree unresponsive, add, from the municipal view, uncooperative. Therefore, cooperation is unexpected, and even modest cooperation is appreciated when it appears.
- (h) Most primary users of the subject maps, as defined for the present purpose, were managers, mayors, municipal engineers, and some municipal secretaries with managerial duties.
- (i) The subject maps were addressed to municipal secretaries, and this addressing practice was moderately effective, as is shown by the fact that maps were distributed internally to primary users in most municipalities (table 2, col. 7).

Additional observations.--

- (1) The packet of landslide susceptibility, flood-prone-area and man-modified-land maps often was not recognized as a specialized and unique product for Allegheny County.
- (2) Covering memoranda accompanying maps and reports sent by mail frequently are not read.
- (3) The identifying GPRS covering envelope may have been a deterrent to use in a few cases. Previous products of a more general nature or at smaller scales mailed in the GPRS envelope may not have been perceived as useful. A few recipients may have assumed that the subject maps were similar, so they were filed without inspection.
- (4) Frequently staff at the municipal level do not have technical training and therefore tend to discount value of maps, especially those prepared by remote methods, such as interpretation of aerial photographs. Moreover, there is a strong tendency to believe that only scales of about 1" equals 800' are relevant to a small community. Distrust of the scale of 1" equals 2,000' was very common in administrators or councilmen with limited knowledge of cartography. Where such an interviewee took pride in his prior use of other USGS materials, usually limited use of topographic maps, influenced by the early dates of extant copies of some such maps he made the assumption that the subject maps also were out of date. One manager judged to be quite competent guessed erroneously that the landslide-susceptibility, flood-prone-area, and man-modified-land maps were prepared in the 1930's. Unknown to this manager was the fact that the municipal engineer had used the subject maps to prepare current municipal maps.
- (5) A parallel observation is that a number of those interviewed did not know that USGS topographic maps are revised periodically, in Allegheny County most recently in 1969.

Recommendations.--The map dissemination strategy of mailing most environmental maps to all 129 Allegheny County municipalities without subsequent contact, appears somewhat wasteful, because unsolicited environmental information apparently has little impact on more than 1/2 of the municipalities. If the strategy is to be applied in the future, and assuming that about the same number of maps are available for mailing, we rather recommend that overall effectiveness could be enhanced by addressing single copies to the mayors or managers of the 58 municipalities in categories A through E (table 9), and to personnel of the City of Pittsburgh, with second copies addressed to the engineers of the same municipalities. In addition, copies similarly addressed should be sent to the few known effective exceptions in category F. Only if numbers of maps available for distribution are in excess of requirements for the recommended mailings should maps be sent to the other category-F municipalities, for it appears that most of these maps will find no application and so be essentially a waste.

Relative to face-to-face conferences after map distribution, it is not necessary that persons who prepared the maps make these contacts. We conclude that it has been demonstrated that the "translator" of environmental maps can contribute significantly to achievement of the overall goals of the map "producers." Persons with planning backgrounds, such as the first author, appear particularly well suited for this function. However, with modest training and orientation, it is believed that high-school science teachers and recent geology graduates probably also would make good translators, and we recommend that their capabilities for the purpose be tested.

The municipal categories (table 9) are guides to application of translator effort. If available effort is limited, then a choice might be made, for example, to apply it to enhancement of effectiveness of map use in municipalities of category E. If such effort can be applied on a large scale, then it might be suitable to apply it to municipalities of category F, where environmental awareness is least and environmental education most needed.

From the Allegheny County experience, the categories of effectiveness defined by area and population probably can be used to guide mailings and other environmental-information activities in adjacent counties and perhaps throughout Pennsylvania.

Reference

Wissel, Peter; O'Connor, Robert; and Cigler, Beverly, 1976, The use of geological information in the Greater Pittsburgh area--summary report: The Pennsylvania State Univ. Center for the Study of Environmental Policy [Appalachian Regional Comm. Rept. ARC 74-19-2564], 23 p.

Appendix I

Maps on which the study was based

The focus for the study was provided by the packaged sets of maps mailed to each Allegheny County municipality in late 1974. The maps were on the 7.5-minute quadrangle format. If a municipality was covered entirely by a quadrangle, only maps of that quadrangle were included in the set mailed. Many municipalities require more than one quadrangle for coverage, and in such cases maps of the necessary quadrangles made up the set.

Map subjects were: (1) landslide susceptibility; (2) land modified by man; and (3) flood-prone areas.

The following list identifies the "Landslide-susceptibility maps" and "Maps of land modified by man" by quadrangle, and authors of the maps are indicated by initials: William E. Davies--WED, John S. Pomeroy--JSP. The locations of the quadrangles are shown in figure 16. To illustrate the character of the maps, segments of landslide-susceptibility, man-modified-land, and flood-prone-area maps that cover the same small part of the county are shown in figures 17, 18, and 19.

Availability.--The open-file maps of landslide susceptibility and land modified by man, identified by number and quadrangle may be inspected at:

U.S. Geological Survey Library, National Center
12201 Sunrise Valley Drive, Reston, Virginia

Copies may be made at cost of reproduction from transparencies on file at:

Department of Planning and Development, County of Allegheny
Allegheny Bldg., Room 1200, 429 Forbes Avenue
Pittsburgh, Pennsylvania

Copies of flood-prone-area maps, identified by quadrangle, may be acquired free on application to:

U.S. Geological Survey, Water Resources Division
P.O. Box 1107, Harrisburg, Pennsylvania 17120

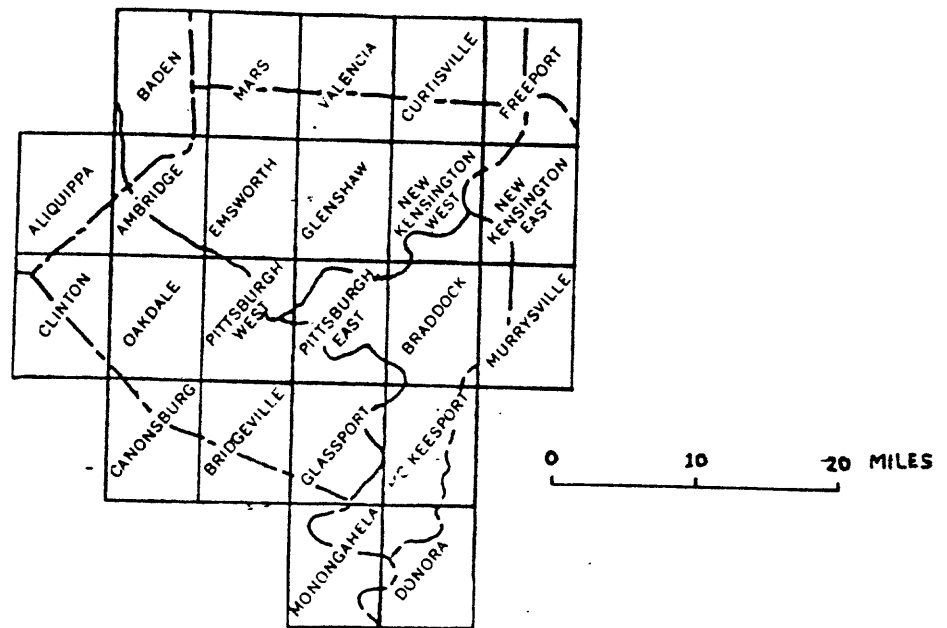


Figure 16.--Index to 7½-minute quadrangles, Allegheny County and vicinity, Pennsylvania.



Figure 17.--Northeastern part of the Oakdale 7½-minute quadrangle, Allegheny County, and vicinity, Pennsylvania (USGS open-file map 74-232; see list in Appendix I). Solid black--recent landslides, smallest enclosed in triangles; dotted--prehistoric landslides; diagonal dashed lines--slopes with conspicuous soil creep; shaded--outcrop area of thick "red beds" and associated rocks; horizontal lines--man-made fill, smallest indicated by F; no pattern or symbol--relatively stable ground.

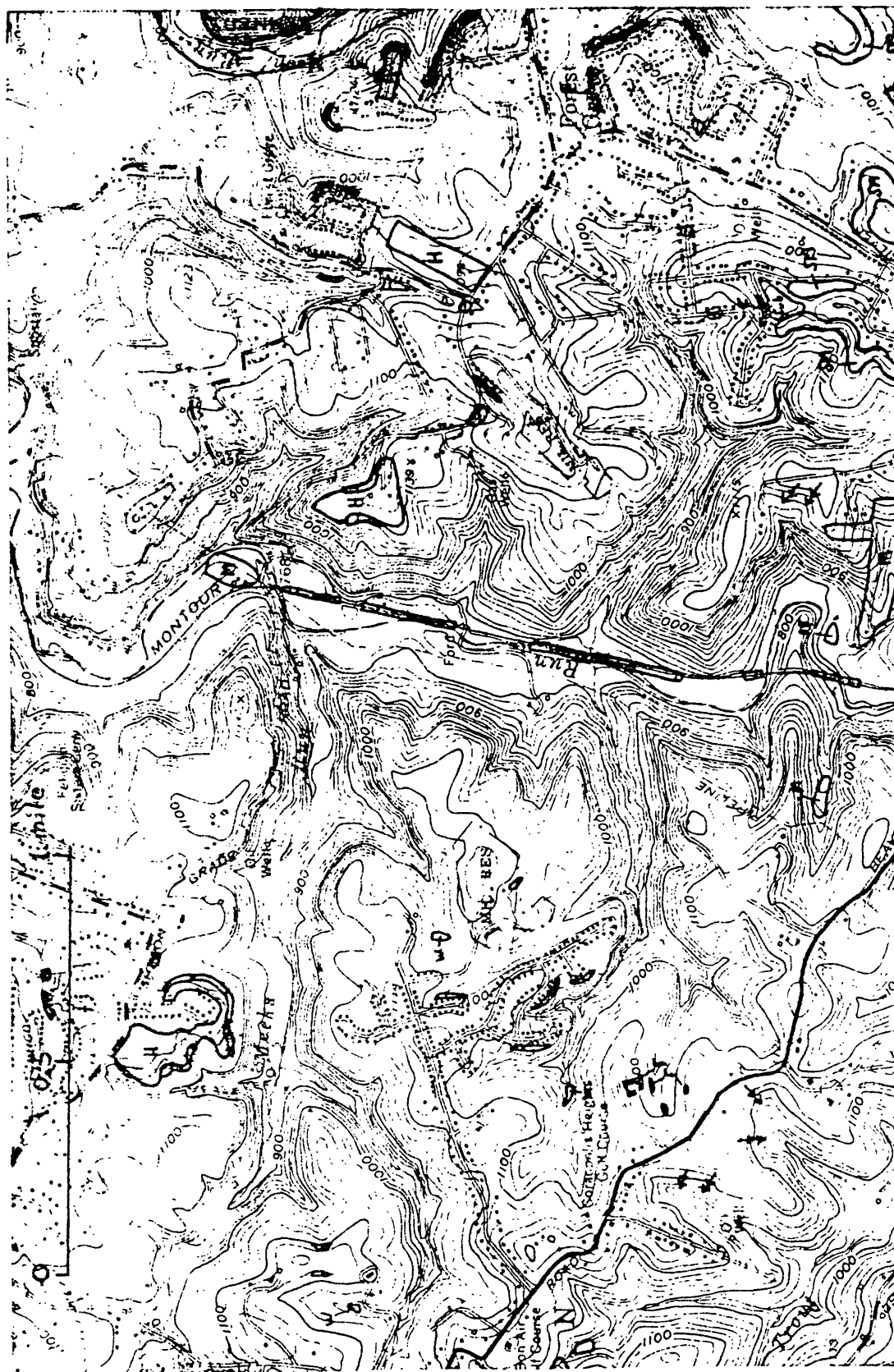
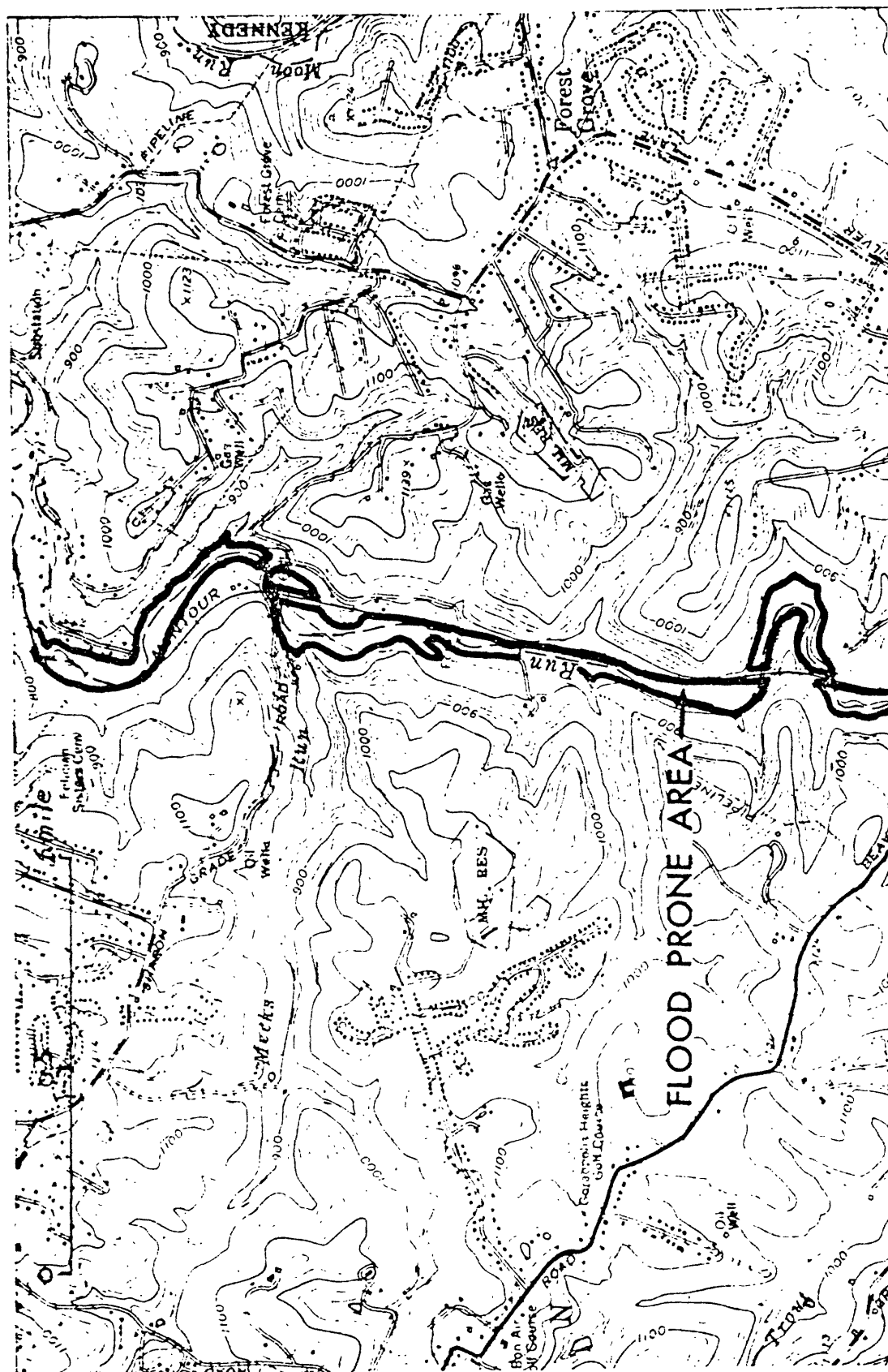


Figure 18.--Northeastern part of map of man-modified land in the Oakdale 7½-minute quadrangle, Allegheny County and vicinity, Pennsylvania (USGS open-file map 74-233; see list in Appendix I). SM--surface (strip) mine, not reclaimed; SMr--surface mine, reclaimed by grading; Sub--mine subsidence; RB--mine-refuse banks; H--urban development; M--predevelopment modification; T--land modified for transportation; horizontal lines--earth and rock fill, smallest indicated by F; W--water impoundments; double arrows--gullied land.



Aliquipp (part of)--JSP	74-120(both subjects on one map)	
Ambridge--JSP	74-76	74-74
Baden (part of)--JSP	74-121(both subjects on one map)	
Braddock--JSP	74-273	74-285
Bridgetown (part of)--WED	74-274	74-286
Canonsburg (part of)--WED	74-275	74-287
Clinton (part of)--WED	74-234(both subjects on one map)	
Curtisville (part of)--WED	74-276	74-288
Donora (part of)--WED	74-277	74-289
Emsworth--JSP	74-75	74-73
Freeport (part of)--WED	74-278	74-290
Glassport--WED	74-279	74-291
Glenshaw--JSP	74-118	74-119
Mars (part of)--JSP	74-114	74-115
McKeesport--WED	74-280	74-292
Monongahela (part of)--WED	74-281	74-293
Murrysville (part of)--WED	74-282	74-294
New Kensington East (part of)--WED	74-283	74-295
New Kensington West--WED	74-284	74-296
Oakdale--JSP	74-232	74-233
Pittsburgh East--JSP	74-229	74-231
Pittsburgh West--JSP	74-228	74-230
Valencia (part of)--JSP	74-116	74-117

Appendix II

Questionnaire for interviews

The basic content of the questionnaire was readily established by the purpose of the study, to find what became of the subject maps.

However, information from the CSEP study of municipal perceptions and attitudes (Wissel and others, 1976) enabled appreciable refinement. The CSEP estimates of environmental data needs related to local land use decisions derived from completion of their mailed questionnaires (or from failure to do so), and information garnered about type and level (even competence) of community planning were of particular interest and value.

The separate questionnaire for the municipal secretary was found to be unnecessary and was discarded early in the study. Central to the development of the other questionnaire were a number of considerations. It must:

- (1) clearly establish to the interviewee that the maps in question were prepared to assist municipal decision makers and technical staff, not to dictate to them what their decisions should be;
- (2) convey to the interviewee the significance of environmental maps for use in all municipalities, no matter what their area, population, and governmental class;
- (3) obtain information on environmental problems from the perspective of the interviewee as a means of determining the potential usefulness of different types of environmental maps and reports;
- (4) solicit negative as well as positive criticism of the maps for the purpose of suggesting improvements for succeeding products;
- (5) utilize open-ended questions to encourage the interviewee's free expression of attitudes and philosophies of the community; and
- (6) consider time constraints from points of view of both interviewee and interviewer.

In the resulting questionnaire, open-ended questions allowed abbreviation or lengthening of discussion, dependent on the interviewees general response to the interview situation. Maximum time was set at 40 minutes. Broad questions to be answered by the interviews included:

- (a) Would face-to-face conferences at the municipal level enhance the use of the maps significantly?
- (b) Are there factors or parameters common to municipalities that indicate greater or lesser likelihood of effective utilization of the maps?
- (c) If so, can it be estimated that these factors or parameters would be significant indicators in other regions, such as those characterized by institutionally strong counties?

- (d) What is the effect of the free-mailing strategy on, and the response of:
- (i) Municipalities that already have maps of some kind and "comprehensive plans" (that is, municipalities with relatively high technical sophistication and capability) versus those that don't?
 - (ii) Municipalities of different classes of government?
 - (iii) Municipalities with different characteristics of areas, populations, traditions, etc?
- (e) Would personal contacts with municipalities prompt requests for services from GPRS beyond the scope of the project and the capacity of the staff?
- (f) Should future mailings be addressed to the municipal secretary or to others of the municipal staff?

Results of the interviews were summarized in tables, and interpretations were drawn therefrom. Some conclusions were reached through graphic analysis.

Appendix III

Selection of municipalities for interviews

Because time limitations made interviews of all Allegheny County municipalities impossible, selection of a sample was necessary. In addition, there existed no firm experience on just how much time would be required for contacts and interviews in individual municipalities, so it was not possible to select in advance a finite sample set commensurate with the over all time available. Therefore, a priority list of municipalities was set up for sampling in priority order as far as time permitted.

Allegheny County municipalities are diverse in area and population, and an effort was made to assure that this diversity was represented in the ultimate sample (step #1, below). Municipalities small in both area and population are very common in the county, so it was expectable that a randomly established priority list would be to a degree dominated by such municipalities. On the recommendation of Peter Wissel (CSEP, oral commun., 1975), an adjustment was made to ensure that larger municipalities also were well represented (step #3, below).

The priority list was established as follows:

- (1) Municipalities were grouped into 16 unequal sets on the basis of area and 1970 population (table 1 of text). The City of Pittsburgh was excluded owing to its extremely large population, complexity, and large area relative to the other municipalities, and two boroughs were excluded because they are largely in adjacent counties.
- (2) The order of priority of the municipalities in each set was determined by a random statistical method.
- (3) The bottom, lowest priority, half of each of the 2 sets containing municipalities equal to or less than 1 square mile in area (sets I and II) and similarly small municipalities in the bottom half of set III (table 1 of text) were then set aside, thus removing from consideration 21 small municipalities.
- (4) Each set was then assigned a priority number determined by a random statistical method.
- (5) The first-priority municipality in the first-priority set became the first municipality on the list for interviews; the first-priority municipality in the second-priority set became the second municipality; and so on, with the first-priority municipality in the sixteenth set becoming the sixteenth municipality on the list.
- (6) Succeeding municipalities on the list, through number 105, were placed by prorating the municipalities remaining in the sets across the spaces available, by priority of the municipalities within the sets and by priority of the sets, with due regard to the unequal numbers of municipalities within the sets. Although it was exceedingly unlikely that sampling would proceed through 105 municipalities, the 21 municipalities cut off in step #3 were placed in positions 106 to 126 by interspersed priorities, and the 3 municipalities excluded in step #1 completed the County total of 129. Among high-priority municipalities there was some geographic bias favoring parts of the county, minimized by minor reworking of the selection technique. However some bias remained; the eastern part, in particular, was over-represented.

In table 1 of the text, the total number of municipalities in each set and the number of municipalities of each set that were sampled ultimately are shown. Neither municipalities nor sets are shown in table 1 in the order of priorities determined by the above method, and to preserve anonymity the resulting countywide priority is not included.

Totals and means of municipal area, 1970 population, and population density are shown in table 13 by municipal class and by the parts of municipal classes sampled. In column 1, the disparities in mean area and mean population between all cities and boroughs and the sampled cities and boroughs reflect the conscious weighting of sample selection in favor of municipalities larger in area, because most of the smaller municipalities "cut off" in step #3 were boroughs. This also is reflected by the percent of class and class area sampled. Columns 2 and 3 suggest that as groups the townships sampled are fairly representative of their classes.

Table 13.--Total and mean area and 1970 population characteristics of municipal classes in Allegheny County compared to mean area and population of municipalities sampled.

	1. Cities of the 3d class and boroughs, undivided ^{1/}	2. Townships of the 1st class	3. Townships of the 2d class	4. All municipal classes ^{1/}
Total municipalities in class	84	26	16	126
Municipalities in sample	30	11	7	48
Percent of class sampled	36%	42%	43%	38%
Total area of class (square miles)	216.4	199.0	259.0	674.4
Area of sampled municipalities of class (square miles)	112.9	95.4	95.9	304.2
Percent of class area in sampled municipalities	52%	48%	37%	45%
Mean area, all municipalities of class (square miles)	1.3	7.6	16.2	5.4
Mean area, sampled municipalities of class (square miles)	3.8	8.7	13.7	6.3
Range in area, all municipalities of class (square miles)	0.1 to 29.7	0.5 to 21.2	2.6 to 32.8	0.1 to 32.8
Total population of class	610,730	376,300	97,200	1,084,230
Population of sampled municipalities of class	285,500	143,550	41,050	470,100
Percent of class population in sampled municipalities	47%	38%	42%	43%
Mean population, all municipalities of class	7,300	14,500	6,100	8,600
Mean population, sampled municipalities of class	9,500	13,100	5,900	9,800
Range in population, all municipalities of class	154 to 37,977	558 to 62,866	1,694 to 18,317	154, to 62,866
Mean population density, all municipalities of class (persons, square mile)	2,800	1,900	380	1,600
Mean population density, sampled municipalities of class (persons, square mile)	2,500	1,500	430	1,550
Range in population density, all municipalities of class (persons square mile)	110 to 16,100	420 to 6,600	140 to 970	110 to 16,100

^{1/} Does not include City of Pittsburgh, owing to size and complexity, and Boroughs of McDonald and Trafford, because they are partly in adjacent counties. Includes 3 cities and 81 boroughs.

Appendix IV

Interview methods

On arrival at the municipal building or other place of municipal business, the interviewer asked for the municipal secretary or, if the secretary was absent, she spoke to whoever appeared in charge. She introduced herself as a U.S. Geological Survey Land-use Assistant operating out of GPRS headquarters in the Borough of Carnegie in Allegheny County, and stated her reasons for the visit without subterfuge. If this first person contacted could identify the individual to whom the subject maps were given or, alternatively, a person involved with land-use matters, the interviewer asked to see that individual. If he or she was not immediately available, then an appointment with or the location of the individual was requested.

Interviews largely were in municipal buildings, the common term in Pennsylvania for what might be called town or city halls elsewhere. A few were in the interviewee's residence, from which municipal business was conducted, and a number took place at the offices of engineering consultants to the municipalities.

In addition to the questionnaire, the interviewer carried copies of the subject maps relevant to the municipality and copies of other recent products distributed by mail by GPRS. They were in GPRS covering envelopes, which served as a visual reminder of the maps to the municipal personnel. She also carried packets which contained a booklet and pamphlets describing U.S. Geological Survey functions and activities; a list of available GPRS products; and an index to topographic maps for Pennsylvania. One such packet was left with each municipality for their information and "good will".

The interviewer wrote responses and observations directly on the questionnaire, unless the interviewee indicated by manner of discomfort or express statement (the latter on one occasion only) a reluctance to be quoted. Following the interview, what had been said was reconsidered and additional observations were recorded on the questionnaire.

Guiding interviews were the following specific thoughts:

- (1) The interviewee must be at ease throughout regarding the interviewer's impartiality to any views expressed; care was taken to impart no criticism of local decisions in environmental matters.
- (2) Even a minimum amount of information given by the interviewee was acceptable. Certainly when the interviewee became reticent on a particular matter, tact dictated no further questioning on that matter. In other parlance, the approach was "soft-sell" rather than "hard-sell."
- (3) Some reassurance was called for if an individual felt lacking in skills toward comprehension of the subject maps, for certainly a secondary goal or indirect result of the municipal visits should be educational, encouraging local use of environmental information.