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INTRODUCTION

The staff of the Cornell University Remote Sensing Program has been actively promoting the application of aircraft and satellite remote sensing through conferences, seminars, newsletters, news releases, instruction, and action- or benefit-producing demonstration projects. Staff accomplishments during the past six months, from June 1 to November 30, 1977, are reviewed in this Semi-Annual Status Report, the eleventh to be submitted to NASA since the Program's inception in June 1972.

COMMUNICATION AND INSTRUCTION

Contacts and Cooperators

Over the past six months, members of the Program staff have spent many hours in discussion with representatives of various federal, state, county and local agencies, public and private organizations, the academic community, and foreign countries. These conferences with past, present and potential users, as well as with cooperators and other visitors, continue to occupy a central role in the conduct of the Cornell Remote Sensing Program.

During the fall semester, Program staff served as host to seminar speakers from six federal agencies, the Canadian Centre for Remote Sensing, two private companies, and one other university (Appendix H); to members of the Central New York Region of the American Society of Photogrammetry; and to visitors from universities in Australia and England. Program staff also held orientation sessions for visiting members of the St. Lawrence Section of the American Society of Engineering Education and for some 30 foreign participants in an AID-sponsored workshop on science, technology and development (see below and Appendix H).

In addition to receiving project cooperators from the Soil and Water Conservation District of Yates County, N.Y., the Planning Department of Columbia County, N.Y., the New York State Department of Environmental Conservation, the New York State Soil and Water Conservation Committee, and the Eastern Region of The Nature Conservancy, Program staff traveled to discuss projects with officials of Seneca County, N.Y., and Yates County, N.Y. As in the past, many new and continuing dialogs were held via the mail and telephone, especially for the purpose of providing consultations on remote sensing (Appendix F).

Newsletters and News Releases

The Program's "Cornell Remote Sensing Newsletter" is now received monthly by approximately 350 individuals or groups in some 30 states and 14 foreign countries (Appendices I and J). Begun in

September 1972, the Newsletter continues to provide a valuable link with the Cornell community and off-campus cooperators.

Over the past six months, Program investigations have been the subject of nationally distributed news releases. In articles prepared for the Eastman Kodak Company, Program work on assessing aquatic vegetation has been reported in several sources, including "Electro-Optical Systems Design," "Environmental Science and Technology," and "The Professional Photographer"; and an earlier study of landfill leachate detection was reported in "Solid Wastes Management" (Appendix G).

The Program's ongoing analysis of dam inspection methodologies was recently publicized by Cornell's Public Information Division. This led to an "on-the-air" interview with an all-news radio station in Buffalo, N.Y. (WEBR) and state-wide newspaper reports. The radio interview emphasized the application of satellite data for dam inventory (Appendix G).

Seminars

Because of an error in the University's course roster listings for the fall semester, student registration in the Program's Seminar in Remote Sensing was substantially below that of previous semesters. As the semester progressed, however, attendance at the weekly seminars increased from the 15 registered students to approximately 30. The increase in attendance is attributed to the interest generated by a highly varied list of topics and to the quality of speakers--invited experts from government, industry and other institutions (Appendix H).

Courses, Special Studies and Orientation Sessions

The Seminar in Remote Sensing is part of a complete curriculum in aerial photographic studies, photogrammetry and remote sensing. In addition to taking regular formal courses, students may also perform independent study or research in these subject areas through special topics courses, professional masters design projects, or through M.S. or Ph.D. theses. A relatively high proportion of students who major, minor or simply take courses in these areas is made up of foreign students. Countries represented by current graduate students in these areas are Australia, Nigeria, Philippines, Thailand, Trinidad and Tobago, United Kingdom, and Venezuela. As noted in earlier reports, a university education in remote sensing serves to complement the shorter term training that representatives of these countries may receive elsewhere.

Cornell University receives many visitors each year, and members of the Program staff are frequently called upon to give formal and informal orientation sessions on remote sensing. During the past six months, for example, sessions were held for the St. Lawrence Section of the American Society of Engineering Education, which

includes educators and practicing engineers from Ontario, Quebec and upstate New York, and for participants in the AID-sponsored Multi-Regional Project on Science, Technology and Development, which included high-level representatives of some 30 countries (Appendix H).

DATA AND FACILITIES

Staff research and instruction have been enhanced through acquisition and expansion of capabilities for analyzing and interpreting a wide range of remotely sensed, aircraft and satellite data. These data, along with the Program's facilities and equipment for their analysis, are made available at no cost to cooperators, students and other interested users.

With assistance from the NASA Office of University Affairs, the Program has received Landsat, Skylab, high-altitude and low-altitude coverage of sites in the Northeast. The U.S. Environmental Protection Agency has also overflown Program-selected sites at no cost to the Program; and imageries have been obtained from the U.S.A.F. Rome Air Development Center, the U.S. Geological Survey, the U.S. Department of Agriculture, the St. Lawrence Seaway Development Corp., the National Air Photo Library of Canada, the Tri-State Regional Planning Commission, the National Archives and several commercial firms.

The Program maintains or has access to a spectroradiometer and selected image analysis equipment (i.e., zoom and non-zoom stereoscopes, density slicer, color-additive viewer, Zoom Transfer Scope, densitometer, stereoplotters, and other photogrammetric and photographic instruments). The Program also maintains a series of computer routines for analyzing multispectral digital data. During the past six months, these routines have received increased usage in Program-sponsored and spinoff investigations with Landsat data. In line with the increased emphasis on computer analysis, the Program staff is preparing a proposal to the National Science Foundation for a grant to develop an interactive digital image analysis facility at Cornell.

PROJECTS COMPLETED

Staff of the Cornell Remote Sensing Program completed four projects, and assisted in a fifth, during the six-month period, June 1 to November 30, 1977. The projects are summarized here, and pertinent material on each is included in an appendix.

1. Evaluation of Proposed Fly Ash Disposal Sites
2. Development of Priorities for Drainage Improvements
3. State Park Analysis for Rehabilitation and Development
4. Watershed Study for Water Quality Planning
5. Assistance Project--Landfill Site Selection

1. evaluation of proposed fly ash disposal sites

At the request of a representative of the New York State Public Service Commission (PSC), the agency which regulates public utilities in the state, Program staff examined four sites that had been proposed by a power company for the disposal of power plant fly ash (Appendix A). Using published soil and geologic data to supplement an analysis of high and medium altitude aerial photographs, Program staff assessed the land use/cover, drainage conditions and soil depths at each site. This information has been provided to the power company through the formal testimony of the PSC geologist during public hearings on the proposed sites. The Program's evaluation will thus have a direct bearing on site selection and subsequent development.

2. development of priorities for drainage improvements

At the request of the Manager of the Soil and Water Conservation District, Seneca County, NY, Program staff developed priorities and materials required for planning county-wide drainage improvements (Appendix B). Using data from several sources and an enlarged Skylab photograph as a base map, Program staff prepared 1:62,500 scale, county overlays depicting: (1) major watershed boundaries, (2) general land use/cover, (3) soil drainage limitations, (4) limitations for cultivation, and (5) priority ratings for drainage improvements. The information provided to Seneca County is being used in decision-making regarding scheduling and funding for drainage/erosion control programs.

3. state park analysis for rehabilitation and development

At the request of the Deputy Commissioner for Environmental Services of the New York State Office of Parks and Recreation (OPR), Program staff completed three studies of the Allegany State Park--the largest park (65,000 acres) in the state parks system (Appendix C).

For the initial study, parkland suitability for development was evaluated on the basis of soils and botanical information derived from high and medium altitude aerial photographs and background reports. Areas were categorized according to whether detailed soil or botanical surveys would be desired or whether they were unnecessary (i.e., the areas being unsuitable for development or containing no special botanical features). Those areas recommended for detailed surveys, less than one-third of the total park, are now being examined by OPR and federal (Soil Conservation Service) personnel.

For the second study, Program staff conducted an inventory and assessment of soil borrow sites (mined areas) located within or adjacent to the park. This information, derived from high and

medium altitude aerial photographs, will be used by the OPR in requesting remedial actions by the State Department of Transportation or the U.S. Army Corps of Engineers.

For the third study, Program staff evaluated and recommended possible corridors for the North Country Trail, a potential addition to the National Trails System. The Program's recommendations will be incorporated into the decision-making process of the OPR in selecting the final route.

4. watershed study for water quality planning

At the request of an official of the New York State Soil and Water Conservation Committee and the District Manager of the Soil and Water Conservation District of Yates County, N.Y., Program staff analyzed changes in a portion of a watershed being studied in a state water quality pilot project (Appendix D). Administered through the New York State Department of Environmental Conservation, under Section 208 of the Federal Water Pollution Control Act, the state project is examining pollution control measures for three watersheds. The Program staff focused on a portion of one of the watersheds, demonstrating how land use/cover changes and stream bank erosion could be monitored using multi-date aerial photographs. The information submitted to Yates County is being used by county and state personnel in defining the causes of stream sediment and in planning remedial measures. It is probable that remote sensing techniques will be applied in further studies of these watersheds.

5. assistance project -- landfill site selection

Program staff assisted in screening a landfill site being considered by Schuyler County, N.Y., and the regional office of the New York State Department of Environmental Conservation (Appendix E). One serious objection to the proposed site is the possibility that a private cemetery had been located on the site during the late 19th century. Program staff examined 1938 and 1975 aerial photographs of the site and found no evidence of a cemetery. This was reported to the state personnel, and site investigations are proceeding.

PROJECTS IN PROGRESS

Program-Sponsored

As of December 1, 1977, the Program staff was conducting four projects under the NASA grant: (1) assessment of vineyard-related problems, (2) Landsat analysis for pheasant range management, (3) photo-historic evaluation of Revolutionary War sites and (4) thermal analysis of building insulation. The objectives, cooperators, users, expected benefits and actions, and status of these projects are described, as follows:

1. *assessment of vineyard-related problems*

-cooperators:	Taylor Wine Company and other vineyards; N.Y.S. Agricultural Experiment Station, Geneva, N.Y.; Cornell Depts. of Plant Pathology and Pomology; Eastman Kodak Co.
-users:	Taylor Wine Co. and other vineyards; N.Y.S. Cooperative Extension.
-benefits/actions:	Appropriate action by vineyards on range of problems assessed with remotely sensed data; development of remote sensing as a vineyard management tool; ultimately, improved production.
-expected completion date:	September 1978

The Program staff is examining the extent to which remotely sensed data might provide useful information for assessing vineyard-related problems. The first phase of the investigation, an evaluation of vineyard drainage, was completed and described in the Program's 7th Semi-Annual Status Report (Dec. 1975). For the second phase of the investigation, Program staff used large-scale color infrared aerial photographs to assess plant vigor. This project was discussed in the Program's 9th Semi-Annual Status Report (Dec. 1976). Follow-up studies of vineyard siting, crop vigor and practical monitoring techniques are being initiated using low-altitude, multispectral aircraft data acquired for the Program by NASA during the summer 1977.

2. *Landsat analysis for pheasant range management*

-cooperator/user:	N.Y.S. Dept. Environmental Conservation
-benefit/action:	Landsat and other remotely sensed data will be used by state in developing a statewide pheasant range management plan
-expected completion date:	Methodology - Sept. 1978

The Program staff is working closely with the New York State Department of Environmental Conservation to develop the most appropriate methods for inventorying land covers that are thought to influence pheasant populations. A letter which describes the study was contained in the previous semi-annual status report and is included again here for completeness (Appendix F). Because of the size of the area that will ultimately be surveyed--a major portion of New York State--Landsat data were judged to be the best potential source of land cover information. Program staff efforts are concentrating on extracting requisite information from the

Landsat computer-compatible tapes. If these efforts are successful, less costly means for extracting the information will also be evaluated.

3. *photo-historic evaluation of revolutionary war sites*

-cooperators/users:	Historians in Fulton and Montgomery Counties, N.Y.
-benefit/action:	Remote sensing might provide new or refined information on Revolutionary War sites; information would be used in publications and displays
-expected completion date:	June 1978

The Program staff is working with historians in Fulton and Montgomery Counties, N.Y., to better define the setting of the Battle of Stone Arabia, fought during the Revolutionary War, in 1780. A letter describing the study and the intended use of new findings is included in Appendix F. Program staff efforts are presently aimed at deriving historical information from existing aerial photographs of the area.

4. *thermal analysis of building insulation*

-cooperator/users:	Cornell Physical Plant Operations Cornell Univ.; Public Utilities
-benefits/actions:	Improved building insulation where required, with decreased energy losses and heating/cooling costs; possible survey implementation by utilities
-expected completion date:	January 1979

With Program staff assistance, Cornell's Physical Plant Operations (PPO) contracted for an airborne thermal survey of campus steamlines (6th Semi-Annual Status Report, June 1975). After studying the thermal data for steamline leaks, personnel of the PPO requested that the Program utilize the data to evaluate roofing insulation of campus buildings. With these data as a focal point, the Program staff began a study to develop an airborne survey/analysis methodology which would characterize roofing materials as well as insulation needs. Toward this end, the Program requested NASA to overfly the campus area during the winter and spring of 1976. Only the spring mission was flown, and the data were not supplied to the Program until five months after the mission. These delays were accompanied by changes in personnel and initiation of projects with more immediate "payoffs." Further, during this period, many similar studies were conducted by other research groups in the United States

and Canada. It is expected that the thermal investigation will be re-defined and re-initiated in the near future.

Spinoff Projects

During the past six months, members of the Program staff have been involved in three non-NASA funded projects that arose directly from Program-sponsored investigations. As a consequence of earlier studies of aquatic systems, the U.S. Department of the Interior's Office of Water Research and Technology (OWRT) funded a one-year study, "Changes in Aquatic Macrophytes Accompanying Phosphorus Reduction on a Eutrophic Lake in New York State: An Assessment Based on Remotely Sensed and Other Data," and a four-month investigation, "Assessment of Aquatic Vegetation with Satellite Derived Data." The OWRT is also funding a one-year study of remote sensing techniques for assessing dam flooding hazards--work initiated under the NASA grant (see 9th Semi-Annual Status Report, Dec. 1976).

FUTURE PROJECTS

The Program staff is continually soliciting and screening new remote sensing projects--projects that the staff has not completed elsewhere for another user, projects that will not compete unduly with private companies or consultants, and projects that, if completed successfully, will produce tangible benefits or actions by definable users. Among the topics under current consideration are:

1. With the *N.Y.S. Department of Environmental Conservation*--develop remote sensing methodology for statewide monitoring of extractive industries (all mining, including sand and gravel operations).

2. With the *N.Y.S. Department of Health*--refine remote sensing techniques for evaluating mosquito breeding sites in New York State (Appendix F).

3. With the Eastern Region of *The Nature Conservancy*--develop guidelines on the applicability of remote sensing for conducting specific tasks.

4. With the *Planning Board of Columbia County, N.Y.*--various topics, including the identification of active agriculture and/or prime lands as bases for redefining agricultural districts in the county (Appendix F).

Depending on user interest, personnel and available funds, any of these as well as other projects may be undertaken.

PROGRAM STAFF

The Program staff includes Prof. Ta Liang, principal investigator, Prof. Arthur J. McNair and Dr. Warren R. Philipson, co-investigators, Messrs. Thomas L. Erb and Brian L. Markham, research specialists, Ms. Josephine Ng, data analyst, Ms. Deborah Halpern, photographic laboratory technician, and Ms. Pat Webster, secretary. Prof. Donald J. Belcher and Dr. Ernest E. Hardy are general consultants to the Program and, for specific projects, assistance has been provided by many Cornell and non-Cornell personnel. Among those at Cornell, special mention is due Mr. Carl Diegert, of the School of Operations Research and Industrial Engineering. Students who have contributed to the Program staff effort over the past six months include Ronald J. Linkenheil, Timothy L. Roberts, Jeffrey R. Gregrow, Ann E. Russell, Laurie B. Schuller, David W. Adams, David Fernandez and Mary E. Musgrave.

LIST OF APPENDICES

APPENDIX A

EVALUATION OF PROPOSED FLY ASH DISPOSAL SITES

PHYSICAL EVALUATION OF PROPOSED FLY ASH DISPOSAL SITES IN TOMPKINS AND NIAGARA COUNTIES, NEW YORK

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ACKNOWLEDGMENTS

The site analyses described in this report were completed by Timothy L. Roberts at the request of William D. Lilley of the Office of Environmental Planning, N.Y.S. Public Service Commission. The work was supported by NASA Grant NGL 33-010-171.

Ta Liang
Professor and
Principal Investigator

INTRODUCTION

This demonstration project was undertaken to assist the Office of Environmental Planning of the N.Y.S. Public Service Commission in its efforts to minimize the impact of power plant fly ash disposal through proper selection and/or design of the disposal site. Toward this end, the physical environments at four proposed disposal sites in Tompkins and Niagara Counties, N.Y. (Figs. 1, 2, 3, and 4), were evaluated using multi-date, multi-scale aerial photography. The environmental parameters assessed for each site included land covers/uses, drainage conditions and soil depths.

METHODS AND MATERIALS

Primary information on the proposed fly ash disposal sites, which range from 110 to 185 hectares (270 to 460 acres), was derived through stereoscopic analysis of the aerial photographic coverage listed in Table 1.

Depths of soil over bedrock and drainage conditions were interpreted from an analysis of topography, erosion, tone, texture and vegetation. Supportive data on soil depths in the Niagara area were provided by a ground water report by Johnston (1964)*.

Ground water levels were interpreted as being high year-round, seasonally high, or low year-round through comparison of the seasonal photographic coverage (Table 1). Acetate overlays to the multi-date photographs of each site were prepared indicating the locations of possible springs, wet areas, and functioning tile drains. For this purpose, the high-altitude aircraft coverage was first enlarged photographically from a scale of approximately 1:130,000 to 1:24,000. Information on the separate overlays for each date and site was transferred to a composite site overlay, at a scale of 1:24,000, using a Zoom Transfer Scope (Fegs. 2, 3, and 4).

Site information on the existing land cover types and the number of residences that would be displaced by site development was derived from the most recent photographic coverage available for the study, the high altitude aircraft photographs (Table 1). The percentage of each land cover/use was determined for each site using a grid to estimate relative areas.

RESULTS AND DISCUSSION

The analyses of the four proposed fly ash disposal sites are summarized in Table 2 and Figures 2, 3, and 4. Ground water level, depth of soil over bedrock, land cover/use, and number of residences displaced at each site are compared in Table 2.

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*Johnston, R.H. 1964. Ground water in the Niagara Falls area, New York; With emphasis on the water-bearing characteristics of the bedrock. Bull. GW-53. U.S. Geological Survey for the N.Y. Conservation Dept. Water Resources Comm.

Three conditions of ground water level--high year-round, seasonally high, and low year-round--were distinguished. Depth to bedrock was also grouped into three categories: shallow, 0 to 1.5 meters (0 - 5 feet), 1.5 to 6 meters (5 - 20 feet), and deep, over 6 meters (20 feet). Four types of land cover/use were recognized, and their relative areas measured: crop, pasture, forest and landfill. The number of farm and non-farm residences that would be displaced by site development is also tabulated. Land cover data represent the situation as of the date of the most recent photography, June 1973 for the Niagara County sites and May 1975 for the Tompkins County sites.

The locations of possible springs, wet areas and functioning tile drains are shown in Figures 2, 3, and 4, which are copied portions of U.S. Geological Survey, 1:24,000 scale, topographic maps (Barker, Ludlowville and Trumansburg) and map overlays.* Because of the association between wet areas and possible springs, no attempt was made to distinguish between these areas. In contrast, tile drains, observed only at the Tompkins County sites, were included in a separate figure to facilitate the analysis of wetness.

In conclusion, it is emphasized that all information contained in this report was derived through aerial photographic interpretation and is subject to field verification.

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* Because of distortions in the copying process (xerox), the actual topographic maps should be used for follow-up site investigations with the overlays.

Table 1. Aerial photographic coverage used for analysis of proposed fly ash disposal sites.

Site	Coverage	Approx. Scale	Date	Source*
Tompkins Co. 1	panchromatic prints	1:20,000	25 Oct 54	USDA
	panchromatic prints	1:24,000	28 Apr 67	LUNR
	color infrared film	1:130,000	7 May 75	NASA
Tompkins Co. 2	Idem panchromatic prints	Idem 1:20,000	Idem 6 July 64	Idem USDA
Niagara Co. 1 and 2	panchromatic prints	1:24,000	28 Apr 68	LUNR
	color infrared film	1:130,000	2 June 73	NASA

* USDA - U.S. Department of Agriculture; LUNR - N.Y.S. Land Use and Natural Resources Inventory; NASA - National Aeronautics and Space Administration

Table 2. Environmental analysis of proposed fly ash disposal sites based on aerial photographic interpretation.

Site	Level of Ground Water	Depth to Bedrock*	Land Cover and/or Use**	No. Residences Displaced
Tompkins Co. 1	seasonally high	medium	crop, 84% forest, 10% pasture, 6%	1 farm and 1 non-farm
Tompkins Co. 2	seasonally high to high year-round	medium to deep	crop, 74% forest, 10% landfill, 16%	none
Niagara Co. 1	seasonally high	medium	crop, 100%	1 farm and 1 non-farm
Niagara Co. 2	high year-round	medium	crop, 85% forest, 15%	none

* medium, 1.5 to 6 meters (5-20feet); deep, over 6 meters (20 feet)

** land cover/use in Tompkins County based on 7 May 1975 photography; in Niagara County, based on 2 June 1973 photography

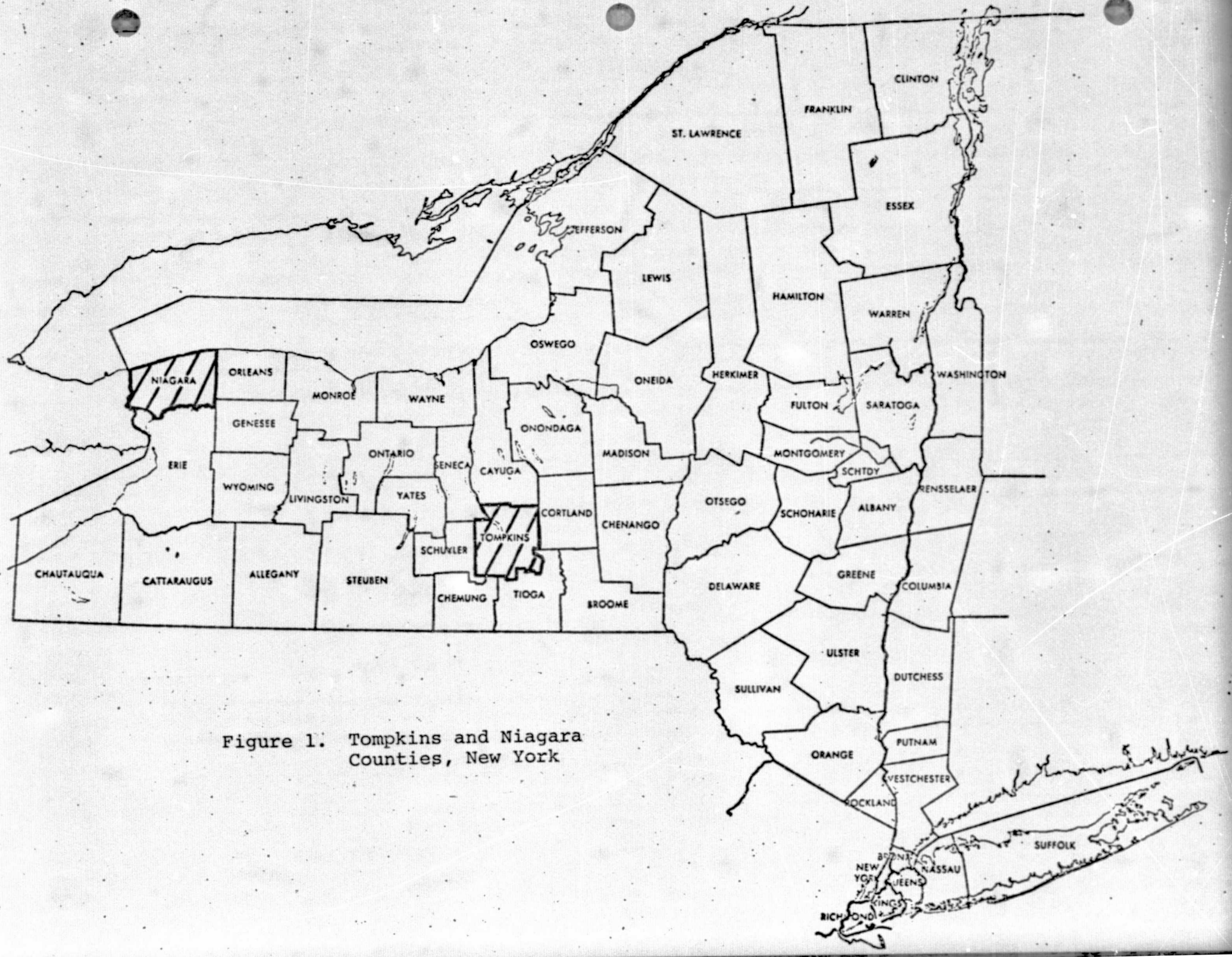

Figure 1. Tompkins and Niagara Counties, New York

Portions of
LUDLOWVILLE QUADRANGLE
TRUMANSBURG QUADRANGLE
NEW YORK
7.5 MINUTE SERIES TOPOGRAPHIC

Figure 2a
Tompkins County Sites 1 and 2

SCALE 1:24000

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

- N -

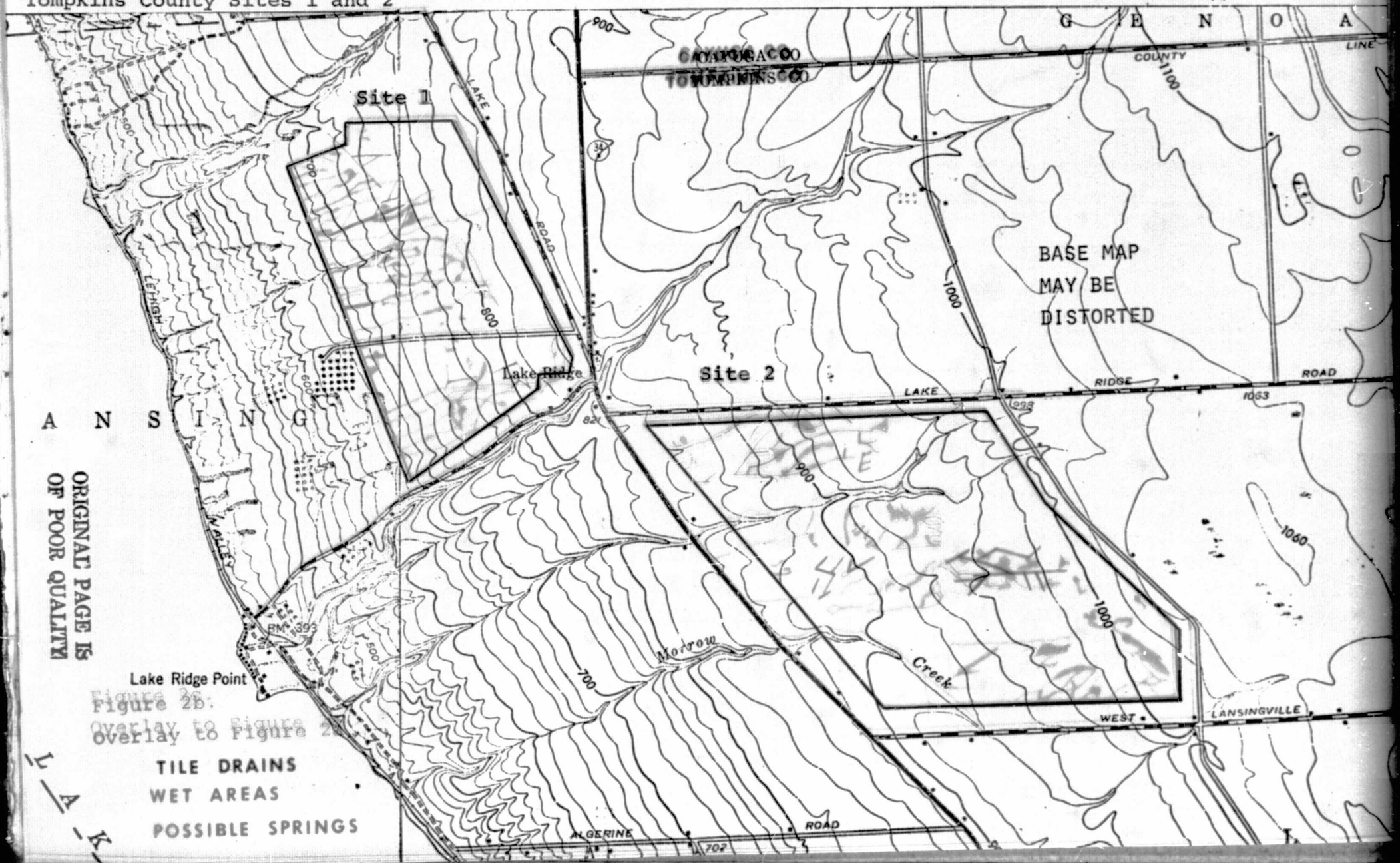

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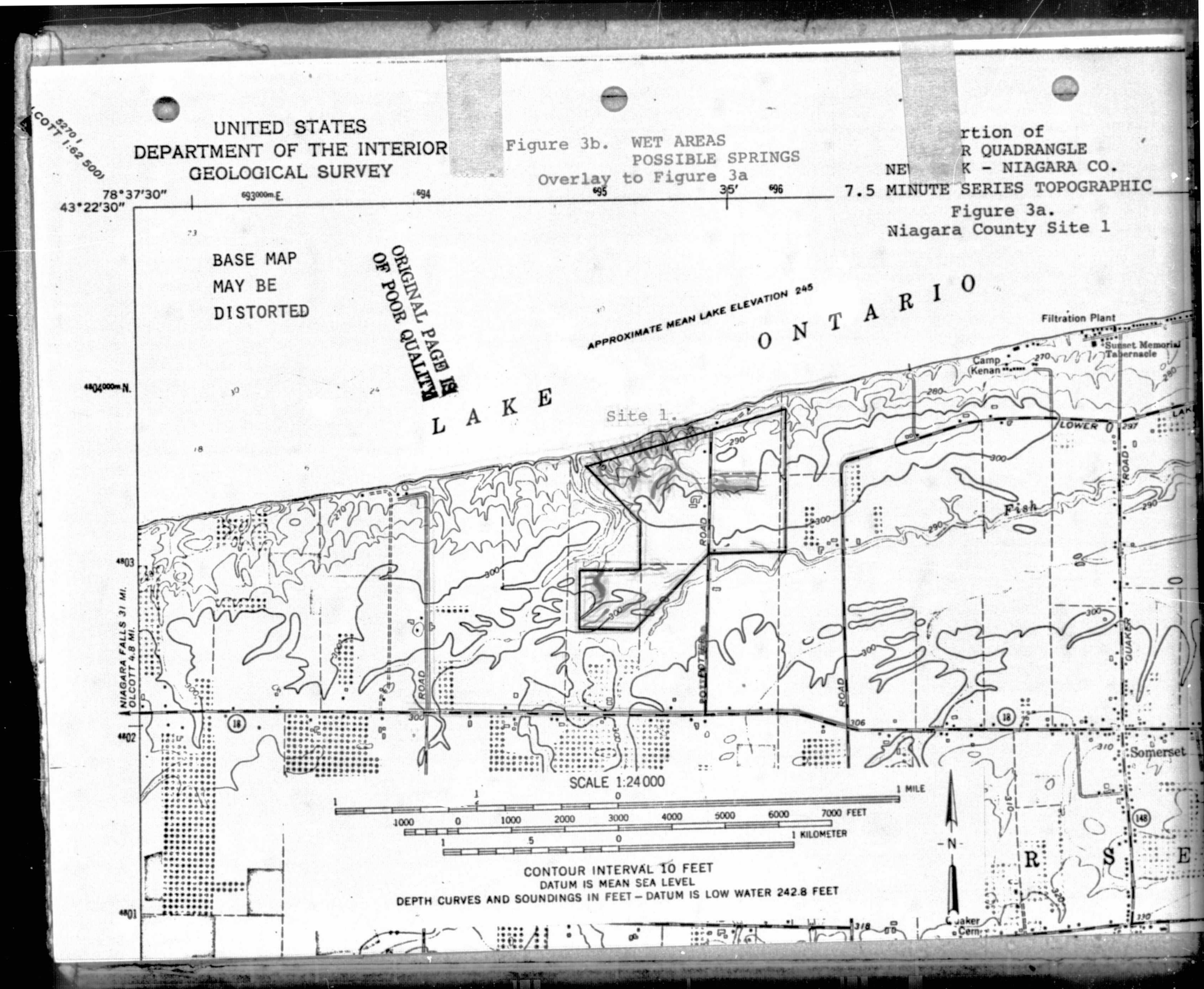
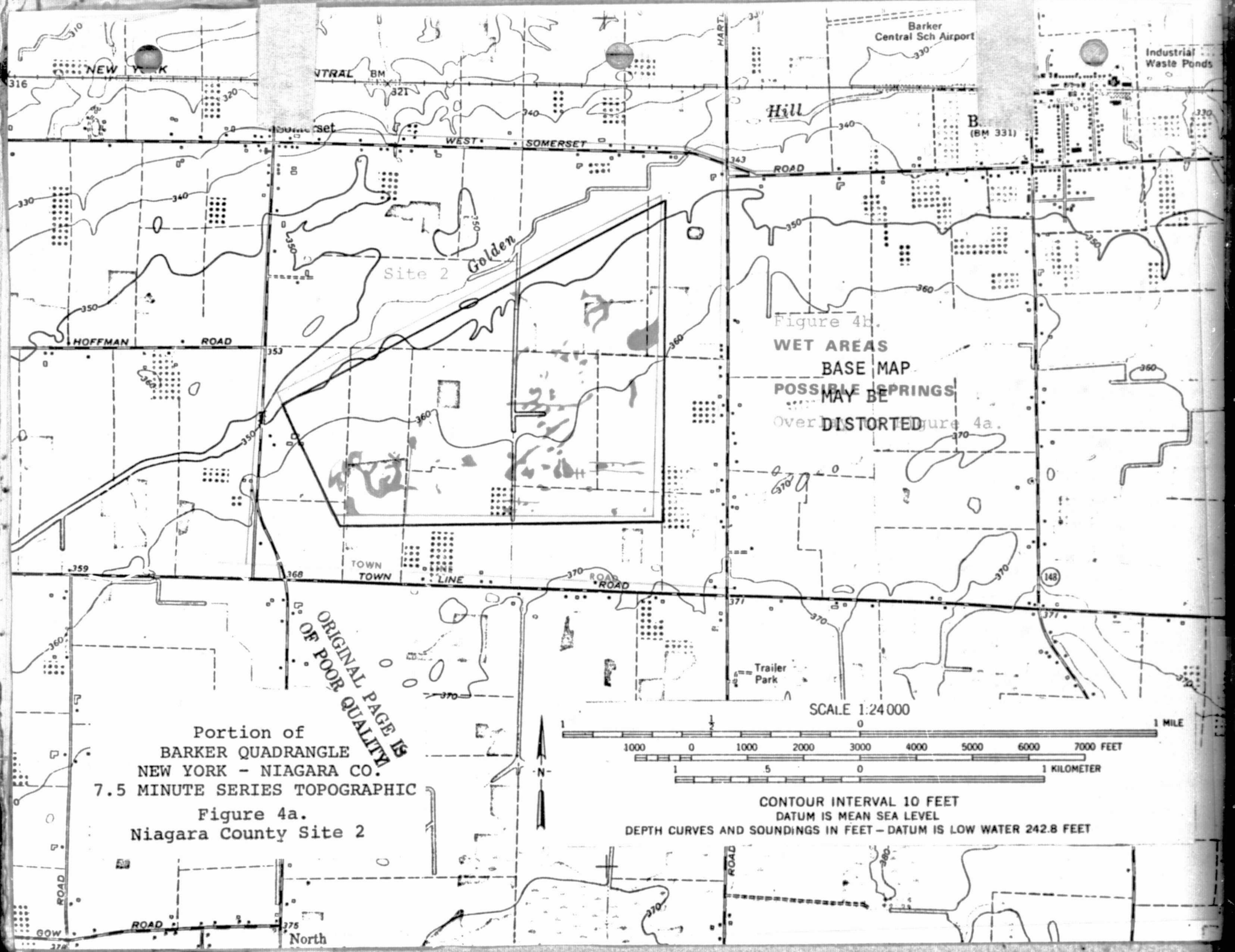
Figure 2b.
Overlay to Figure 2a

TILE DRAINS
WET AREAS
POSSIBLE SPRINGS

L A K E


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Figure 3b. WET AREAS
POSSIBLE SPRINGS
Overlay to Figure 3a
rtion of
R QUADRANGLE
NE K - NIAGARA CO.
7.5 MINUTE SERIES TOPOGRAPHIC
Figure 3a.
Niagara County Site 1
78°37'30"
43°22'30"
693000m E.
694
695
35'
696
4804000m N.
4803
4802
4801
BASE MAP
MAY BE
DISTORTED
ORIGINAL PAGE IS
OF POOR QUALITY
APPROXIMATE MEAN LAKE ELEVATION 245
ONTARIO
LAKE
Site 1.
Filtration Plant
Sunset Memorial Tabernacle
Camp Kenan
LOWER
ROAD
Fish
ROAD
ROAD
QUAKER
Somerset
NIAGARA FALLS 31 MI.
OLCOTT 4.8 MI.
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
DEPTH CURVES AND SOUNDINGS IN FEET – DATUM IS LOW WATER 242.8 FEET
N
R
S
E
Quaker Cem.



Portion of
BARKER QUADRANGLE
NEW YORK - NIAGARA CO.
7.5 MINUTE SERIES TOPOGRAPHIC

Figure 4a.
Niagara County Site 2

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OF POOR QUALITY

Figure 4b.
WET AREAS
BASE MAP
POSSIBLE SPRINGS
MAY BE
DISTORTED
Overlay for Figure 4a.

APPENDIX B

DEVELOPMENT OF PRIORITIES FOR DRAINAGE IMPROVEMENTS

PRIORITIES FOR DRAINAGE IMPROVEMENTS IN SENECA COUNTY, NEW YORK

Remote Sensing Program
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September 1977

PREFACE

This study was performed at the request of Mr. William J. Cool, District Manager of the Seneca County Soil and Water Conservation District, N.Y. The work was sponsored by NASA Grant NGL 33-010-171 and completed by Mr. Ronald J. Linkenheil, under the direction of Dr. Warren R. Philipson. Ms. Ann E. Russell and Ms. Laurie B. Schuller assisted in the data and photographic analyses, while Messrs. Paul Pirkle and David Adams assisted in preparing the cartographic products that accompany this report.

Ta Liang

Professor and
Principal Investigator,
Remote Sensing Program

INTRODUCTION

Like many counties in New York and other states, Seneca County, N.Y., is currently developing a county-wide drainage plan. This plan will constitute the basis for funding or scheduling the construction of new drainage facilities. In Seneca County, as in many other counties, most of the physical data required for developing a drainage plan are available; however, they were not in a form compatible with planning needs.

The objective of this project was to demonstrate how remotely sensed data, together with existing soils and map data, could be used in arriving at priorities for drainage improvements.

METHODS AND MATERIALS

A scale of 1:62,500 was selected as the most appropriate for assessing county-wide drainage needs in Seneca County. A photographic base map was prepared at this scale by enlarging a black-and-white Skylab satellite photograph, acquired on 10 September 1973 at a contact scale of 1:950,000.

Five acetate overlays to the photographic base map were compiled, depicting: (1) major watershed boundaries, (2) general land use/cover, (3) soil drainage limitations, (4) limitations for cultivation, and (5) priority ratings for drainage improvements.

Watershed boundaries, although obtainable from the existing topographic maps, were derived from a 1969 report, "Seneca County Drainage Plan," by Weaver Enterprises, Waterloo, N.Y. Major watersheds from the report were delineated at a scale of 1:62,500 using a Zoom Transfer Scope.

General types of land use/cover were identified through stereoscopic analysis of NASA high altitude, color infrared, aerial photographs, acquired on 7 May 1975 at a scale of approximately 1:130,000. The land use/cover types recognized were: water, built-up areas, forest/brushland, wetlands, and agriculture, the latter including pasture and any other undeveloped, unforested, non-wetland areas.

The overlays depicting soil drainage limitations and limitations for cultivation were derived from the 1972 Seneca County Soil Survey Report (U.S. Dept. Agriculture in cooperation with Cornell Univ. Agricultural Experiment Station). Soil series listed as poorly or very poorly drained were rated as having severe limitations; soil series listed as somewhat poorly or moderately well drained were rated as having moderate limitations; and soil series listed as well or excessively drained were rated as having slight limitations. Similarly, soil series listed

under Land Capability Class V or higher were rated as generally unsuitable for cultivation; Class III and IV soils were rated as having severe to very severe limitations; and Class I and II soils were rated as having slight to moderate limitations. Class III and IV soils were further differentiated with respect to their main limiting factor, being wetness or erosion.

In reducing the soils limitations data from the scale of the soil survey report (1:15,840) to 1:62,500, the soil mapping units were first generalized in different colors on acetate overlays. These overlays were then photographed using a 35 mm color slide (positive transparency) film (Kodak Ektachrome). The slides were projected onto a rear-view projection screen, to which had been affixed an acetate overlay with a 1:62,500 scale outline map of Seneca County. The soils limitations data were then transferred directly, there being a color overlay compiled for soil drainage limitations and a different color overlay compiled for limitations for cultivation.

The fifth overlay, designating priority ratings for drainage improvements, was derived from the combined data contained on the soil drainage, land capability and land cover overlays. Initially, areas were rated for their probable return on investments for drainage improvements, based on their drainage and cultivation limitations. These ratings are recorded in Table 1, with higher numbers associated with higher relative returns for drainage improvements.

Table 1. Priority ratings for drainage improvements based on soil limitations.

	LIMITATIONS FOR CULTIVATION			
DRAINAGE LIMITATIONS	Slight to Moderate	Severe to Very Severe		Generally Unsuitable
		wetness	erosion	
slight	1	1	1	1
moderate	3	3	2	1
severe	*	2	1	1

* Factor combination cannot occur.

Secondly, the land use/cover types were rated in accordance with their relative influence on investments versus returns for drainage improvements. These ratings are shown in Table 2, with higher numbers corresponding to a relatively higher positive influence.

Table 2. Land use/cover influence ratings as multipliers to combined soil ratings.

LAND USE/COVER	RATING
Built-up or Water	0
Forest/Brushland	1
Wetland	1
Agriculture	2

The final priority ratings were derived by multiplying a map unit's combined soil limitation rating (Table 1) by its land cover rating (Table 2). The final ratings were then compiled as: excluded (0), low (1), low to moderate (2), moderate (3), moderate to high (4), and high (6) priority for drainage improvements.

RESULTS AND DISCUSSION

Five acetate overlays to a 1:62,500 scale, photographic base map of Seneca County, N.Y., accompany this report. The overlays depict: (1) major watershed boundaries (in black), (2) general land use/cover types (in green), (3) soil drainage limitations (in blue), (4) limitations for cultivation (in red), and (5) priority ratings for drainage improvements (in brown).

The priority ratings and watershed boundary overlays are the principal inputs to county-wide drainage planning; however, all of the overlays, as well as the photographic base, provide useful information. They may be considered individually or in combinations. It is emphasized that any change (update) in the land use/cover overlay will necessitate a change in the priority ratings overlay.

Although errors in the overlays would likely have arisen in data generalization and transfer (i.e., cartographic errors) and in the photographic analysis of land cover, it is felt that the major source of any error would be in the soil survey report. The quality of the overlays is thus governed ultimately by the quality of the soil survey.

APPENDIX C

STATE PARK ANALYSIS FOR REHABILITATION AND DEVELOPMENT

NEW YORK STATE PARKS & RECREATION Agency Building 1, Empire State Plaza, Albany, New York 12238 Information 518 474 0456
Otis Lehmon, Commissioner

July 26, 1977

Mr. Warren R. Philipson
Senior Research Associate
Cornell University
Remote Sensing Program
School of Civil and Environmental
Engineering
Hollister Hall
Ithaca, New York 14853

Dear Warren:

This letter will follow up our telephone conversation suggesting additional experimental work to be done under the NASA funded remote sensing program at Cornell. We would like to request additional aerial photo services to help with an analysis and planning project for the Allegany State Park area. Our program includes planning for rehabilitation and/or potential changes in management for the entire park which is also the largest public open space holding in Western New York.

We feel that several aspects of our program requirements for Allegany State Park would constitute a new research component warranting NASA support. The project would provide the following features evaluating the applicability of satellite and/or high level aerial photography:

1. Identification of potential areas for further detailed mapping and study. The Office of Parks and Recreation has been working with the U.S.D.A. Soil Conservation Service to develop soils information and other data which would become a part of our conservation/management plans for major State Park land holdings. Our land holdings within Allegany State Park are too extensive, however, to allow SCS to provide the detailed surveillance they would normally make available for entire parks. The initial aerial photo interpretation problem is to identify the areas which are of possible interest for development so that costly SCS and OPR field work is limited to those areas which offer the greatest payoff.

2. Identification and analysis of the shoreline impacts of the Kinzua Reservoir (U.S. Army Corps of Engineers). Allegany State Park borders a substantial part of the Kinzua Impoundment. A full evaluation of the impacts of this major waterbody on newly created floodplains and shoreline lands has never been made. Additionally, specific major gravel barrow areas had been developed along the

Kinzua shorelines also within the park. We think that the need for identifying what changes had occurred in land going from upland to shoreline or mined land conditions is most important. We would use this information in the development of restoration and use programs for these areas.

3. We are interested in identifying any observable differences between our forested park lands and the Allegany National Forest in Pennsylvania which borders the entire State Park to the south. We are considering a change of forestry practices which in part would be based upon contrasting the results of practices in forested areas such as the Allegany National Park and our property. The relationship here is all the more important since these unglaciated Allegany highlands constitute somewhat different problems than those found in other areas of the State.

4. The North Country National Scenic Trail (recently proposed by the Department of Interior for Federal legislation) runs through the Allegany National Forest, Allegany State Park and then along the Finger Lakes Trail to the north of the park. It would be important at this stage of the North Country National Scenic Trail project to identify the best corridor for this important component of the National Trail System. Aerial photo interpretation could be especially helpful in identifying open space corridors which would link to the State Park.

I will be happy to provide additional information on any of these study proposal components. We suggest that the project would have sufficient national experimental significance to warrant your undertaking the required aerial photo interpretation work during the next year. I understand that in addition to the standard ERTS coverage, you might be able to obtain U-2 photography to perform this work. If this is possible, we would appreciate if two additional sets of aerial photos could be ordered so we could undertake field work at the park and research in our Albany office to coordinate with your efforts. We would be happy to pay for these duplicates. Thank you for your consideration.

Sincerely,

Ivan P. Vamos
Assistant Commissioner for
Environmental Affairs

IPV/dg

cc: R. Block
H. Dyer

Cornell University
REMOTE SENSING PROGRAM
SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING
HOLLISTER HALL
ITHACA, NEW YORK 14853
(607) 256-4330, 256-5074

9 September 1977

Mr. Ivan P.Vamos
N.Y.S. Parks & Recreation
Agency Bldg. #1
Empire State Plaza
Albany, NY 12238

Dear Ivan:

I have enclosed our first submissions on the Allegany State Park study. In accordance with your request, we have identified areas of the park which might be singled out for more detailed soil and botanical surveys.

The soil survey recommendations are based on the Cattaraugus County, New York, Soil Survey (issued March 1940, Series 1935, No. 12), with generalized soil areas confirmed through photo interpretation. The botanical survey recommendations are based entirely on (older) literature--the photographs on hand provide no supporting evidence. The principal references on park botany are:

(1) N.Y.S. Museum Handbook 17, 1937. pp. 1-412.
(2) House, H.D. and W.P. Alexander. 1927. Flora of the Allegany State Park Region. N.Y.S. Museum Handbook 2. pp. 1-225.

The botanical information was compiled by Ann E. Russell, who has left Cornell, and the soils information was compiled by Ronald J. Linkenheil and myself. Mr. Linkenheil prepared the mosaics and overlays.

We will begin other phases of the study as soon as possible.

Very truly yours,

Warren

Warren R. Philipson
Sr. Research Associate

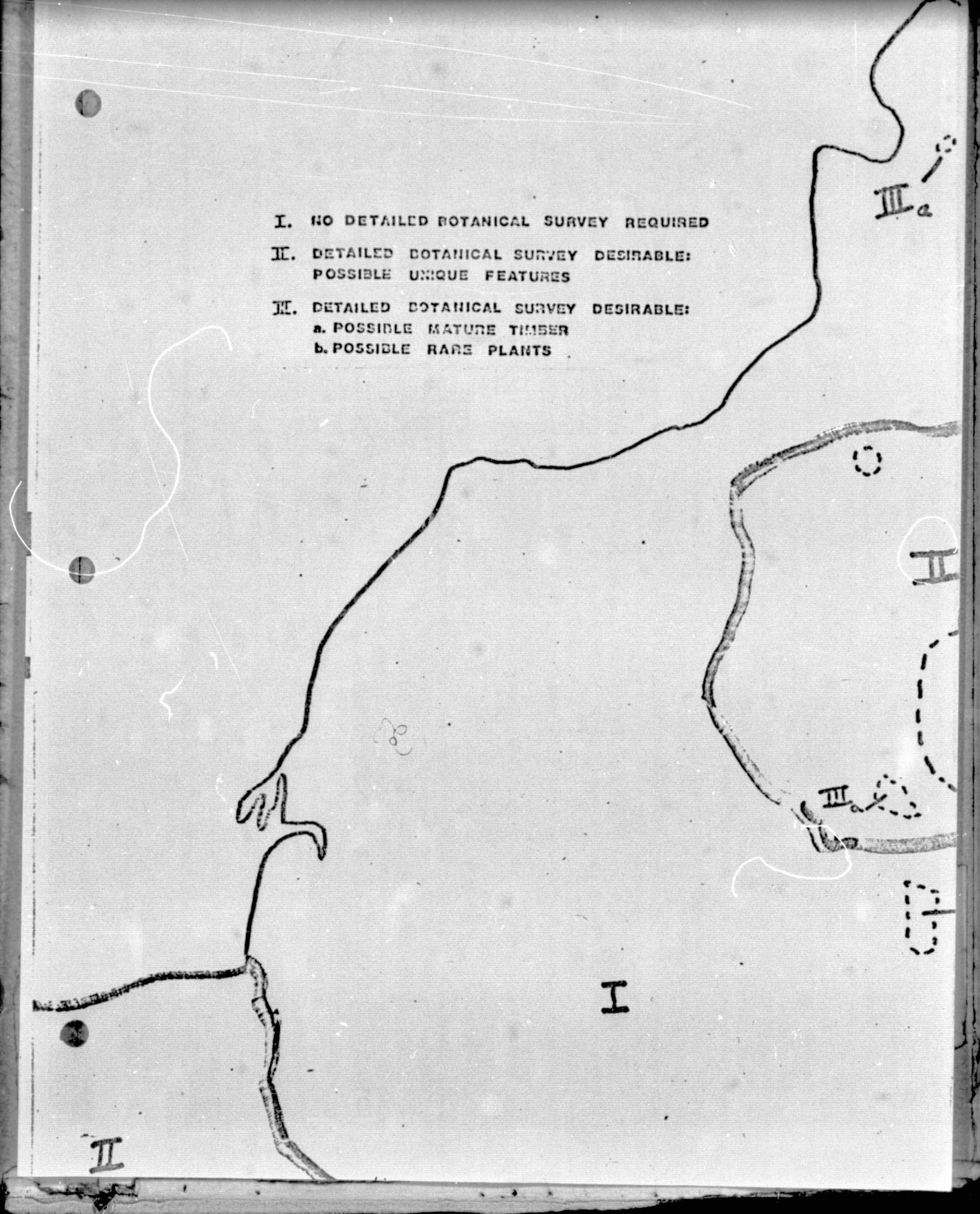
cc: Prof. Ta Liang
Encs.

MORE DETAILED SOIL SURVEY DESIRABLE: SOME AREAS SUITABLE FOR PARK DEVELOPMENT

MORE DETAILED SOIL SURVEY DESIRABLE: SOME AREAS PROBABLY SUITABLE FOR PARK DEVELOPMENT

NO DETAILED SOIL SURVEY REQUIRED AT THIS TIME: AREAS TOO STEEP, STONY, SHALLOW AND/OR POORLY DRAINED

NO DETAILED SOIL SURVEY REQUIRED AT THIS TIME: AREAS SUBJECT TO PERIODIC FLOODING


I. NO DETAILED BOTANICAL SURVEY REQUIRED
II. DETAILED BOTANICAL SURVEY DESIRABLE: POSSIBLE UNIQUE FEATURES
III. DETAILED BOTANICAL SURVEY DESIRABLE:
a. POSSIBLE MATURE TIMBER
b. POSSIBLE RARE PLANTS
III a
II
III a
I
II

716 354-2545 Reservations – Red House
716 354-2182 Reservations – Quaker

716 354-2555 Police
716 354-2535 Business Office

ALLEGANY STATE PARK & RECREATION COMMISSION
Allegany State Park, Salamanca, New York 14779

Nicholas M. Fedorka, Commission Chairman
Roland A. Block, Regional Administrator

September 29, 1977

Warren R. Philipson
Sr. Research Associate
Cornell University
School of Civil & Environmental Engineering
Hollister Hall
Ithaca, NY 14853

Dear Mr. Philipson:

Deputy Commissioner Ivan P. Vamos, Parks and Recreation, delivered to the Planning Department of this Commission on 9/28/77 the first submissions which you sent to him with your letter dated September 9, 1977.

We greatly appreciate the information you are obtaining as requested by Ivan and know that it will be very useful to us in developing a new Master Plan for Allegany State Park.

We hope you have the opportunity to visit us at Allegany in the near future.

Sincerely,

Roland A. Block

Roland A. Block
Regional Administrator

RAB/mf

cc: Ivan P. Vamos, OPR, Deputy Commissioner
Daniel J. Pihlblad, ASP, Landscape Architect

Cornell University
REMOTE SENSING PROGRAM
SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING
HOLLISTER HALL
ITHACA, NEW YORK 14853
(607) 256-4330, 256-5074

21 October 1977

Mr. Ivan P. Vamos
N.Y.S. Parks and Recreation
Agency Building #1
Empire State Plaza
Albany, New York 12238

Dear Ivan:

I have enclosed a photo mosaic and overlay indicating borrow sites--shallow, deep or undergoing active erosion in September 1973--within or adjacent to the Allegany State Park. Several other major sites were observed, but these are west of the reservoir (or river). The borrow sites were identified and analyzed using the NASA high altitude color infrared photographs flown in 1973 (scale, 1:130,000) and the LUNR photographs flown in 1968 (scale, 1:24,000).

Also enclosed is a series of maps indicating possible corridors for the North Country Trail. One route connects with the existing trail north of Salamanca, while another is to the east, avoiding Seneca land. As you'll note, alternative connecting links are identified. In general, route selection was guided by existing bridges, existing trails, state lands, suitable topography and land use/cover.

Both projects were completed by Ronald J. Linkenheil under my direction. We would be happy to expand on any point of interest or confusion, or to re-examine any questionable interpretations. As always, we would appreciate being advised of how and to what extent the information is used in order that we might, in turn, advise our NASA monitor.

Thank you for your cooperation.

Very truly yours,

Warren R. Philipson
Sr. Research Associate

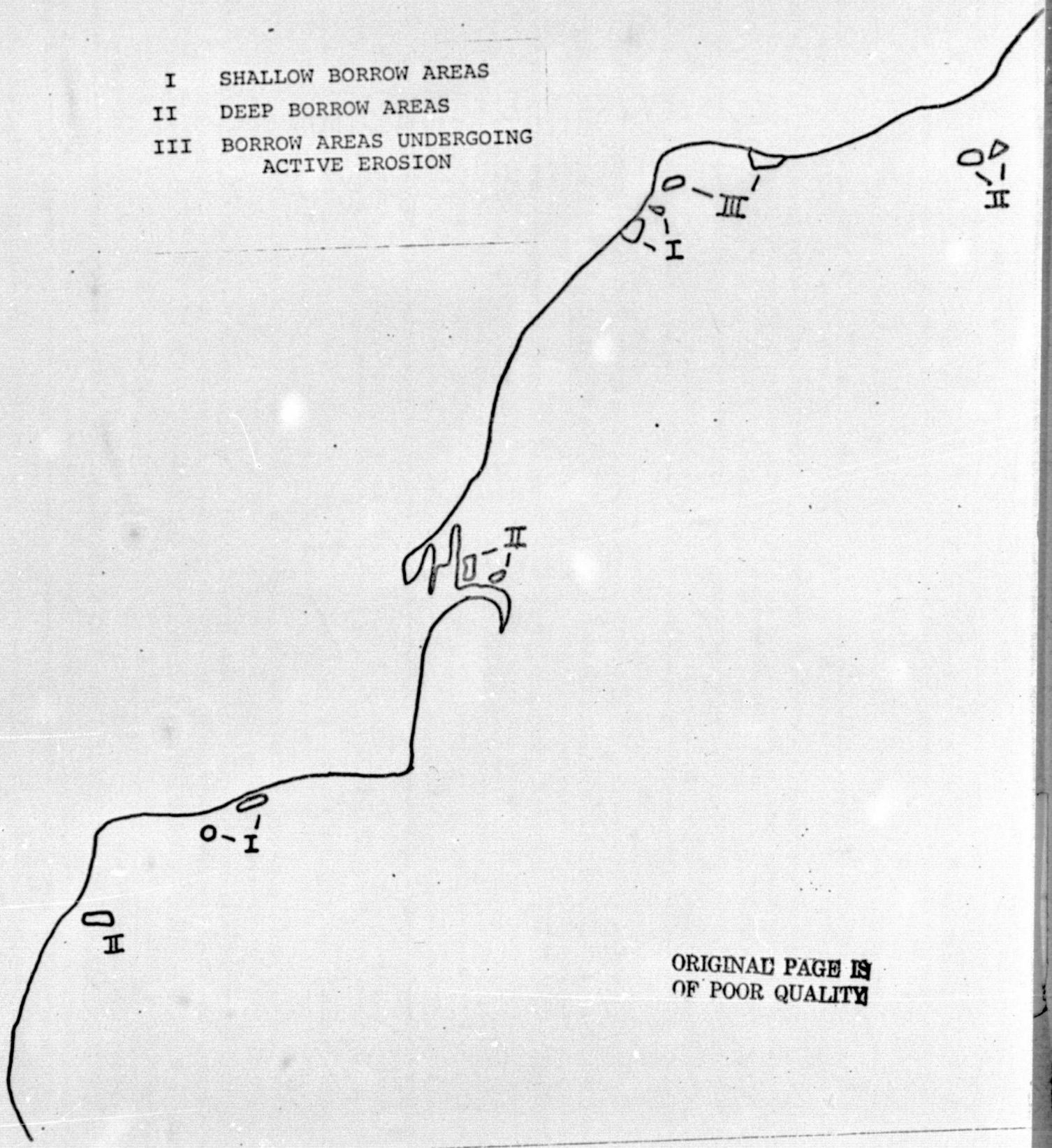
WRP/pw
cc: Prof. Ta Liang

Encs.

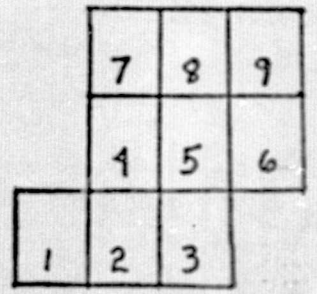
I SHALLOW BORROW AREAS

II DEEP BORROW AREAS

III BORROW AREAS UNDERGOING ACTIVE EROSION

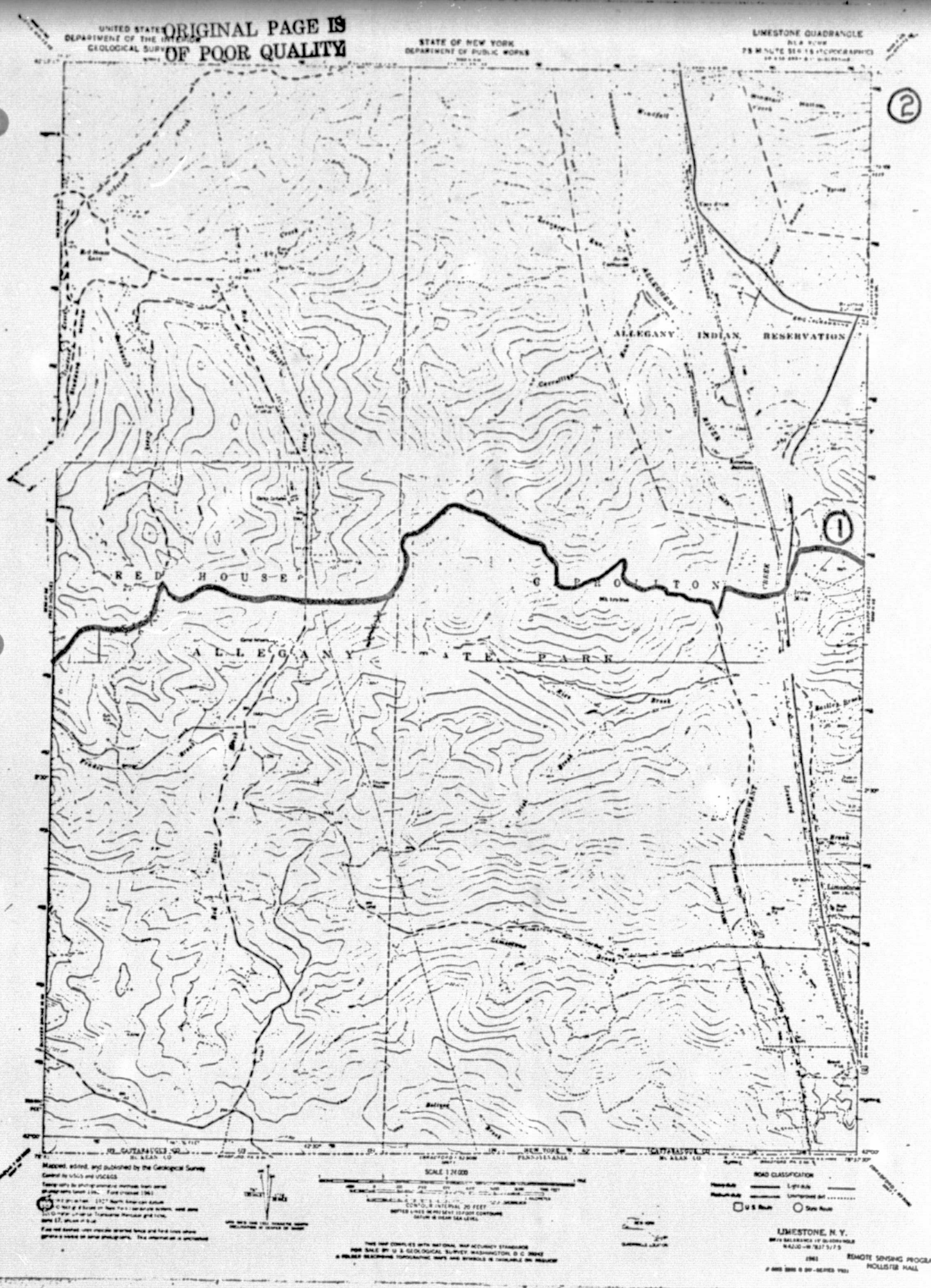


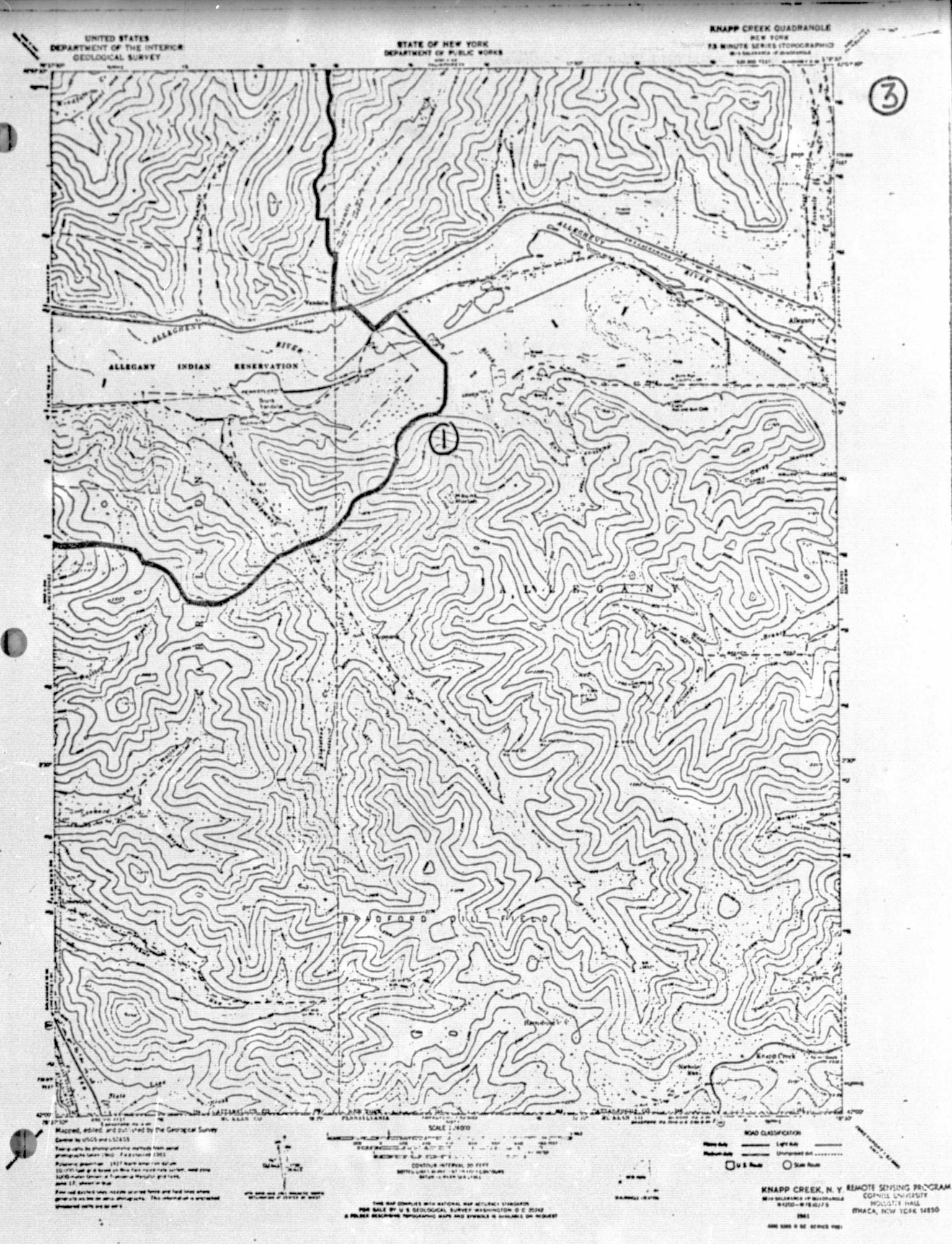
The preparation of this map was financially aided through a Federal Grant from the Department of Housing and Urban Development under the Comprehensive Planning Assistance Program authorized by Section 701 of the Federal Housing of 1954, as amended. This map was prepared under the Comprehensive Planning Assistance Program for the New York State Department of State. It is financed in part by the State of New York.

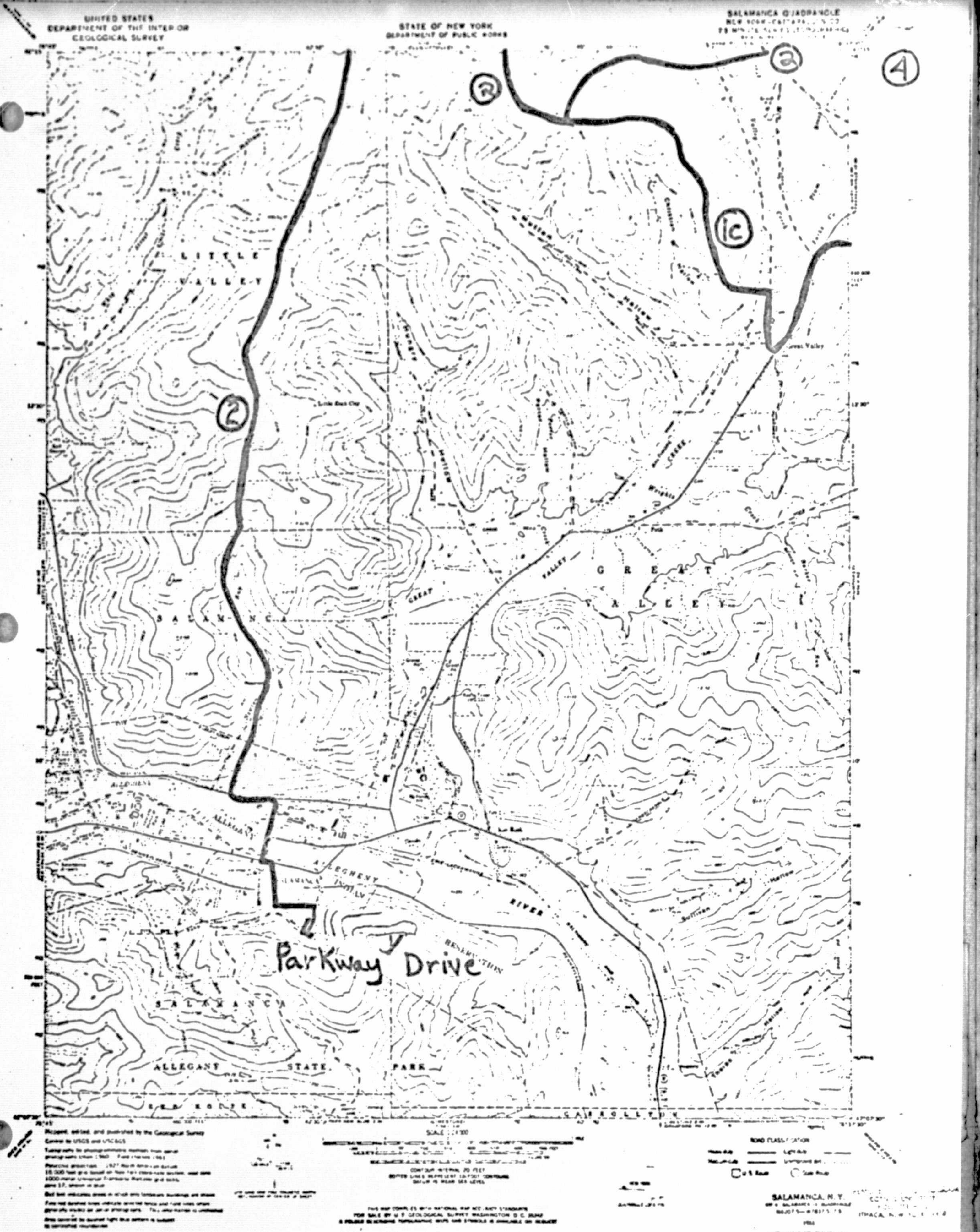


Key to Topographic Maps


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS
RED HOUSE QUADRANGLE
NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)
COLD SPRING
ALLEGHENY RESERVOIR
ALLEGHENY RIVER
INDIAN RESERVATION
ALLEGANY
R E D H O U S E
A L L E G A N Y S T A T E P A R K
E L K O
Trail 4a
Trail 4a – (Allegany State Park Section Finger Lakes Trail)
SCALE 1:24000
CONTOUR INTERVAL 20 FEET
ROAD CLASSIFICATION
RED HOUSE, N. Y.
REMOTE SENSING PROGRAM
COOP. U. UNIVERSITY
HOLLISTER HALL
ITHACA, NEW YORK 14850
1952




UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS
KNAPP CREEK QUADRANGLE
NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)
ALLEGHENY RIVER
ALLEGANY INDIAN RESERVATION
ALLEGANY
BRADFORD OIL FIELD
Knapp Creek
Mapped, edited, and published by the Geological Survey
SCALE 1:4800
CONTOUR INTERVAL 20 FEET
ROAD CLASSIFICATION
Light duty
Unimproved dirt
U.S. Route
State Route
KNAPP CREEK, N. Y.
REMOTE SENSING PROGRAM
CORNELL UNIVERSITY
HOLLISTER HALL
ITHACA, NEW YORK 14850
1961


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS
SALAMANCA QUADRANGLE
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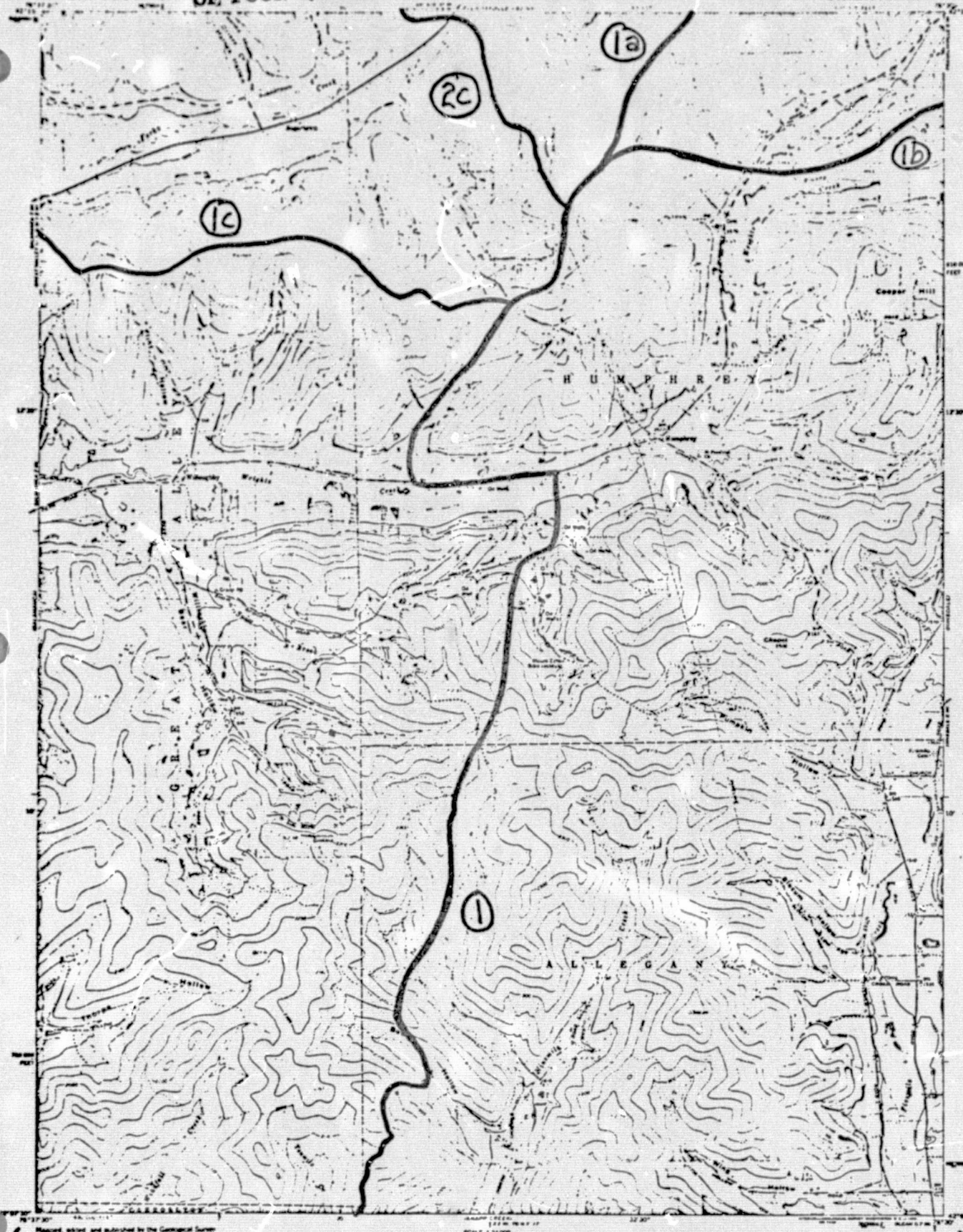
LITTLE VALLEY
SALAMANCA
GREAT VALLEY
Great Valley
ALLEGHENY
RIVER
RESERVATION
Parkway Drive
SALAMANCA
STATE
PARK
CARROLLTON
CONTOUR INTERVAL 20 FEET
SALAMANCA, N.Y.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS

HUMPHREY QUADRANGLE
NEW YORK-CATTARAUGUS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USC&GS and USGS

Topography by photogrammetric methods from aerial photographs taken 1960. Field checked 1961

Polyconic projection. 1927 North American datum
10,000-foot grid based on New York coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks,
zone 17, shown in blue

Fine red dashed lines indicate selected fence and hedge lines where generally visible on aerial photographs. This information is unchecked

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

REMOTE SENSING PROGRAM
CORNELL UNIVERSITY
HOLLISTER HALL
ITHACA, NEW YORK 14850

HUMPHREY, N. Y.

1961

REMOTE SENSING PROGRAM
HOLLISTER HALL

2184


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS
HINSDALE QUADRANGLE
NEW YORK—CATTARAUGUS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
16
6
HUMPHREY
HINSDALE
ALLEGANY
DURAND
Mapped, edited, and published by the Geological Survey
Control by USGS and USC&GS
SCALE 1:24 000
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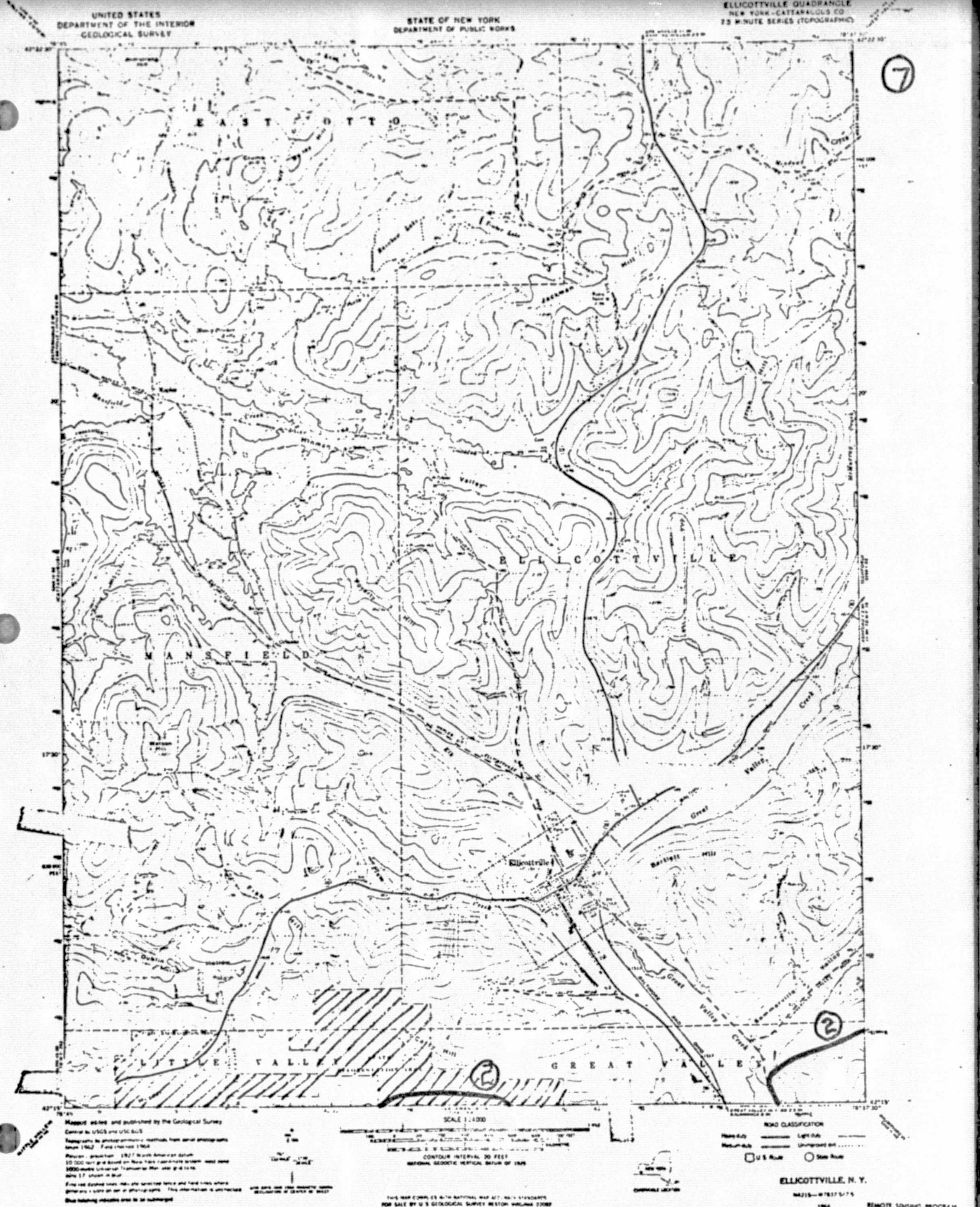
REMOTE SENSING PROGRAM
CORNELL UNIVERSITY
ITHACA, NEW YORK 14850


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS
ELLICOTTVILLE QUADRANGLE
NEW YORK-CATTARAUGUS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
7
EAST OTTO
ELLICOTTVILLE
MANSFIELD
Ellicottville
Great Valley
Bartlett Hill
LITTLE VALLEY
GREAT VALLEY
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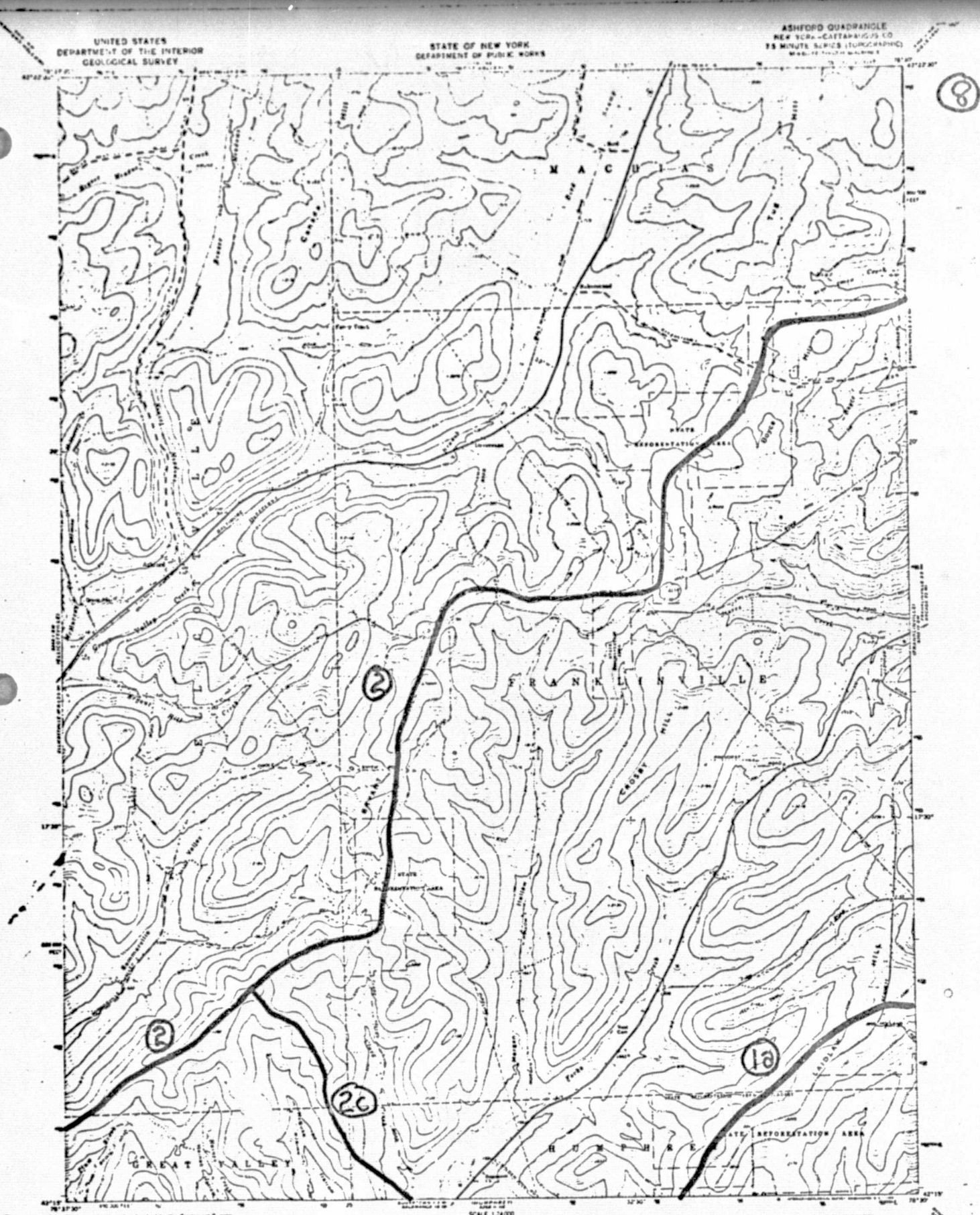
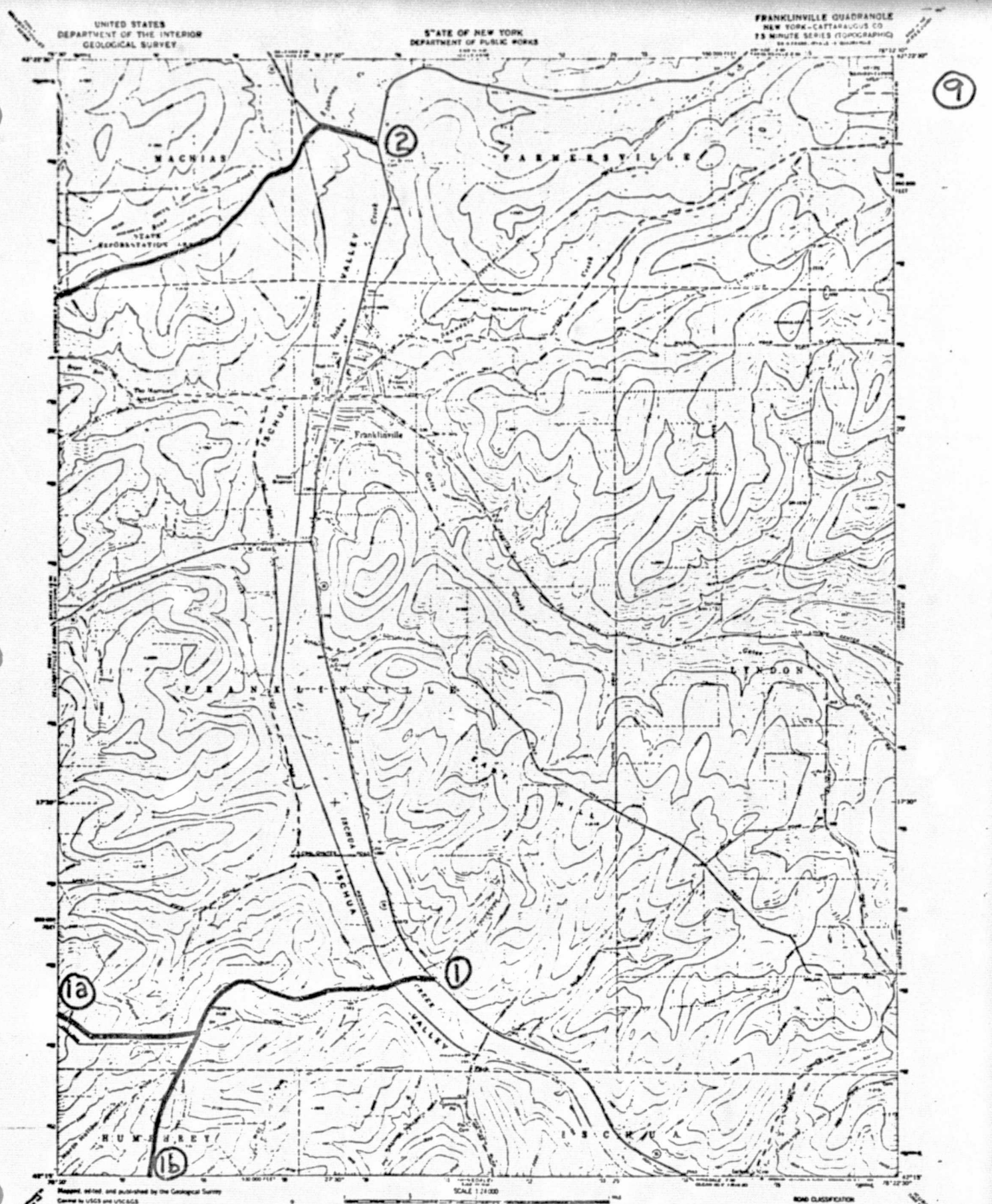
1964
REMOTE SENSING PROGRAM
HOLLISTER HALL




UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
STATE OF NEW YORK
DEPARTMENT OF PUBLIC WORKS
FRANKLINVILLE QUADRANGLE
NEW YORK-CATTARAUGUS CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
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FARMERSVILLE
STATE
RECREATION
AREA
ISCHUA
VALLEY
Creek
Franklinville
FRANKLINVILLE
LYNDON
HUMPHREY
ISCHUA
SCALE 1:24000
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL
ROAD CLASSIFICATION
Light-duty
Unimproved dirt
FRANKLINVILLE, N.Y.
1953
REMOTE SENSING PROGRAM
HOLLISTER HALL

APPENDIX D

WATERSHED STUDY FOR WATER QUALITY PLANNING

Cornell University
REMOTE SENSING PROGRAM
SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING
HOLLISTER HALL
ITHACA, NEW YORK 14853
(607) 256-4330, 256-5074

22 November 1977

Mr. Peter Tierney
District Manager, Yates County
Soil and Water Conservation District
110 Court Street
Penn Yan, New York 14527

Dear Pete:

I have enclosed our analysis of changes in a portion of the Kashong Creek and adjacent land use/cover. The overlays were compiled by Ronald J. Linkenheil based on his analysis of 1938, 1954, 1963 and 1975 aerial photographs.

We would be happy to expand on any point of confusion or interest, and we would appreciate being advised of your use of this information.

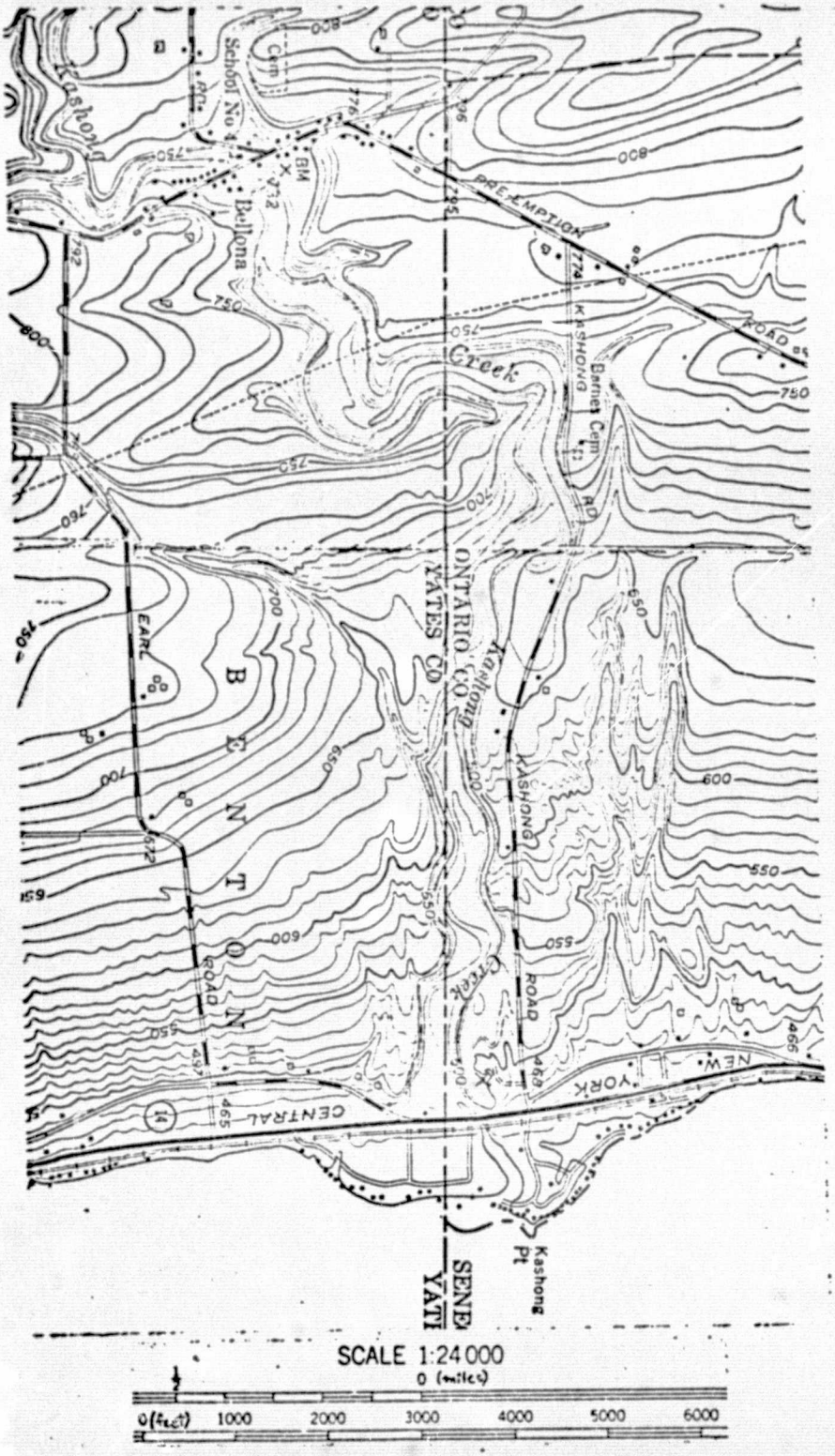
Very truly yours,

Warren R. Philipson
Sr. Research Associate

WRP/pw
cc: Prof. Ta Liang

Enc.

KASHONG CREEK



N

LAND USE / COVER

A: CROPLAND

B: BRUSHLAND

F: FOREST

G: GRAVEL PIT

I: INACTIVE CROPLAND

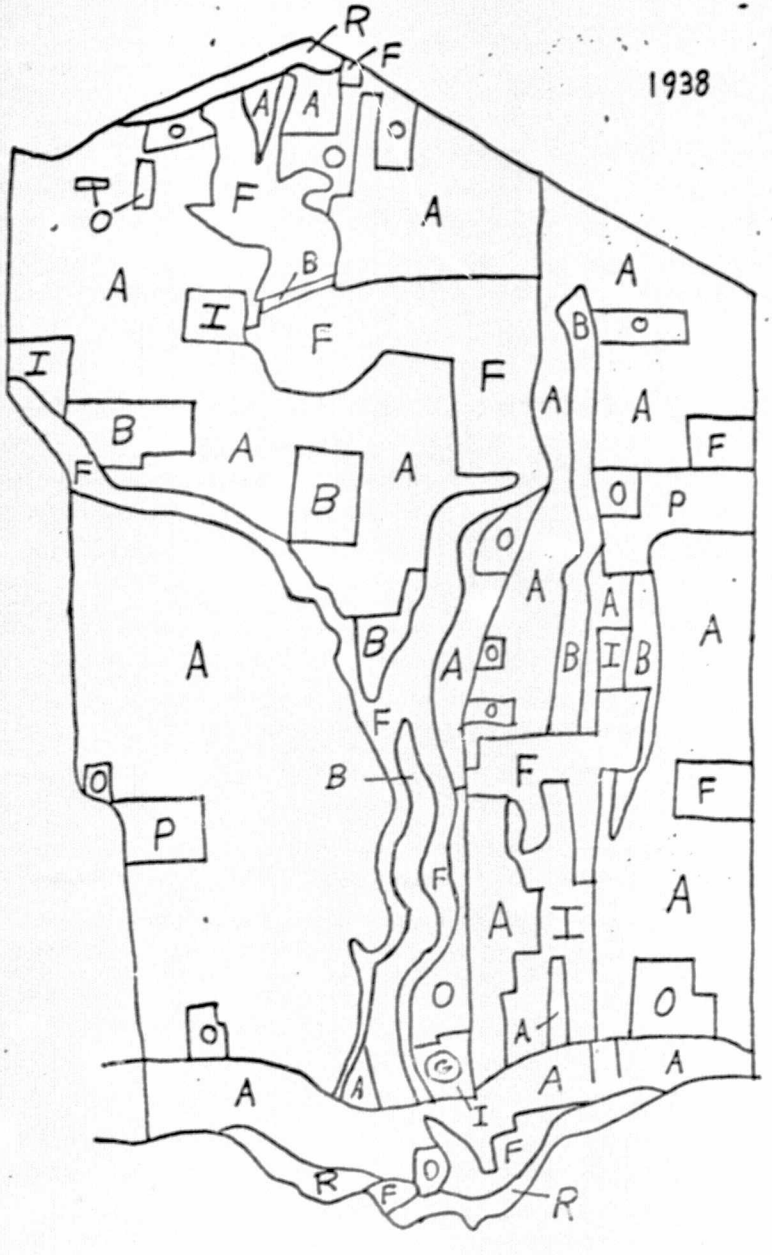
O: ORCHARD

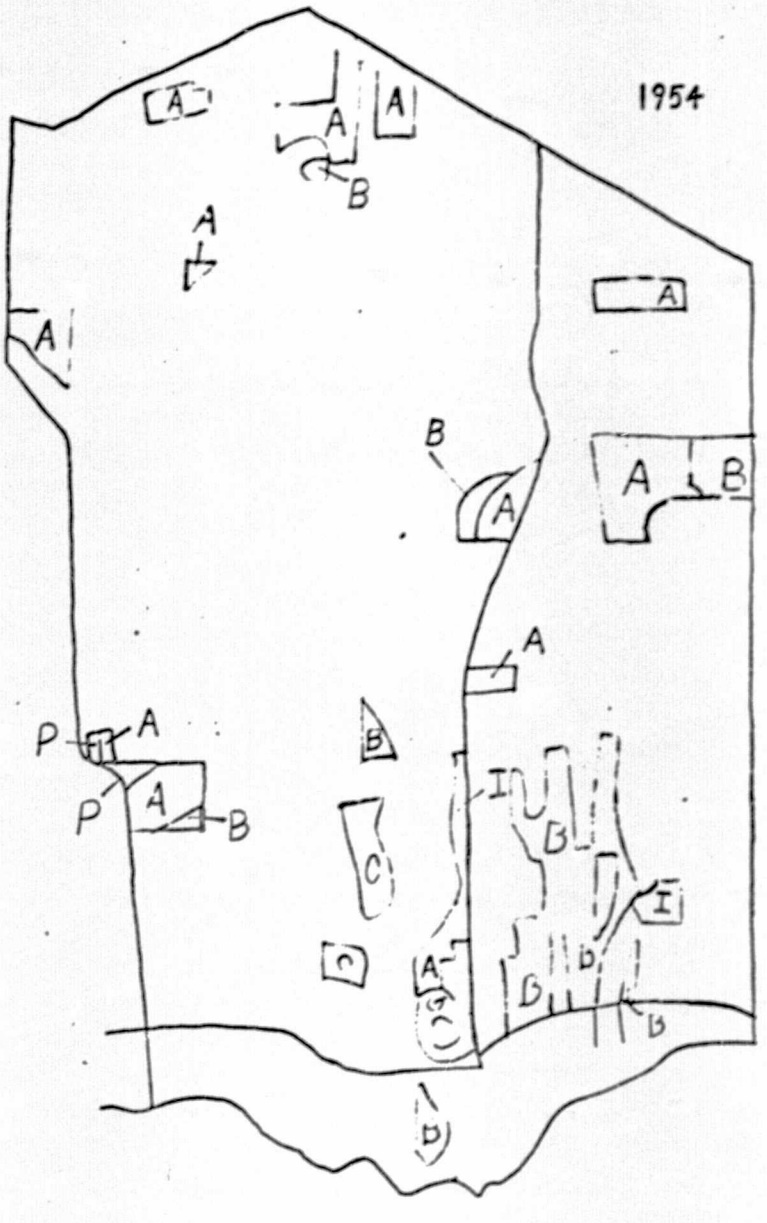
P: PASTURE

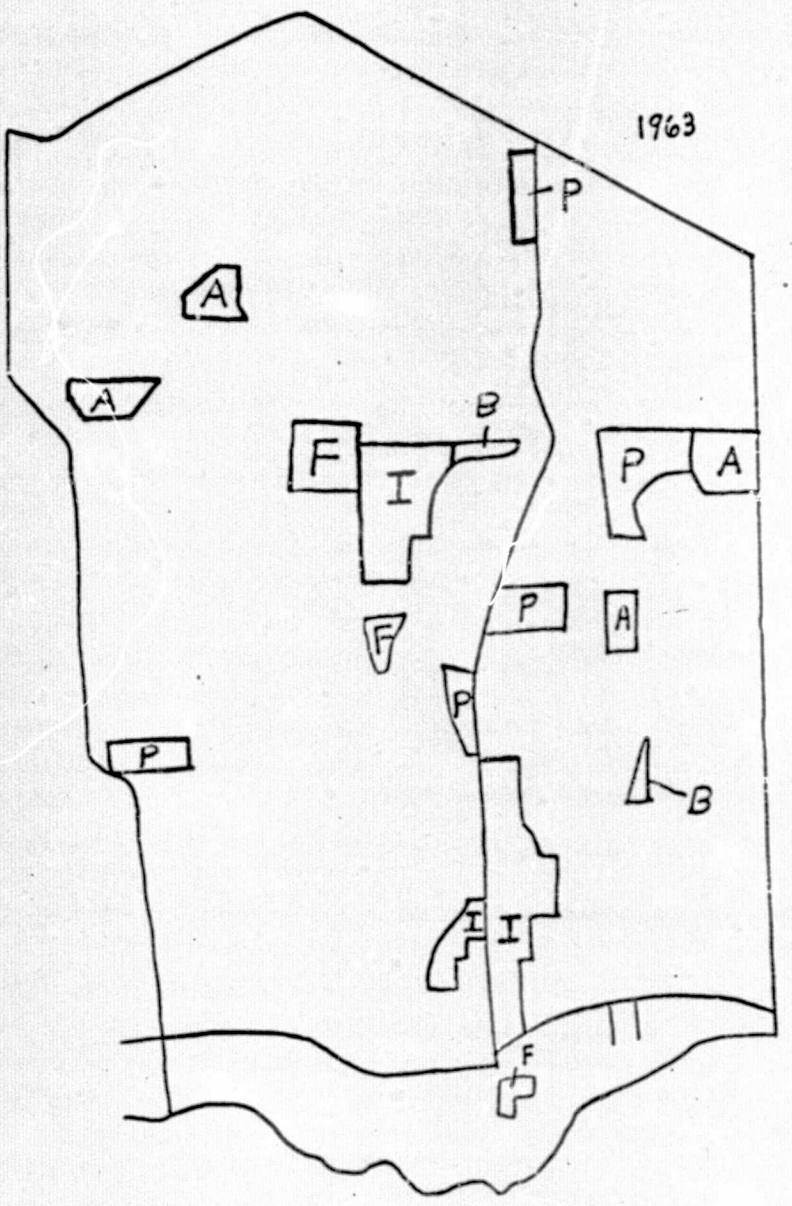
R: RESIDENTIAL

CORNELL UNIVERSITY
REMOTE SENSING PROGRAM

NOVEMBER 1977


1938


1954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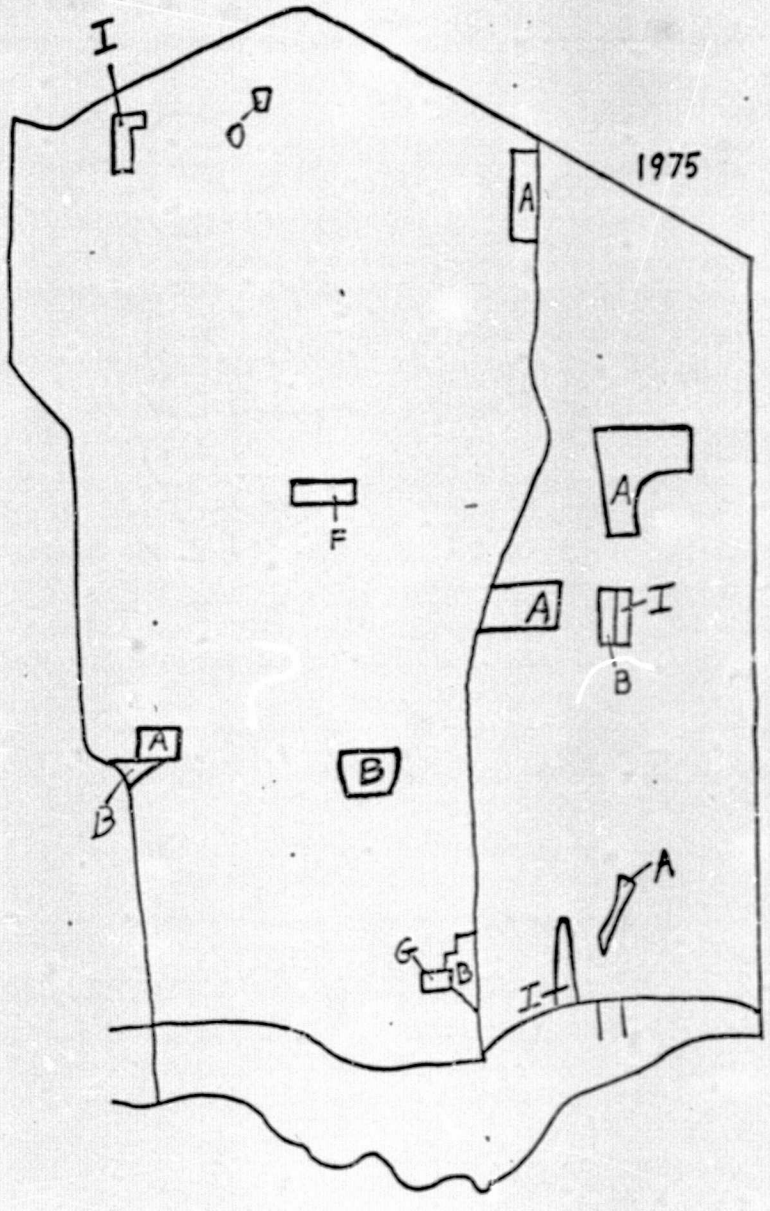
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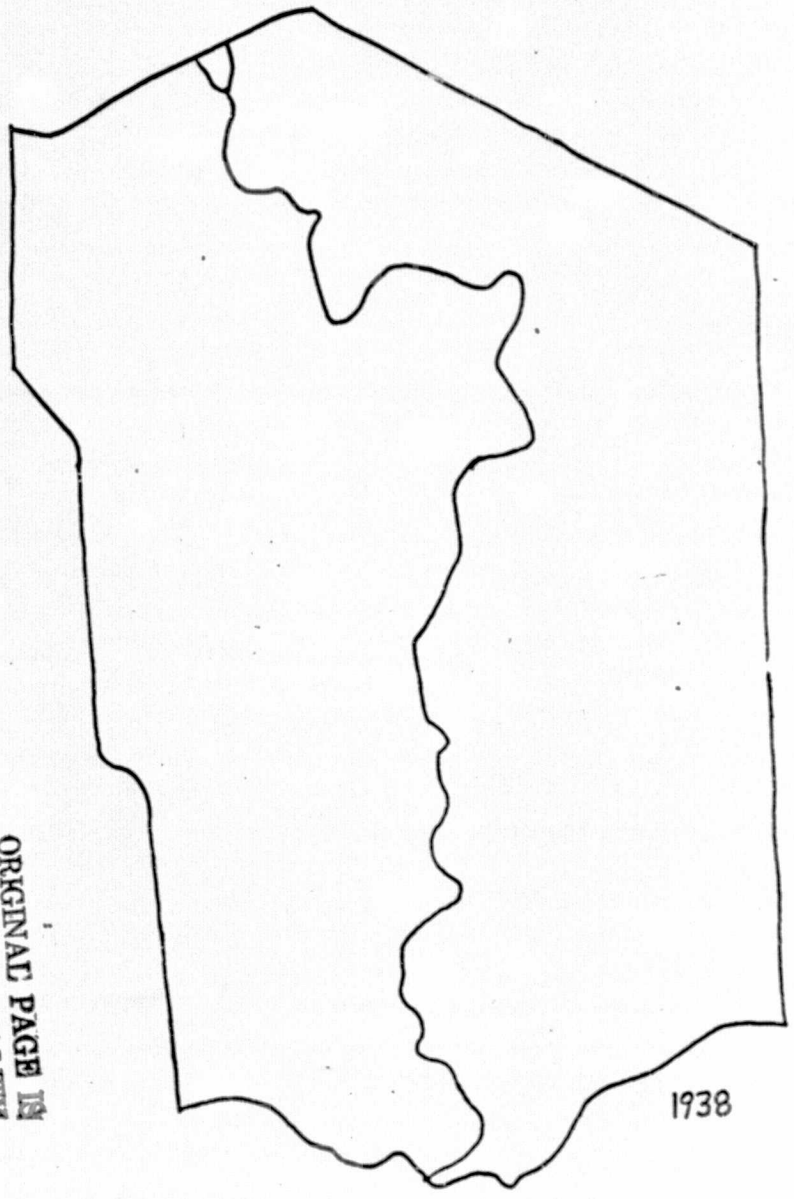
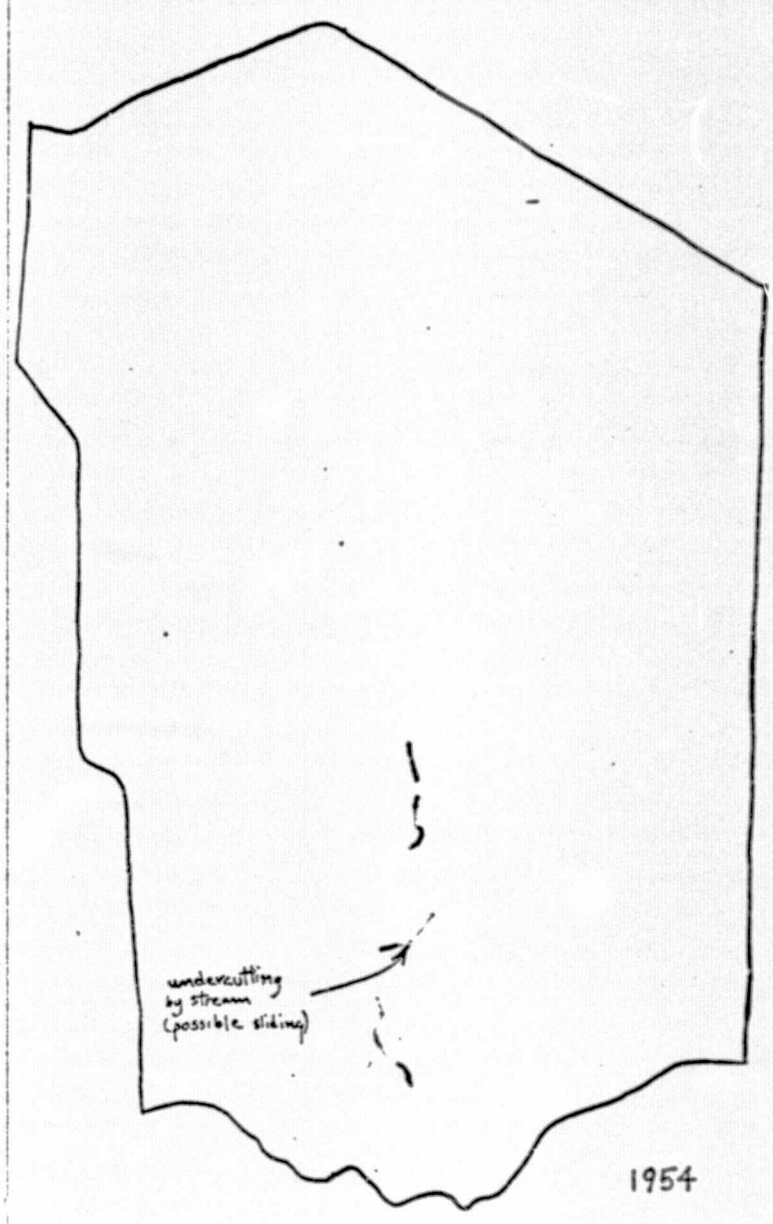
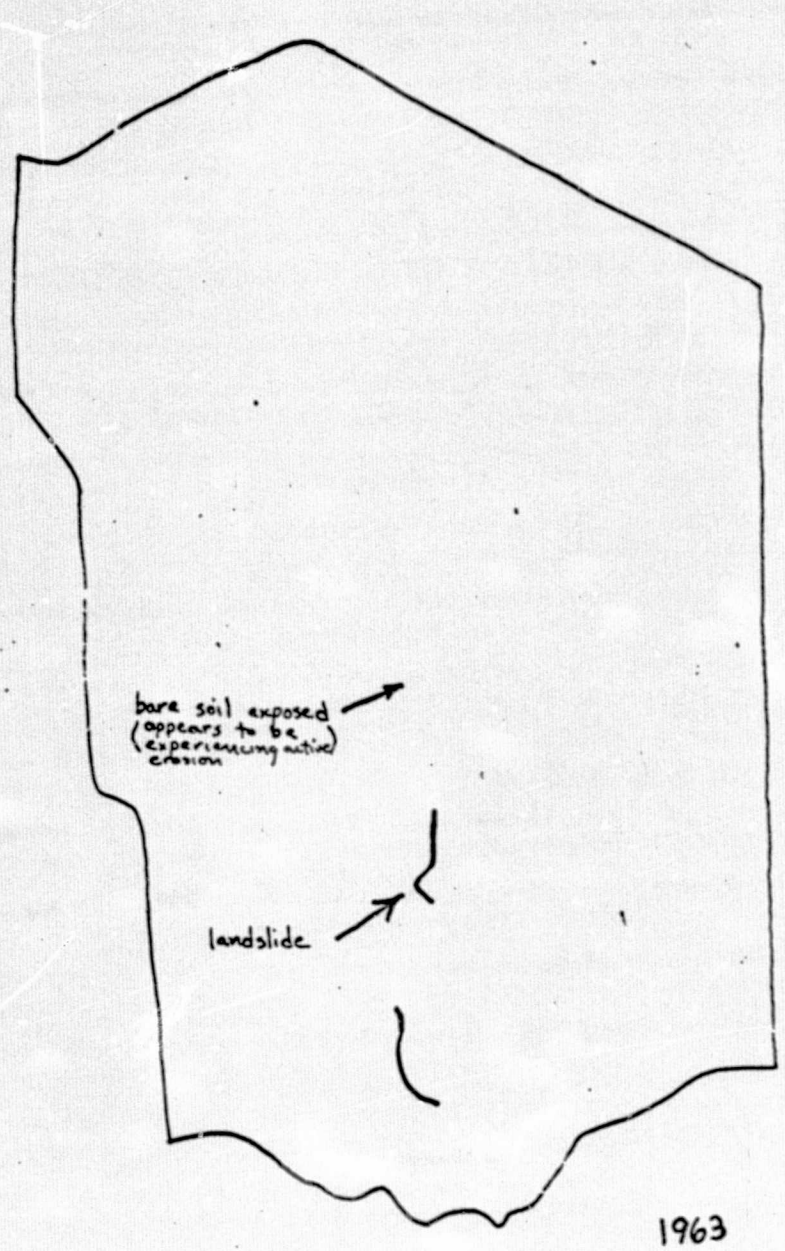


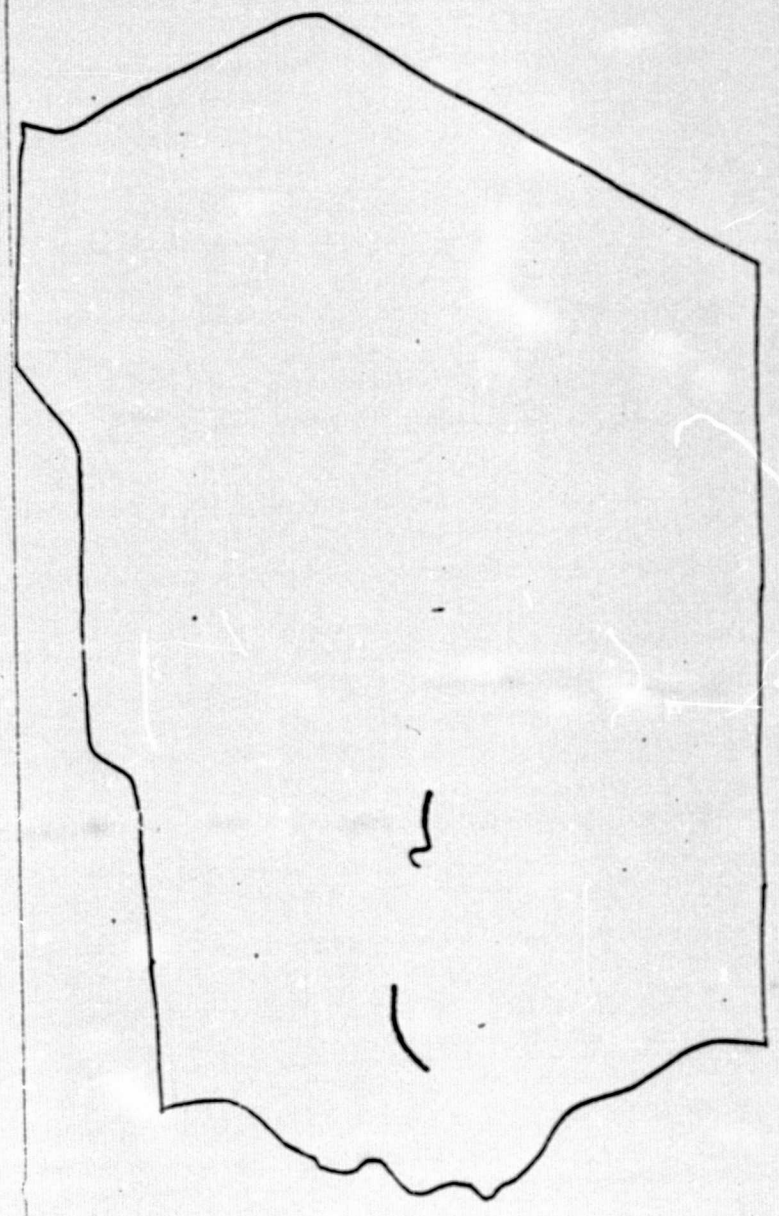
1938



1954


bare soil exposed
(appears to be
experiencing active
erosion
landslide

1963



1975

APPENDIX E

ASSISTANCE PROJECT--
LANDFILL SITE SELECTION

ITHACA JOURNAL

Landfill site to be studied

MONTOUR FALLS — The possibility of establishing a landfill site on County Road 21 is out of the question until it can be determined whether or not there is a graveyard there, according to Frank Clark, a specialist on sanitary landfills for the Department of Environmental Conservation in Avon.

People who grew up in the area claim there is a small burial ground on a knoll in the field in question and that some of Brigham Young's ancestors may be among those interred on the site. Bryant Rossiter, regional representative of the Mormon Church for the Eastern Area, is aiding the investigation, according to Margaret Bartow, a resident on County Road 21. The Schuyler County Historical Society has no indication of a private cemetery on that location.

Frank Rose, environmental planner for the Southern Tier Regional Planning Board, said that the Mud Lake Road had been declared a scenic corridor and the potential landfill site is only about one-half mile away. "The amount of visual disturbance should be minimal" from the designated corridor, he said. But he added that it is not too late to prevent the site from being established so near the recreation area and agreed that the graveyard issue is a critical one.

Schuyler site study continues

By BARBARA BELL

WATKINS GLEN — The Schuyler County Sanitary Landfill Commission will not abandon its study of a site adjacent to the Sugar Hill Road, for a possible landfill. It will also continue study of two other potential sites in other areas.

The commission's decision followed a meeting Wednesday with Frank Clark of the Avon office of the state Department of Environmental Conservation.

Residents of the Sugar Hill area, opposed to establishment of a landfill there, have cited the proximity of the Sugar Hill Recreation site, the possibility of a private cemetery being on the proposed landfill site and also claim the drainage is not congenial to such a use.

Clark said the soil type is entirely suitable although further deep core tests need to be completed.

He said that a 1938 aerial photograph of the site shows the entire acreage freshly plowed, including a small sector where some residents claim a few people were buried in the 19th century. Clark said that other aerial photographs will be made of the area to determine whether or not an abandoned cemetery may be there.

If any burial is proven, Clark said the cemetery could be fenced off and the rest of the land used as a landffill.

Check wells must be maintained at any future landfill site with frequent testing of water to determine possible ecological threats. Holding ponds are also required to control normal drainage

Concerning objections to proposec landfills, Clark said the commission may as well resign itself to facing the "flak."

Thursday, November 17, 1977

Cornell University
REMOTE SENSING PROGRAM
SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING
HOLLISTER HALL
ITHACA, NEW YORK 14853
(607) 256-4330, 256-5074

8 November 1977

Mr. Frank Clark
New York State Department of Environmental Conservation
P.O. Box 57
Avon, New York 14414

Dear Mr. Clark:

We have coverage of the potential landfill site in Schuyler County on aerial photography, which was flown on 31 May 1938, and on high altitude photography, flown on 7 May 1975. I have enclosed a xerox copy of a 1938 photo (#ART-1-76) on which I have delineated what we believe to be the landfill site. Stereoscopic analysis of this and adjacent 1938 photos indicates that the entire field had been recently plowed and that there are no tree-covered areas within the field. No evidence of a cemetery in the field could be seen on either the 1938 or 1975 photography. As you suggested, the cemetery may be located along the hedgerows, or in adjacent fields.

I have enclosed a brief description of our Program, and if we can be of further assistance on this or other projects, please do not hesitate to call me.

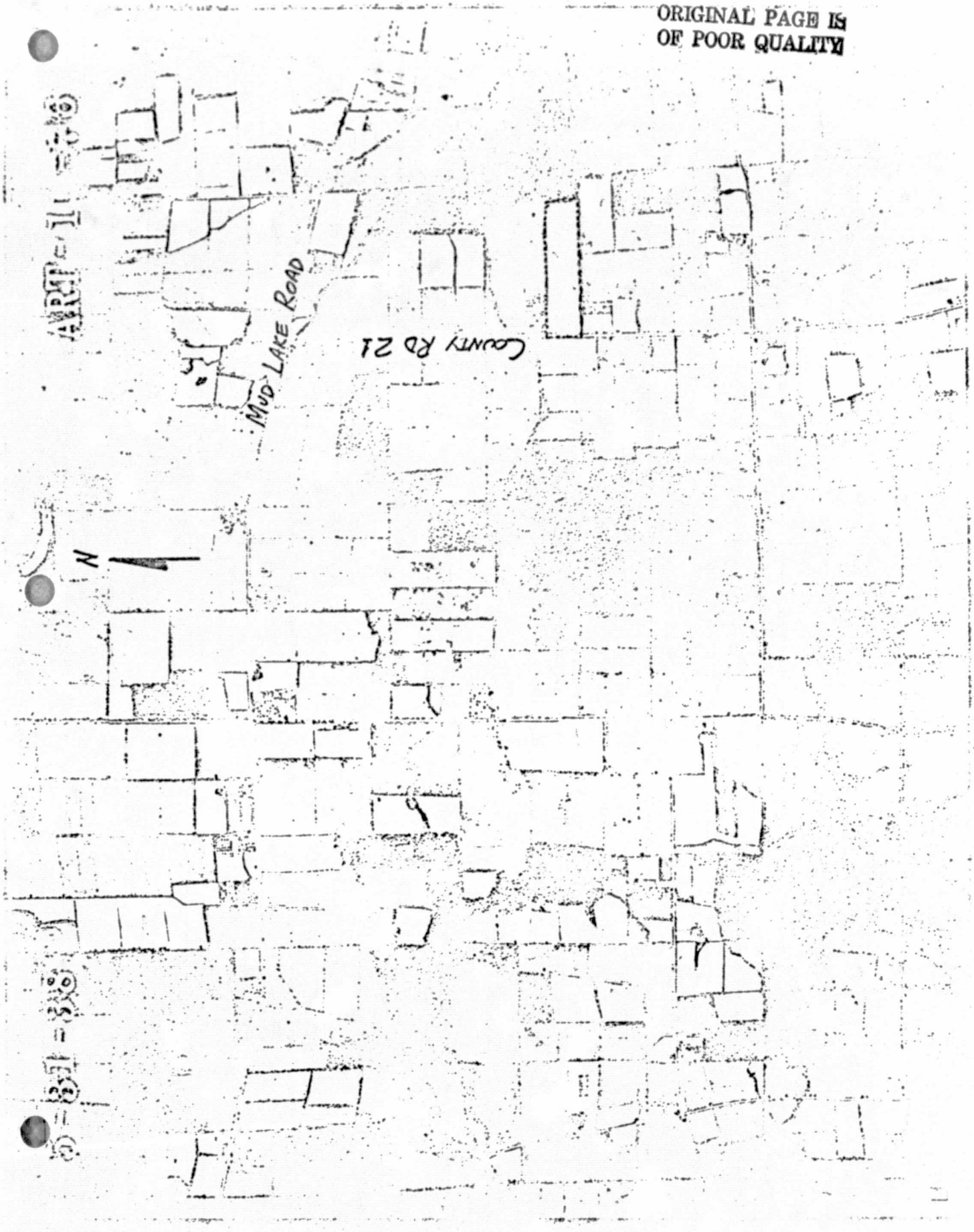
Very truly yours,

Thomas L. Erb

Thomas L. Erb
Research Specialist

TLE/pw
cc: Prof. Ta Liang

Encs.



APPENDIX F

PROJECT-RELATED CORRESPONDENCE

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Peter A. A. Berle,
Commissioner

June 1, 1977

Mr. Warren Phillipson
Research Associate
Remote Sensing Unit
Cornell University
Ithaca, New York 14853

Dear Mr. Phillipson:

As per our telephone conversation of May 16, the following is a brief outline of pheasant habitat definition that we are proposing for execution by your unit. The pheasant population is most dense in the Lake Plains-Finger Lakes area of the State, but pheasants are distributed in agricultural areas throughout the State, such as the Mohawk and Hudson River Valleys. Pheasants have declined in numbers throughout their range during the past few years. In order to understand the effects of land use on pheasant density and to evaluate the possibility that changing land use has contributed to the recent population decline, it is requisite that known pheasant densities be correlated with land use patterns.

The keystone which links pheasant density with land use is probably a combination of kind, amount, and distribution of habitat types rather than just simply the availability of agricultural crops. The land uses that should be evaluated in relation to pheasant density are:

a) brushland (> 5' < 15' height, 60% or more of area)

b) woods (>15' height, 60% or more of area)

c) fallow fields

d) pasture

e) hay

f) corn

g) all other grains

h) wetlands

i) truck crops and plowed land

j) forest plantations

k) orchards and vineyards

The challenge is to determine the appropriate size, type and interspersion of land uses (perhaps some type of diversity index) that produce the best pheasant habitat (i.e. maximum pheasant density) through a gradient to land uses that produce no pheasant habitat. The Lake Plains-Finger Lakes area is the most important area that needs habitat definition, but the study could be applied Statewide if you have the interest and desire.

The project would have immeasurable value to the Upland Game Birds Study. The information would be used as a basis for: 1) delineation of potential pheasant habitat throughout the State as a basis for possible transfer of wild birds and as a basis for channelling releases of birds reared on game farms, by 4-H members and by sportsmen; 2) harvest recommendations; 3) habitat management by those people interested in encouraging pheasant populations; 4) educational programs to explain to sportsmen and the general public the land uses determining pheasant carrying capacity and consequent differences in pheasant populations throughout the State; and 5) delineation of potential Hungarian partridge habitat.

If your unit is interested and gains approval for the project, we would be interested in a meeting at the earliest mutually convenient date. You can reach me by phone at 518-457-3730.

Sincerely,

Peggy R. Sauer

Peggy R. Sauer
Supervising Wildlife Biologist

PRS/pld

FULTON COUNTY DEPT. OF HISTORY

OFFICE OF THE DEPUTY FULTON COUNTY HISTORIAN

Lewis G. Decker
187 Bleecker St.
Gloversville, N.Y.
12078

telephone: Area Code 518
725 - 0473

July 3, 1977

Dr. Philipson,

First off please accept my apologies for not sending you a formal letter of request on behalf of our local history project. After our telephone conversation, I became involved in several other projects and for the last two weeks have been attending a media conference in audio-visual at Cooperstown, which I hope will be of benefit to the students in their future research pro--jects. With no further excuses, I have forgotten to write and forward the needed information and request. I hope I am not too late, if som I understand, and no further apologies.

Dr. Philipson, I was in hopes, through your summer program you could assist us in our historical research which we are trying to compile on the Battle of Stone Arabia on Oct. of 1780, fought between our Militia and State Levies aganist the British Regulars and Tories. I might add, it was a British Victory, our Mohawk Valley forces suffered severely, the Commander of the forces was mortally wounded and a large number of the Americans were placed in a mass grave after the Battle. To this day there is much controversy and speculation, from past historians as well, as to the route taken by the British (roads in 1780), location of the Fort Sites, and where the mass burial was. We are trying to compile new information on this Battle, its site and hopefully what happened. We have uncovered new information, (documented) and with these bits and pieces, hope to put together by 1980 (200 yrs), a publication on the material.

We have organized a large group of interested historians in the two Counties of Fulton and Montgomery who have been meeting, discussing their versions and contributing material as well as accepting assignments, We have the sponsorship of the Mohawk Valley Sons of the American Revolution,(Stone Arabia Battle Chapter,) Gloversville Historical Society, and above all a student award winning youth group of young historians called the Yorkers Post 1776 of Fulton County who have printed the enclosed material and are building a diorama of the Battlefield. To do the diorama and future publications we need to know a number of things and we are hoping, through your program, you could help us through your areal photographing, possibly to locate the old roads, fort sites and even possibly through infrared, the mass burials. Never the less,the old or present farm boundries, hedge rows, and fences shown on a areal view could be of great value as few of these lot boundaries have changed through the years, also we would request permission to use your photos in our future publication if possible.

I have enclosed some of the past clippings which I hope explain our group and its endeavors as well as some researched material printed by the students and distributed at the meetings to the public in attendance. Also please note a U.S. typographical survey map of the area. I have outlined the area we are interested in and have tried to, as closely as possible, show you in red what we believe to be the old road and fort sites, as well as two locations of burials (mass Burial).

After waiting so long to answer you Dr. Philipson, I am hastly sending this letter and material off to you. I am sure there will be further questions from you and your team. My youngest son will be attending a three day course at Cornell, the 15, 16, and 17th of July on Bee Keeping. He was a guest of your college when he was 12 yrs old and attended the National Entomology meet which was held there. He is very much impressed with Cornell. If you would like a personal contact (as Randy is President of the Yorkers Post 1776, and has been attending our meeting) to explain any other details on the map of the Stone Arabia area I could arange to have Randy stop by your office if its on the campus as he is arriving by bus.

Thank You.

I Remain Respectfully

Lewis G.Decker

NEW YORK STATE PARKS & RECREATION Agency Building 1, Empire State Plaza, Albany, New York 12238 Information 518 474-0456
Onn Lehman, Commissioner

July 21, 1977

Mr. Warren R. Philipson
Senior Research Associate
Cornell University
Remote Sensing Program
School of Civil and Environmental
Engineering
Hollister Hall
Ithaca, New York 14853

Dear Warren:

I am sorry it has taken so long to follow up my telephone conversation regarding your site analysis for the Chimney Bluffs State Park area of New York State. I found the report and maps to be most helpful. This information will, no doubt, provide a firm basis for the development of conservation plans for parts of this area and use programs for the remainder of the property. I appreciate the fine work done by the Remote Sensing Program staff on this project.

I am transmitting the base maps developed through this project to our Finger Lakes Regional Office in Trumansburg for their review and for added field work. I would appreciate if you would answer any questions that they may generate through this additional effort regarding the work you have so far undertaken.

Thank you again for your help. I will identify our current program needs in a separate letter.

Sincerely yours,

Ivan P. Vamos
Assistant Commissioner for
Environmental Affairs

IPV/dg

cc: A. Mazzella

County of Fulton
COUNTY BUILDING
JOHNSTOWN, NEW YORK 12095

Telephone (518) 762-4832

PLANNING DEPARTMENT

HAROLD P. KAULFUSS, Director

August 25, 1977

Dr. Warren Philipson, Research Associate
Remote Sensing Program
Hollister Hall - Cornell University
Ithaca, NY 14853

Dear Warren,

As I had promised, I am enclosing five (5) copies of the completed Soil and Slope Considerations report for the Town of Caroga. The Airphoto Assessment, prepared by the Remote Sensing Program, was an extremely valuable tool in the preparation of this report. You and your staff are to be commended for your excellent work.

As the Town Plan and Zoning Ordinance is finalized, I will forward them to you as further evidence of our utilization of this Airphoto Assessment.

Again, thank you for your assistance.

Sincerely,

Paul O'Connor

Paul O'Connor
Town Planner

PO:sj
Enclosures

ROBERT P. WHALEN, M.D.
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF HEALTH
REGIONAL OFFICE
677 S. SALINA STREET
SYRACUSE, N. Y. 13202

ROBERT W. BACORN, M. D.
REGIONAL HEALTH DIRECTOR

November 25, 1977

Dr. Warren Philipson
Department of Civil & Environmental Engineering
Hollister Hall
Cornell University
Ithaca, New York 14850

Dear Dr. Philipson:

This letter will confirm the tentative meeting date of December 13, for discussing the potential of using remote sensing techniques to evaluate mosquito breeding areas in central New York State.

Dr. Thomas Bast and I will be in Ithaca by noon and can meet with you at 1 p.m.

We are very excited about the potential of the technique and are certain we can show a favorable cost-benefit ratio compared to ground based work. Thank you for your interest and cooperation. I look forward to meeting you December 13.

Sincerely,

Charles

C.D. Morris, Ph.D.
Sr. Medical Entomologist

cc: Dr. Bast

COLUMBIA COUNTY PLANNING BOARD

70 NORTH THIRD STREET, HUDSON, NEW YORK 12534
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Hudson, New York 12534

ALAN P. MUIR
Planning Director

November 29, 1977

Mr. Warren R. Philipson
Senior Research Associate
Remote Sensing Program
464 Hollister Hall
Cornell University
Ithaca, New York 14853

Dear Mr. Philipson:

We appreciated your introduction to remote sensing; in particular, the facilities available for specific projects at Cornell University. As discussed during our visit, we understand the limitations in remote sensing systems. Within these established parameters the Planning Department staff has developed several possible remote sensing projects. We feel they have practical application for both your laboratory, and our Planning Department. Brief descriptions of each project area are described on the enclosed attachments. Once you have had the opportunity to review our suggestions, please contact me to discuss the implementation. We are hopeful that one or more of the projects may satisfy the NASA guidelines and can be included in your work program.

I have also enclosed the following material to assist you in your review:

MAPS: energy installations and routes
drainage basins
agricultural districts
highways
landfill and sewers
townships
stream classification

COPY: Legislation to Permit Agricultural Districts in New York
Coastal Zone Studies I & II in Columbia County
Draft of Columbia County Land Use Plan, 1977.

If you require any additional information, please do not hesitate to let me know.

Sincerely,

Sarah V. Mylroie

Sarah V. Mylroie
Environmental Technician

SVM:de
Enc.

1. Agriculture

A. Problem: Inaccurate districts: At present land included within Agriculture districts may not be active or considered prime agricultural land. Land outside of existing district boundaries may be desirable for inclusion due to activity or prime status.

Need: Remote sensing data to accurately describe location of active agriculture and/or prime lands.

Implementation: Information can be used to help judge the effectiveness of agricultural district law. The results of this study will be submitted to legislatures reviewing agricultural districts law in 1978.

Information can be used to incorporate active lands into the existing district or expand existing district to include new members previously overlooked.

Information may supply sufficent lands to form a new, separate district.

B. Problem: Inappropriate agricultural districting in town zoning ordinances.

Need: Same as above.

Implementation: Use data to revise existing zoning ordinance districts and in formulating zoning districts in proposed ordinances.

C. Problem: Proposed high tension lines (765KV) and gas pipe lines infringing on prime agricultural land.

Need: Same as above.

Implementation: Use data to suggest possible transmission corridors which avoid prime agricultural lands. See Legislation to Permit Agricultural Districts in N.Y. page 13, Article 25AA, Section 305 #4.

2. Power Plant Siting

Problem: Proposed for the Columbia County area are four major power plants with sites in the towns of Catskill (Cementon), Athens, Stuyvesant, and Clermont-Livingston. State and federal siting requirements examine each proposal individually, but there is local concern that construction of two or more of these plants will have synergetic effects that may be overlooked in the individual reviews.

Need: Information on geologic characteristics of these sites which may have common influences on the plants involved, e.g. geologic weaknesses that could tolerate the effects of one plant, but not a second located several miles away.

Application: Data collected can be used to support local testimony in ongoing and future site review hearings.

3. Coastal Zone

I **Problem:** Pollution of Hudson River and associated wetland areas.

Need: As the sources of direct influences on River water quality, both point and non-point, are located within a short distance of the shoreline, an identification and inventory of water quality problem areas is required. It is believed that a study area approximately three miles east of the shoreline will enable a comprehensive examination of this problem.

Application: Information collected will be applied to studies being done under Section 208 of the Federal Water Pollution Control Act and will provide important data which will assist in implementing local programs under the Freshwater Wetlands and Environmental Quality Review Acts. We also believe that completion of this program would enable us to establish a regular monitoring program of water quality using remote sensing data. Presently water quality is unmonitored in any part of the County due to the expense of field work required. A remote sensing program would enable this monitoring to be done.

II **Problem:** There is state and local interest in protecting or utilizing areas along the river coastline which offer unique resources or opportunities.

Need: Needed is an examination of the coastal area to determine the more unique resources of this area which are presently being ignored or mismanaged. Three principal areas should be included in this study as follows.

a. Identification of sites with the potential for development as river oriented recreation facilities to serve community needs. Adequate access, either existing or new, is a requisite for these sites.

b. The Army Corps of Engineers is required to dredge portions of the river channel periodically. Spoil is about 80% sand and must be disposed of nearby. Needed is an inventory of suitable sites for spoil disposal, possibly in conjunction with recreation sites or other community activities.

c. North and South Bays at the City of Hudson are abused major tidal wetlands. Critically needed is an examination of the effects of urban and industrial activities (including city landfill and salt storage) on the integrity of these wetlands.

Application: Information gathered from this study will be incorporated into the State's Coastal Management Program and will be used to guide municipalities in implementing recreation, coastal development or wetland management programs.

4. Water Pollution

Problem: Heavy weed beds and algae bloom indicate water pollution problems on Copake Lake, Kinderhook Lake and Robinson Pond. These eutropic lakes are becoming residentially developed. The water quality has diminished with the influx of new residences.

Need: Identification of pollution sources. The location of weed beds and algae concentrations. Depth profile and shore line encroachments.

Implementation: The data will assist in water quality evaluation. Pollution abatement is enforceable under the State Environmental Quality Review Act, Section 8, and the Freshwater Wetlands Act to be effective law in 1978. Identification of Sources and the Extent of Existing Problems. Existing zoning can be evaluated for shoreline use restrictions.

APPENDIX G

SELECTED PUBLISHED NEWS ITEMS

State Turns Its Attention to Dams

By MICHAEL DESMOND
Courier-Express Staff Reporter

Dams are a hot issue in government again, so hot that two New York State agencies, two universities and three federal agencies are now looking at and into them.

First of all, they have to find them. That may seem simple, but it isn't. There is really no adequate list of how many dams are scattered around the state, although state officials will throw out an estimate of 6,000.

Dams have been built around the state for so long that no one knows which is the oldest or how old some of them are. George Koch, supervisor of the Dam Safety Section of the State Department of Environmental Conservation (ENCON), said there are "quite a few" which date back to the early 1800s.

Downstream Hazard

To complicate the whole discussion, the state and the federal government have different ways of stating the "downstream hazard classification." Dams and their hazards aren't rated on the structure, but on the damage which could be created downstream if it collapses.

The dam which collapsed recently in Georgia is an example of a "high hazard" dam because a trailer park was downstream. "It was put in the high hazard category and rightfully so," Koch said. Thirty-seven persons died.

To really check each dam, there has to be an inspection.

Aerial Photography

At Cornell University, a team is studying how aerial and satellite photography can be used to find and examine dams.

At the Polytechnic Institute of New York, another group is studying the use of dams, especially smaller dams, to generate electric power. This is being done on a grant from the State Energy Research and Development Authority, using EnCon data and a survey of larger dams conducted several years ago by the U.S. Army Corps of Engineers.

The Cornell study started out with a grant from the National Aeronautics and Space Administration. It is now being paid for with more money from the Office of Water Research and Technology of the Federal Department of the Interior. It is being done to help EnCon.

But, the Cornell group doesn't know about the New York Polytechnic group. Last weekend, the Polytechnic group was on the Cornell campus to discuss starting up electric generation from a former power dam in the middle of the Cornell campus.

The Cornell dam, 130 feet in height, was shut down for economic reasons when other sources of power were cheaper. That may not be true now.

As the cost of oil and coal rises, hydro-electric power looks better and better. So, the New York Polytechnic study has produced a list of 75 sites where power could be generated from existing dams or dams could be improved. A separate list of sites where dams could be built is also being put together.

20 Sites

Eventually 20 sites will be picked from the two lists and intensively examined for power possibilities.

Three dams in Western New York are in the list of 75. They are a flood control dam on Gates Creek in Franklinville; the 1906 Hemlock Lake control dam on the Genesee River and the Mt. Morris power dam, on the Genesee River, now used by Rochester Gas & Electric Corp. to generate small amounts of power.

The Cornell study is looking at another problem. Governments have not been willing to spend money on dam inspections. The federal government has never started its mandated dam inspection program. Koch and one assistant are supposed to inspect all dams in this state.

Warren R. Philipson, senior research associate at Cornell, said the university program is to determine what can be done with aerial and satellite photography. "In essence, all we are trying to help the state do is establish a more efficient program," he said.

The pictures from a satellite can pick up a dam pond as small as 10 acres. The overhead pictures can also pick up the condition of dam spillways, changes in water depth with the season and signs of leaks or erosion.

Koch said the dams he really has to be concerned about are the 850 turned up in the Corps of Engineers study in 1973. These are dams at least 25 feet high holding back at least 15 acre-feet of water. An acre-foot is a body of water one foot deep on one acre of land. The corps also watches dams six feet high holding back 50 acre-feet of water.

There are 220 dams around the state which are considered "high hazard" because of what is downstream. Koch said, "We don't have a structure in this category which is unsafe."

But, they must be watched.

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Frank N. Kemmer
Technical Editor

(NEW PUBLICATION WHICH INCLUDES
AN AERIAL PHOTOGRAPH FLOWN BY
NASA FOR A CORNELL UNIVERSITY
REMOTE SENSING PROGRAM STUDY)

Scientists use many diverse tools to study water contamination. Top: an asbestos amphibole from Lake Superior, at 19,000X by the electron microscope. Lower: aquatic growth in Canadarago Lake (Eastman Kodak photo of NASA aerial photograph).

Chapter 6

Water Contaminants: Occurrence and Treatment

The introduction of contaminants into water supplies has been shown to be related to rainfall, the geological nature of the watershed or underground aquifer, and the activities of nature and the human population. Water contaminants to be examined in more detail fall in two categories: dissolved matter (Table 6.1) and non-soluble constituents (Table 6.2). Dissolved gases are included in discussions of the biological cycles affecting water quality.

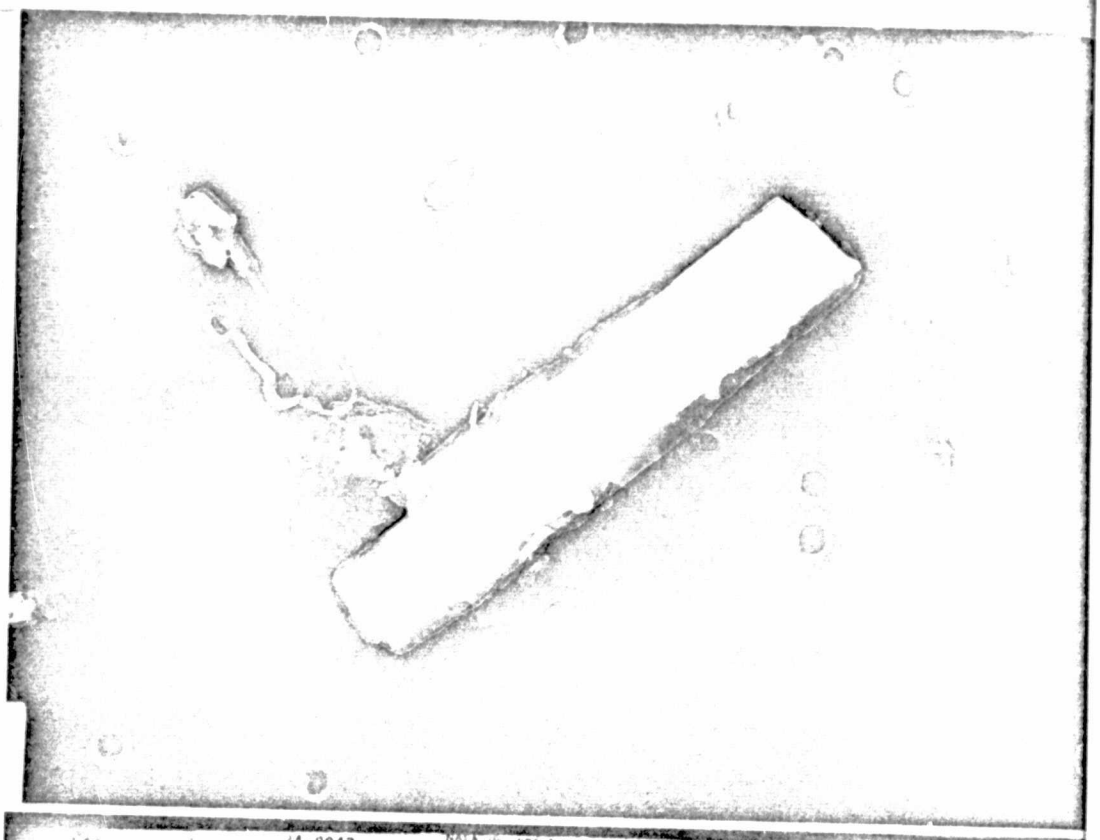
As shown in Table 6.1, soluble materials in water are arbitrarily assigned to five classifications, the first four of which are based on concentration levels, with the last covering those materials usually transient because continuing reactions in the aquatic environment change their concentrations.

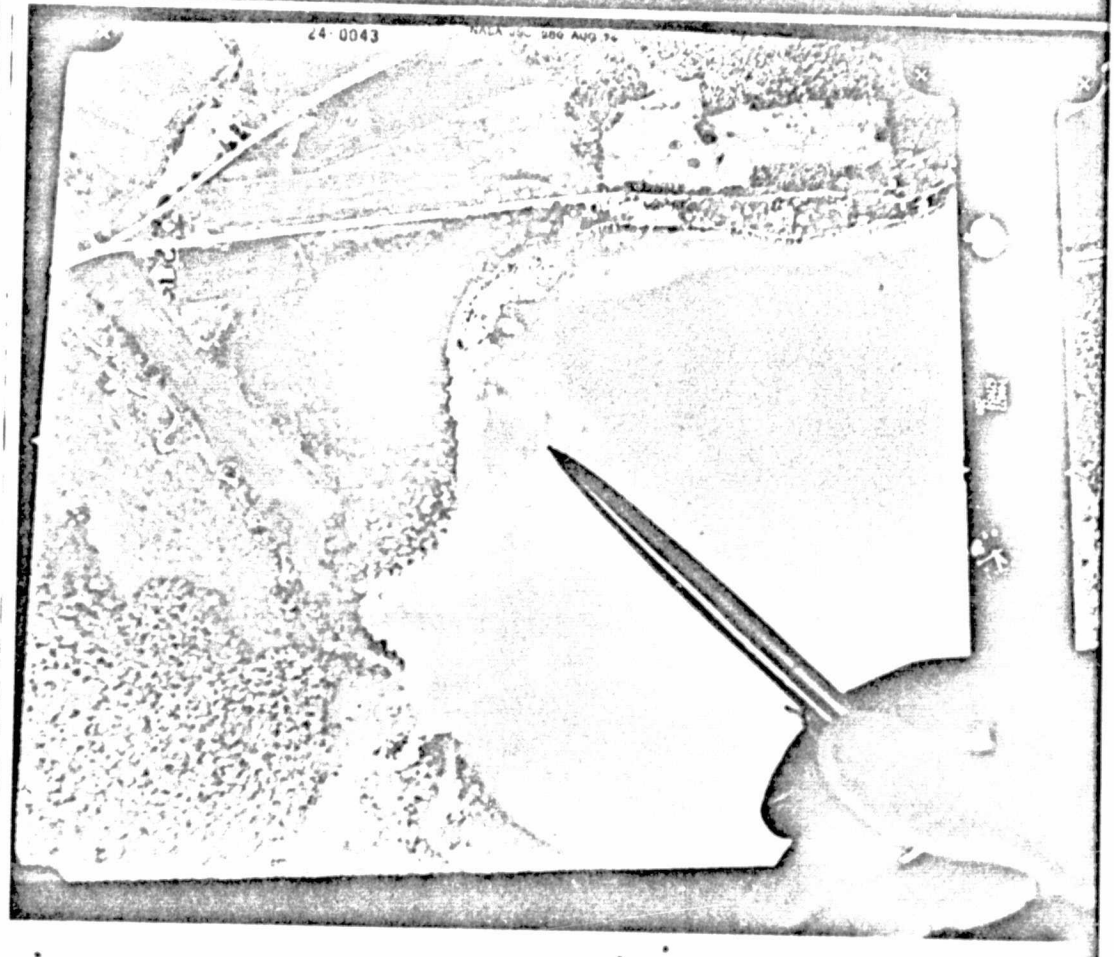
Many materials are transient because of biological activity. The change in CO_2 and O_2 content with sunlight, discussed in Chapter 4, is one example. Equilibrium between NH_3, N_2, NO_2^{-1} and NO_3^{-1} is another, discussed later in this chapter as part of the nitrogen cycle. (See Class 2, Secondary Constituents.)

There are also longer term processes by which Nature cycles matter through living organisms, which in turn modify the environment and leave their records in the rocks. This chapter examines the sources of contaminants in water, many of which are minerals created by living things. Perhaps the best known are the chalk cliffs of Dover and the coral atolls of the Pacific, both composed of $CaCO_3$.

Discussing these atolls in his essay on Formation of Mineral Deposits, C. C. Furnace says, "To the casual observer, it would seem that the polyp has built these great masses of land out of nothing; but, of course, it cannot do that any more than man can. It has taken calcium compounds from very dilute solutions of sea water and built up a shell of calcium compounds to protect itself. In this process of following its preordained metabolic rite, it has concentrated calcium by several thousandfold in the form of an insoluble compound. Insignificant as the coral polyp may appear, it is one of the most important creatures in changing the character of the earth's surface."

Many other natural cycles have been operating over countless geologic ages to produce deposits of sulfur, iron, manganese, silica, and phosphate, to name only a few. In the village of Batsto, New Jersey, the early American colonists set up the first blast furnace in the New World. Their source of iron ore

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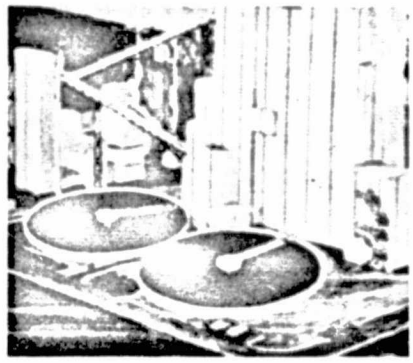
CONTENTS



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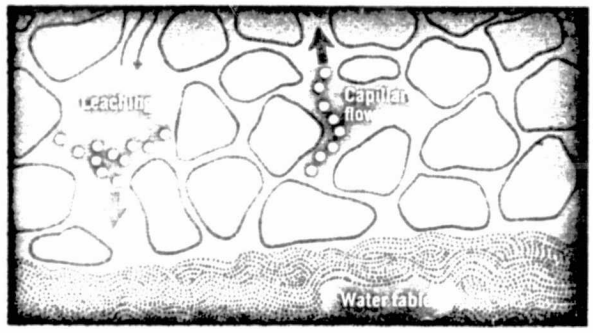

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Those interested in joining the American Chemical Society should write to Admissions Department of Washington Office.

P.A.R. REPORT

The aerial photo—eutrophication link

Cornell University scientists show that a lake is revitalized after wastewater effluent treatment

Since 1968, scientists have been collecting data at Canadarago Lake in central New York State for what may prove to be a classic study of the revitalization of a eutrophic body of water. The lake is relatively small (6 km by 1.5 km, with depths of 13.4 m), and isolated from pollutants except for effluent from a sewage treatment plant at nearby Richfield Springs (pop. 1600).

In January 1973, a new tertiary sewage treatment plant for the village went into operation as a Federal and New York State demonstration project. It replaced a plant built in the late 1800s. The old plant, virtually inoperable in its final years, had been discharging almost raw sewage into the lake. This caused a high phosphorus enrichment in the lake with consequent growth of algae.

The new treatment plant has reduced the lake's phosphorus input by about 40%. With a definite discharge cutoff date, the lake provided an ideal site to study the before-and-after effects of the cleanup on both plant and fish life. It was theorized that a change in sewage treatment would cause a change in the lake's ecology, and this seems to be the case.

Although many components of the lake's ecosystem have been monitored since 1968, little emphasis had been placed on recording changes in aquatic vegetation accompanying the decrease in nutrient loading. The lake had been highly productive of algae, which reduced light penetration through the water and apparently inhibited the growth of rooted plants.

The question was whether the lower nutrient level would reduce the algae population, thus encouraging the growth of higher forms of vegetation. Given that aerial photographs of the lake had been taken both before and after the treatment plant start-up, a project to develop evaluative techniques was undertaken in the Remote Sensing Program of the School of Civil and Environmental Engineering, Cornell University.

The evidence

"Aerial photos have been used in the past to map weed beds," says Brian L. Markham who, with botanist Ann E. Russell, conducted the analysis under the direction of Dr. Warren R. Philipson and Prof. Ta Liang. "Our objective was to demonstrate that aquatic vegetation could be identified reliably from aerial photographs with little or no concurrent ground data. This was also part of a larger project, now under way, to assess what changes have taken place in the lake."

Markham's study was begun under the school's grant from the National Aeronautics and Space Administration, and continued under a grant from the United States Department of the Interior, Office of Water Research and Technology. Photographs were provided by Eastman Kodak Company, the U.S. Environmental Protection Agency, NASA, and the State University of New York College of Environmental Science and Forestry.

Cornell's Markham
"differentiating between green plants"

Aerial photographs of the lake had been taken in 1968, 1969, 1973, and 1974. Fortunately, most of the photography had been done both with Kodak Aerochrome MS film 2448 (Estar base) and with Kodak Aerochrome infrared film 2443 (Estar base) to provide a comparison between normal color and infrared color images.

The interpretation

By studying the aerial images at a scale of 1:6000 with a zoom stereoscope, Markham was able to compare weed beds and note changes over a 6-y period. From these data, he developed three predictive classifications to be used in field studies during last summer. It was predicted that areas having vegetation during the 6-y period and those in which vegetation had developed between 1968 and 1974 would have vegetation at the time of the field survey. Areas revealing no vegetation over the period were expected to still be barren. "We found excellent agreement between the predictions and the ground-truth study," Markham states.

The other part of the study was aimed at identifying major types of vegetation from the photographs. Viewing the photographs, Markham found that he could identify five types of floating or emergent vegetation through location, shape, color, and texture of the patch, and its height above the water surface. Working with the stereoscope, Markham examined plant heights as low as 0.5 meters.

Using prints of the 1974 photography for reference, Markham and Russell identified and mapped the various stands of weeds during the summer's field study. Concurrently, new photography was flown in July and August, and later correlated with field identifications.

What the lake surveillance project showed

- Different species of floating and emergent vegetation can be identified from aerial photographs with little or no ground data. Given sufficient water transparency, submersed vegetation can be recognized and differentiated from other bottom features, such as rocks. However, the different submersed types were generally not separable in the aerial photography.
- Smaller format photography is adequate for species identification, but the coverage afforded by larger format photography is preferable for mapping. Film used for earlier photography was 9½ inches wide, while the 1976 photography was done with 70 mm film.
- Larger scale photography is preferable for detailed vegetation surveys. Generally, scales larger than 1:10 000 are recommended.

Overexposure of the film by about one-half stop aided water penetration. Markham reports that he also saw some stereo effect underwater. He could thus differentiate between low-lying bottom plants and those growing up from the bottom to near the surface. All told, Markham characterized five types of floating (lilies) or emergent vegetation (pickerelweed, bulrush, burreed, and cattail), and five species of submergent vegetation (water milfoil, mud plantain, elodea, curly-leaved pondweed, and muskgrasses).

The August 1976 photographs also were analyzed densitometrically to determine whether spectral characterization would aid in identification of emergent and floating species. "We found that, for our purposes, densitometric analysis did not add to the information we could extract visually with a stereoscope," Markham comments. "We did not attempt to characterize the submergent species in this manner because of the complicating effects of the water. In general, the tones of the submerged vegetation seemed to vary more with the water depth than with the vegetative type.

"We saw changes in the lake over the period of the study," Markham says, "and the major changes involved the submerged vegetation. The changes may have occurred because of the change in water transparency, but we don't know for certain. So, we have the effect but not the cause.

"What we have done is to develop a relatively simple, inexpensive way to assess changes of this sort through aerial photography," he concludes. "Historically, this is important. If past photography of a body of water exists, we can reach back in time and gauge years of change in the short time it takes to analyze the photos."

EOSD

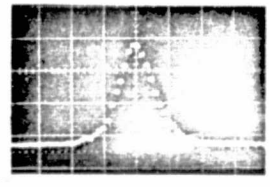
Electro-Optical Systems Design

The Engineering Magazine of Electro-Optical and Laser Technology
August 1977, Vol. 9, No. 8

News

Technology

Cover: *Beam profile of the output of a pulsed dye laser using a new four prism intracavity beam expander. At right is the same profile as viewed by a pyroelectric detector array. (Photos courtesy of Molectron Corp.)*



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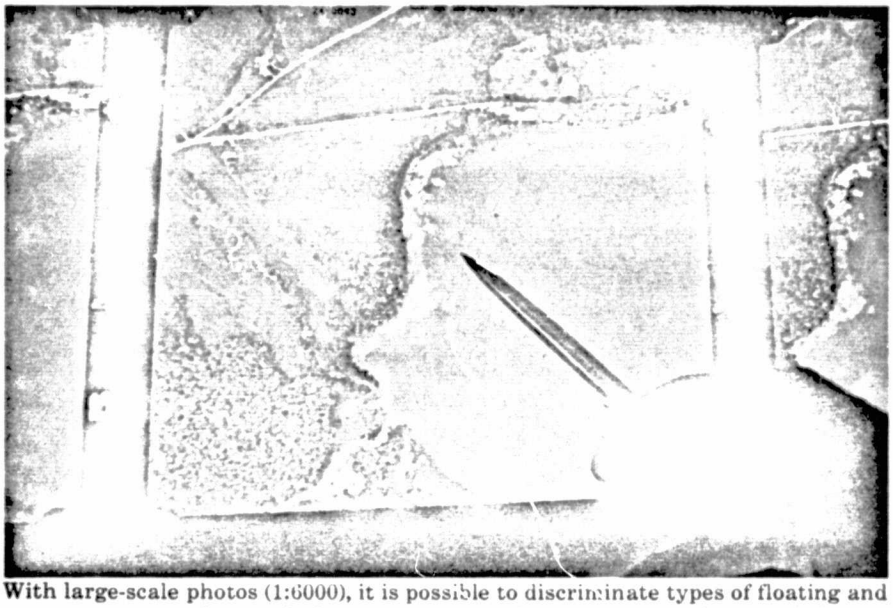
BPA

LIA

OFFICIAL PUBLICATION

Aerial Photography Tracks Algae



With large-scale photos (1:6000), it is possible to discriminate types of floating and emergent vegetation, and also to separate submersed weeds from such botton features as rocks. (Eastman Kodak photo).

Ithaca, NY — Canadarago Lake in Central New York is providing scientists and ecologists with a unique "living laboratory" in which to study the effects of a slowdown or reversal of pollution. The small lake is isolated from industry; the only significant source of pollution has been effluent from a sewage treatment plant at the nearby village of Richfield Springs (pop. 1,600). As a joint demonstration product of the U.S. Government and New York State, the village's old plant was replaced with a tertiary sewage treatment plant that went into operation about four and a half years ago.

The new plant removes almost 90% of the phosphorus that formerly was dumped into the lake in the effluent. This poses the key question: will reducing phosphorus input so much reverse the growth of algae? To help answer that question, scientists in the Remote Sensing Program of the School of Civil and Environmental Engineering, Cornell University, have used aerial photography to study changes in Canadarago Lake's vegetation balance.

"Aerial photography is probably the most efficient way to assess changes that occur over a period of years," says Brian L. Markham, who conducted the analysis under the direction of Dr. Warren R. Philipson and Professor Ta Liang. Markham's work was begun with support from NASA, and subsequently financed by a grant from the United States Department of the Interior, Office of Water Research and Technology.

Markham analyzed five sets of photographs of the lake taken between 1968 and 1974. From this analysis, he predicted areas where weeds would be absent or present. Then, during the summer of 1976, he and botanist Ann E. Russell visited the lake, identified both underwater and above-water plants, and mapped their location. Concurrently, new aerial photographs were taken with both regular and infrared-sensitive film and used to confirm the existence of the weed beds and the identification of plant species.

"We have seen increases in submersed plant population during the four years since the new treatment plant went into operation," Markham notes. "It's too early to tell *why* the increase took place, but we can see it and that's what we wanted to do." □

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Photographer

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features

depts. & cols.

staff

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Aerial Photography Used In Pollution Study

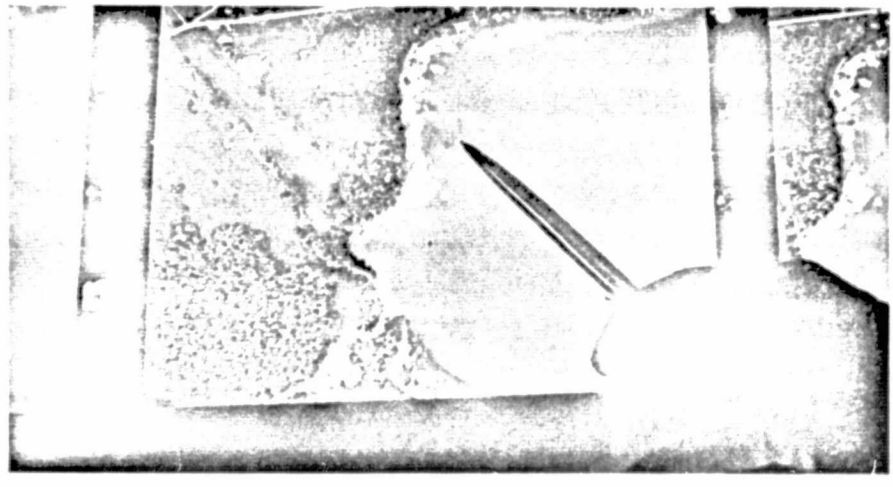
A group of Cornell University scientists studying Canadarago Lake in central New York state to see if a reduction or reversal of pollution is possible have found aerial photography to be an important tool in studying the effects pollution has on underwater plant life.

Isolated from industry, the lake's only source of pollution had been the dumping of phosphorus from a nearby sewage treatment plant. (Phosphorus causes algae to multiply, which reduces sunlight needed by underwater-rooted plants.) In 1973, a new sewage plant reduced the level of phosphorus being dumped into the lake by almost ninety percent. Scientists believe that a reduction of phosphorous in the water would, in time, reduce algae and spur growth of underwater plants.

Aerial photography has been used to study any changes in the lake's vegetation balance. Researcher Brian Markham says, "Aerial photography is probably the most efficient way to assess changes that occur over a period of years." Markham analyzed five sets of photographs taken between 1968 and 1974. In 1976, new photographs were taken with two Kodak Aerochrome films, MS 2448 color film, and Infrared 2443. Markham says plant species identification is easier with infrared film because various species are recorded in markedly different shades of red instead of subtle gradations of green. Markham also found it possible to differentiate submersed vegetation from other underwater features such as rocks and debris.

At present, most studies of the lake are still inconclusive because of the slow deliberate way of nature's working, but with aerial photography scientists have a means to document any long-term relationships between waste dumping and the reestablishment of a balanced plant community.

By comparing aerial photographs, algae growth (the spotted areas) can be easily monitored.



news

Photokina To Push A-V In '78

Germany's fabulous Photokina, billed as the largest photographic trade show in the world, is reportedly making plans to become even larger in 1978.

The Cologne Trade Fair Group has announced that it intends to step up coverage of audiovisual equipment at Photokina-'78, September 15-21, 1978 in Cologne. Advance information suggests that promotion and exhibit layout will increase, and — to make the show more accessible to American exhibitors — Photokina management will offer a complete exhibition package. The comprehensive deal will include booth space and design accommodations, and transportation.

Photokina-'76, featured more than 100 exhibiting American companies, the largest group of foreign companies at the show. The National Audio Visual Association (NAVA) says of those 100, at least twenty were suppliers to the audiovisual industry. NAVA also says percentage figures indicated that of the 100,000 registrants at Photokina-'76, 20,000 were directly interested in audiovisual equipment.

For more information on the exhibitors' package, contact Hans J. Teetz, German American Chamber of Commerce, 666 5th Ave., New York, NY 10019.

Board Adopts New Life Member Policy

PP of A's Board of Directors have approved a new life membership policy for the Association. As of June 1, 1977 an individual who has been a member of the association for twenty-five years and has been active in professional photography for forty-five years or has earned 200 merits is eligible. Any individual who has been awarded the degree of Honorary Master of Photography will automatically become a life member. As in the past, life members will not be required to pay dues or convention registration fees.

Trouble in Labland

Ferrex Corporation, San Carlos, California, manufacturer of the Colorverter Video Analyzer, the Autoverter for printers, translators, and related equipment, has declared bankruptcy as a result of a $2.9 million judgment against the firm in patent litigation with Photo Electronics Corporation, West Palm Beach, Florida. PEC manufactures the VCNA Video Analyzer for Eastman Kodak Company.

Many lab owners who say they bought Ferrex equipment in the belief that the company would win the suit are upset over the loss of replacement source of parts and service.

Chalmer E. Jones, president of Ferrex, said the judgment will be appealed.

trade talk

Rocky Gunn, star of the wedding photography lecture circuit, has some strong opinions on the state of the art today. "Most studios that I see are offering crappy work. Crappy!" was the opinion Gunn fired off in an interview in the May issue of *Canadian Photography*. "Walk down the street and you'll see photos of brides sitting there looking you square on. The photographer didn't learn his ABC's. . . . Some of these guys put in six hours a weekend and think they're pros." Joining in the interview with Gunn were **Al Gilbert,** M.Photog.Cr. and **Bill Browne,** Cr.Photog., two of Canada's top photographers. . . . PP of A convention speaker **Richard Jones,** FAISD, is noted for Eastman Kodak Company's "House of Ideas" project. Jones and his partner, **Ronald Oates,** were commissioned by Kodak to design a Park Avenue apartment in New York to demonstrate the acceptance of professional photography by interior designers as a valid decorative art form. Photographs embellish tables, walls, and hanging fabric used like wallpaper throughout the apartment. Photographers whose work is used in the decor are: Michael de Camp, Michel Deloborde, Burt Glinn, Walter Ioss, and Jay Maisel. . . . Congratulations to **Jim Stewart, M.Photog.,** for receiving the Burt Williams Award from the **National Press**

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VOL. 20, NO. 7

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Solid wastes management

REFUSE REMOVAL JOURNAL & LIQUID WASTES MANAGEMENT

National Magazine for the Sanitation Industry

Contents

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THE COVER

Newspapers across the nation gave coverage to Mobile, Alabama's decision to paint its refuse fleet in red, white and blue for the Bicentennial. This Heil on GMC chassis shows the dramatic impact of the city's civic pride.

Spy in the sky checks landfills

Aerial photography is being pulled out of the scientist's bag of tricks and used to monitor refuse disposal sites at Cornell University's School of Civil and Environmental Engineering.

The work is part of a program to establish standardized methods of landfill monitoring, funded by NASA in cooperation with the EPA, and could be a powerful new tool in the hands of officials to check the impact of wastes burial as mandated by recent congressional legislation.

According to William L. Teng, research assistant conducting the study at Cornell: "We know leachate is warmer than surrounding waters." Basing his experiments on this fact, heat scan photographs of local landfills were taken from the air to determine if these thermal differences were significant enough to show up on the pictures. (In thermal photos, the warmer the object, the darker its color.)

In addition, thermometers were pinpointed around the sites for direct measurement of polluted vs. non-polluted waters over a 12 hour period. Just before dawn, when the land cooled and temperature differences were at their greatest, the airplane flew over the sites and took the pictures.

Five photographic flights were made during different seasons, obtaining natural color shots and infrared pictures as well as the heat scan photos. The missions were directed by Dr. Warren Philipson, a research associate at Cornell working along with Teng on the project. By taking several kinds of aerial pictures, the scientists believe they will be able to draw an accurate profile of landfill seepage from the various data.

Often seepage is not evident from the ground because it may travel some distance before surfacing. Teng feels his experiments will solve this problem. "We discovered one seepage that surfaced in a forest almost 1,000 yards away from the landfill with aerial photography," reports Teng.

After processing, the photos are analyzed with a stereoscope which converts the flat images into 3-D. In this way, hills and valleys, viewed realistically, can determine the direction in which seepage will flow. Water appearing out of the ground near a landfill and any damp soil patches might also indicate leachate. Such areas are plotted and followed-up with closely monitored ground studies over a period of time.

Adds Teng: "Unusual coloration of water often is a direct indication as to what kind of pollutant is being leached out of a disposal site." But in most cases, identifying pollutants isn't that easy and leachate samples must be qualitatively analyzed in the lab.

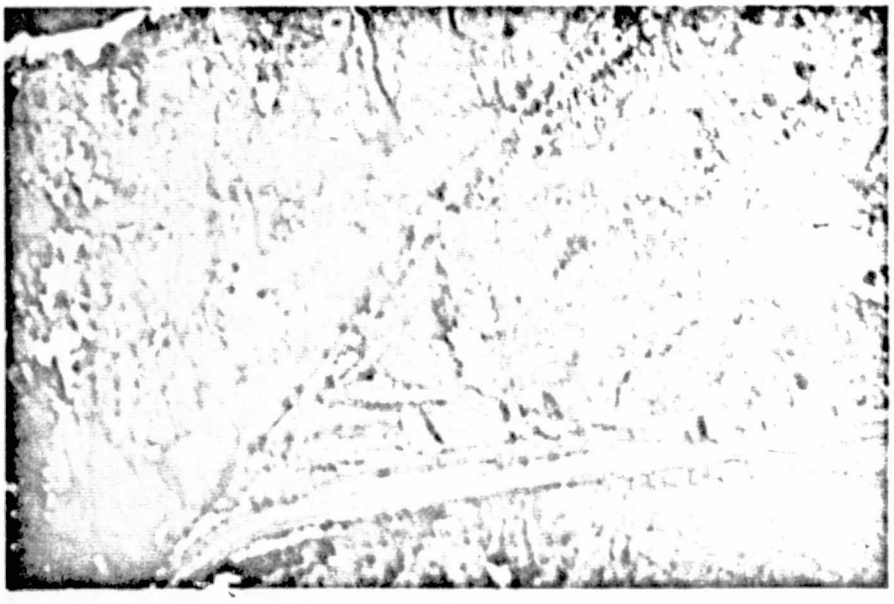
Much of the ground sample analyses are undertaken by Dwight A. Sangrey, associate professor at Cornell, studying temperature and composition of known seepages from local disposal sites. Although the two men work independently of each other, Teng relies heavily on ground samples collected by Sangrey's team.

"We look for three components in leachate," says Sangrey. "These are heavy metals, pollutants which are specific to leachate, and material which should degrade as the leachate moves farther from the landfill."

Researchers can also study long-term environmental impact of landfills on surrounding countryside by comparing recent aerial photographs with identical shots taken decades ago. Utilizing the school's library of more than 600,000 aerial photos, taken as far back as 35 years ago, Teng can spot changes in the course of a stream, size of the stream bed and species of vegetation.

Although most of the results aren't in, and much correlation and analysis remains to be done, Cornell researchers have been able to draw two conclusions from their work. Ground sampling will still be necessary to monitor amount and composition of leachates. But aerial photography can be an instant means of spotting the source of the seepage.

So the next time you see a small plane circling over a landfill, smile — you may be on candid camera! □



Studying aerial photos such as shown at right, scientists can locate escaping leachate.

APPENDIX H

RECENT SEMINARS AND ORIENTATION SESSIONS

SEMINAR IN REMOTE SENSING

LIST OF SEMINARS

Fall Semester 1977

Date	Speaker	Topic
Sept 14	Frank R. Perchalski Principal Engineer HRB-Singer Inc. State College, Penn.	Applied Remote Sensing in Transportation Engineering
Sept 21	Dr. James Anderson Chief Geographer U.S. Geological Survey Reston, Va.	Land Use and Land Cover Map and Data Compilation in the U.S. Geological Survey
Sept 28	Michael M. McDonnell Research Physicist, Research Institute U.S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia	Holographic Terrain Display and Measurements
Oct 5	Dr. Josef Cihlar Scientist, Canada Centre for Remote Sensing Ottawa, Canada	Use of Aerial Thermography for Heat Loss Detection from Buildings
Oct 12	Dr. Shin-yi Hsu Associate Professor, Department of Geography, State University of New York at Binghamton Binghamton, New York	Digital Image Data Processing for Land Use Mapping
Oct 19	Norman E. Banks Chief, Bathymetric Mapping Program, National Ocean Survey, NOAA Rockville, Maryland	Bathymetric Mapping: Road Maps of the Environment Beneath the Oceans
Oct 26	Dr. Fred J. Gunther Task Leader, Geologic Image Processing, Computer Sciences Corporation Silver Spring, Maryland	Discrimination of Rock and Soil Types by Digital Analysis of Landsat Data
Nov 2	Dr. Warren A. Hovis Director, Satellite Experiment Laboratory, National Oceanic and Atmospheric Administration, National Environmental Satellite Service Washington, D.C.	Remote Sensing of Water Pollution

Date	Speaker	Topic
Nov 16	Virginia Carter Biologist Water Resources Division U.S. Geological Survey Reston, Virginia	Remote Sensing Applications in Wetlands
Nov 30	Saul Cooper Chief, Water Control Branch New England Division U.S. Army Corps of Engineers Waltham, Massachusetts	The Use of Satellite Data Collection Systems in Managing Flood Control Systems
Dec 7	John B. Hall, Jr. Aero-Space Technologist National Aeronautics and Space Administration Langley Research Center Hampton, Virginia	NASA Remote Sensing Experiments in the New York Bight

ASEE Conference To Be at Cornell

How do engineering colleges first introduce students to engineering and technology? How do they involve practicing engineers in their curriculum? How do they reach out to women students and minority students? What are the job prospects for their graduates?

These are some of the questions to be discussed at the annual fall meeting of the St. Lawrence Section of the American Society of Engineering Education (ASEE), to be held at Cornell University Friday and Saturday, Oct. 21 and 22.

About 200 faculty members and practicing engineers from Ontario, Quebec and Upstate New York are expected to attend. Conference sessions with themes corresponding to the above questions will involve more than 25 speakers or panelists. In addition, the annual business meeting of the St. Lawrence Section of ASEE will be conducted by the chairman of the section, Edward T. Misiaszek, associate dean of engineering at Clarkson College of Technology.

The co-chairmen and organizers of the meeting are Donald F. Berth and Richard N. White of the College of Engineering at Cornell. A number of other Cornell faculty and staff members have participated in the preparations.

The ASEE is a national organization dedicated both to the improvement of university and college instruction and facilities in engineering and to the interaction between engineers in education and those in industry and practice.

COLLEGE OF ENGINEERING
CORNELL UNIVERSITY

OFFICE OF THE DEAN

To: Professors Frank Moon, Warren Philipson, Dick White, Sid Kaufman and Les Eastman

Date: October 14, 1977

From: Dick Lance, Engineering Open House Subcommittee

Re: Engineering Open House at ASEE Meeting Friday, 21 October

Thanks for your willingness to participate in the open house activity associated with the annual meeting of the NE Section, ASEE, to be held here Friday and Saturday 21-22 October 1977. This is to verify your willingness to participate and to request information.

The open house period is between 4:45 and 5:30 PM Friday 21 October. Those wishing to see your activity will assemble under appropriate signs in the Hollister Hall foyer and be guided to your location by a guide which I'm asking you to recruit (it could be yourself). If you have not already done so, please send me the name and phone number of the guide for your activity and the activity's location. I'll phone the guides as a last minute reminder of their duties.

I'd also like, as an entry in a hand-out, a one-paragraph description of your activity and a corrected title (see list below), where appropriate.

Activity	Location	Director(s)
Magnetic Levitation for Transportation Systems		Frank Moon
Remote Sensing and Photogrammetry		Ta Liang & Warren Philipson
Structural Models Lab.		Dick White
Seismic Reflection Profiling		Jack Oliver
Semiconductor Electronics		Les Eastman

Thanks for your cooperation.

RHL:dk
cc: Donald F. Berth

Multi Regional Project on Science Technology and Development

November 15

Meet Allegheny Flight 348 from JFK arriving Ithaca 6:11 PM. The bus to first drop the participants at Statler Inn and then leave their baggage at Collegetown Motor Lodge. The participants will check at Collegetown Motor Lodge after dinner at the Rathskeller.

November 16

Participants leaving for Pittsburgh on the 16th by Allegheny Flight 345 departing at 5:45 PM should check out in the morning. Baggage will be picked up and brought to Statler Inn later.

8:00 AM - Meet at Statler Lobby

8;00 - 8:45 - Breakfast at Rathskeller

9:00 AM - Morning Session at Taylor Room, Statler Building

9:00 - 9:45 - Topic: Science and Technology for Development Infrastructure for Policies and Plans, Research Institutes, Manpower Development -

Prof: Edmund T. Cranch, Dean, College of Engineering and Director, Program on Policies for Science and Technology in Developing Nations.

9:45 - 10:30 - Group Discussion

10:30 - 10:45 - Coffee break
Topic: Agricultural Science and Technology

10:45 - 11:15 - 1. International Agriculture Programs

Prof: Kenneth L. Robinson (Agricultural Economics)

11:15 - 11:30 - 2. Appropriate Agricultural Technology

Prof. Joseph K. Campbell (Agricultural Engineering)

11:30 - 12:00 - Group Discussion

12:00 - 1:15 - Lunch at West Lounge, Statler Building

1:15 - 1:45 - Topic: Alternate Sources of Energy

Prof. Peter L. Auer
(Mechanical & Aerospace Engineering)

2:00 - Afternoon Sessions at Taylor Room, Statler Building

Topic: Land Use and Water Resources Planning

2:00 - 2:15 - Remote Sensing and Land Use Planning

Prof. Ta Liang
(Civil & Environmental Engineering)

2:15 - 2:30 - Water Resources Planning

Prof. Leonard B. Dworsky
(Civil & Environmental Engineering)

2:30 - 3:00 - Group Discussion

Alternate Sources of Energy

3:00 - 3:15 - Energy from Fermentation

Prof. William Jewell
(Agricultural Engineering)

3:15 - 3:30 - Geology and Energy

3:30 - 4:30 - Group Discussion

4:30 - Closing Remarks: Prof. Edmund T. Cranch

4:30 - Pick-up bus at Statler Inn to meet Allegheny Flight 345 to Pittsburgh

MULTI-REGIONAL PROJECT ON SCIENCE, TECHNOLOGY, AND DEVELOPMENT
November 6 to December 5, 1977

PARTICIPANTS

Dr. Freddy Ba Hli, Technical Adviser, Ministry of Planning and Finance, Rangoon, Burma

Dr. Zarjan Baha, Dean, Faculty of Engineering, University of Kabul, Kabul, Afghanistan

Mr. Tadjou Bello, Director of Studies and Planning, Ministry of Rural Development and Cooperative Action, Cotonou, Benin (formerly Dahomey)

Mr. Joao Mamede Cardoso, Executive Secretary, Science and Technology Program, Department of Culture, Science, and Technology, State of Sao Paulo, Sao Paulo, Brazil

Mr. Hollis R. Charles, Director, Caribbean Industrial Research Institute (CARIRI), Port of Spain, Trinidad and Tobago

Dr. Ramachandra Damodhar Deshpande, Director, Department of Science and Technology, New Delhi, India

Mr. Erling Fjellbrikland, General Secretary, Main Committee for Norwegian Research, Oslo, Norway

Dr. Mohamed Baha-Eldon Fayez, Secretary-General, Academy of Scientific Research and Technology, Cairo, Egypt

Dr. Peter Flubacher, Chief, General Research Section, Office of Science and Research, Swiss Federal Department of the Interior, Bern, Switzerland

Dr. Karoly Fukker, Deputy Department Head, State Office of Technical Development, Budapest, Hungary

Mr. Alberto Giesecke Matto, Director, Geophysical Institute of Peru and Regional Seismological Center for South America, Lima, Peru

Dr. Harsono Wirjosumarto, Professor of Metallurgy and Vice Director, Development Technology Center, Institute of Technology, Bandung, Indonesia

Dr. Soodursun Jugessur, Associate Professor and Chairman, Department of Physics and Electronic Engineering, University of Mauritius, Port Louis, Mauritius

Dr. Koh Lip Lin, Associate Professor of Chemistry and Coordinator of Physical Science Program, Nanyang University, Singapore

Mr. Peter Li, Chief, Operations Division, Royal Observatory, Hong Kong

Dr. Ion Manzatu, Special Advisor to the President, National Council for Science and Technology, Bucharest, Romania

Mr. Modiri J. Mbaakanye, Botswana Enterprises Development Unit, Ministry of Commerce and Industry, Gabarone, Botswana

Mr. Gaston Mehia Brown, Executive Director, Bolivian Center for Scientific Research, La Paz, Bolivia

Mr. Mikobi Mingashanga, Director of Administration, Ministry of Planning, Kinshasha, Zaire

Mr. Peter I. Mwombela, Acting Executive Secretary, National Scientific Research Council, Dar es Salaam, Tanzania

Ms. Naima Shayji, Director of Technical Cooperation and Acting Director of Environmental Affairs, Ministry of Planning, Kuwait

Mr. Shin Man-Kyo, Deputy Assistant Minister for Policy and Planning, Ministry of Science and Technology, Seoul, Korea

Dr. Sitali Mundia Silangwa, Acting Secretary-General, National Council for Scientific Research, Lusaka, Zambia

Dr. Joao Bosco de Siqueira, Director General, National Institute of Technology, Ministry of Industry of Commerce, Rio de Janeiro, Brazil

Dr. Albert Nee Tackie, Executive Chairman, Council for Scientific and Industrial Research, Accra, Ghana

Ms. Ana Luisa Valdes Gonzalez, Coordinator of International Programs and Projects, National Council of Science and Technology (CONACYT), Mexico City, Mexico

APPENDIX I

NEWSLETTER RECIPIENTS

CORNELL REMOTE SENSING NEWSLETTER

LIST OF RECIPIENTS

CAMPUS GROUPS AND INDIVIDUALS*

1. Academic Funding

T.R. Rogers, Director
P.F. Mather, Asst. Dir.

2. Aerospace Studies (Air Force R.O.T.C.)

3. Agricultural Economics

O.D. Forker	(Chairman; Prof.)
B.F. Stanton	(Prof.)
D.J. Allee	(Prof.)
H.E. Conklin	(Prof.)
C.W. Hunt,Jr.	(Research Assoc.)
S. Kraft	(Research Asst.)

4. Agricultural Engineering

E.S. Shepardson	(Chairman; Prof.)
G. Levine	(Prof.)
R.C. Loehr	(Dir. Environmental Studies; Prof., Civil and Envir. Eng'g. and Agr. Eng'g.)
D.C. Ludington	(Assoc. Prof.)
D.A. Haith	(Asst. Prof., Civil and Envir. Eng'g. and Agr. Eng'g.)
L.H. Irwin	(Asst. Prof.)
O. Zolezzi	(Research Asst.)

5. Agronomy

R.F. Lucey	(Chairman; Prof.)
M. Drosdoff	(Prof.)
D.R. Bouldin	(Prof.)
E.R. Lemon	(Prof., Soil Scientist, U.S.D.A.-ARD)
M.J. Wright	(Prof.)
R.W. Arnold	(Prof.)
A. Van Wambeke	(Prof.)
G.W. Olson	(Assoc. Prof.)
J.N. Peverly	(Asst. Prof.)
W.F. Croney	(Sr. Ext. Assoc.)
K. Roberts	(Research Asst.)

6. Anthropology

R. Ascher	(Prof.)
J.S. Henderson	(Asst. Prof.)

* Newsletters are sent to the main office of each department listed, as well as to various individuals within the department. In addition, Newsletters are provided to graduate and undergraduate students, upon request.

7. Applied and Engineering Physics

A.F. Kuckes	(Prof.)

8. Astronomy

M.O. Harwit	(Chairman; Prof.)
F.D. Drake	(Dir., Nat'l. Astronomy & Ionosphere Center.; Center for Radiophysics and Space Research; Prof.)
C. Sagan	(Dir. Planetary Studies; Assoc. Dir. Radiophysics and Space Research; Prof.)
Y. Terzian	(Assoc. Prof.)
J. Veverka	(Asst. Prof., Radiophysics and Space Research)

9. Atmospheric Sciences (Agronomy)

B.E. Dethier	(Prof.)
W.W. Knapp	(Assoc. Prof.)
A.B. Pack	(Sr. Research Assoc.)

10. Biological Sciences

11. City and Regional Planning

S. Saltzman	(Chairman; Prof.)
B.G. Jones	(Prof.)
S.W. Stein	(Prof.)
H.M. Hammerman	(Asst. Prof.)

12. Civil and Environmental Engineering

W.R. Lynn	(Dir. School of C.E.E., Center for Environmental Quality Management; Prof., Envir. Eng'g.)
G.P. Lyon	(Asst. Dir.; Assoc. Prof., Envir. Eng'g.)
R.H. Gallagher	(Prof. and Chairman, Structural Eng'g.)
J.J. Bisgoni	(Asst. Prof. Envir. Eng'g.)
W.H. Brutsaert	(Prof., Envir. Eng'g.)
F.J. Cesario	(Asst. Prof., Urban Devel. and Envir. Eng'g.)
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OVAA8 International Inc.
Philadelphia, Penn.

Prof. Kam W. Wong
Univ. of Illinois
Dept. Civil Engineering
Urbana, Illinois

Woodward-Clyde Consultants
Clifton, New Jersey
(a) Ray Hinkle
(b) Jon R. Lovegreen

Prof. Edward F. Yost, Jr.
Long Island University
Greenvale, New York

Dr. Linda S. Zall
Earth Satellite Corp.
Washington, D.C.

Mr. Michael Ziskin
York Research Group
Stamford, Connecticut

Dr. Michael Zoracki
Pattern Analysis &
Recognition Corp.
Rome, New York

APPENDIX J

RECENT NEWSLETTERS

The Newsletter, a monthly report of articles and events in remote sensing, is sent to members of the Cornell community who have an interest in sensors and their applications.

THE SIXTH YEAR

The Remote Sensing Program is funded primarily by a grant from the National Aeronautics and Space Administration (NASA). Since the Program's inception in June 1972, its staff has endeavored to strengthen instruction and perform research in remote sensing, building upon Cornell's many years of experience in aerial photographic studies; to establish communication links among persons interested or active in remote sensing; and to solicit and conduct user-oriented demonstration projects. These projects are conducted at no charge to the user if the project involves a unique benefit- or action-producing application of aircraft or satellite remote sensing in New York State or the Northeast.

NASA-sponsored projects completed since May 1977 include: aquifer assessment for town developmental planning, physical evaluation for development of a state park, suitability analysis of proposed fly ash disposal sites, and drainage planning for a historical building. Continuing projects are focusing on vineyard-related problems, pheasant range management, a county-wide drainage plan, and various facets of state park management. (continued on page 2).

ASP CALL FOR PAPERS

The 44th Annual Meeting of the American Society of Photogrammetry will be held in Washington, D.C. from 26 Feb. to 3 March 1978. Proposals for papers on photogrammetry, aerial photography or remote sensing should be submitted to: Frederic G. Lavery, Deputy Director, ASP Technical Program Committee, 752 Barbaralynn Place, Herndon, Va. 22070, before 15 Sept. 1977. Proposals should include the author's name, address and professional affiliation, a titled summary of approximately 200 words, and the estimated time for presentation (not to exceed 15 mins.).

CALL FOR PAPERS

A Symposium on Digital Terrain Models will be held from 9 to 11 May 1978, in St. Louis, Missouri. Sponsored by the American Society of Photogrammetry, the St. Louis Region of ASP, and the ASP Committee for Computational Photogrammetry, the symposium will focus on all aspects of producing and applying digital terrain models. Prospective contributors should submit a titled summary of approximately 200 words, together with their name, address, position and professional affiliation, to Dr. G. Warren Marks, School of Civil Engineering, Purdue Univ., West Lafayette, Indiana 47907, before 18 Nov 1977.

SEMINAR IN REMOTE SENSING

The Seminar in Remote Sensing is held on Wednesdays, at 4:30 p.m., in 110 Hollister Hall. Any interested person is welcome to attend. Seminars scheduled for September are, as follows:

Wed., 7 Sept	Organizational Meeting--Overview of Seminars & Introduction to Remote Sensing: Ta Liang & Warren R. Philipson, Cornell
Wed., 14 Sept	Applied Remote Sensing in Transportation: Frank R. Perchalski, HRB-Singer, Inc., State College, Pennsylvania
Wed., 21 Sept	Land Use & Land Cover Map & Data Compilation in the U.S. Geological Survey: Dr. James R. Anderson, U.S.G.S., Reston, Va.
Wed., 28 Sept	Holographic Terrain Displays: Michael M. McDonnell, U.S. Army Engineer Topographic Labs., Fort Belvoir, Va.

SYMPOSIA

Fall Technical Meeting, Amer. Soc. Photogram. - Amer. Congress on Surveying & Mapping; 18-21 Oct; in Little Rock, Ark.; Contact: L.R. Fenton, P.O. Box 2261, Little Rock, Ark. 72203 (tel. 501-569-2408).

3rd Annual William T. Pecora Memorial Symposium; 30 Oct-2 Nov; in Sioux Falls, SD; "Application of Satellite Data to Petroleum & Mineral Exploration"; Contact: S. Linville, AAPG, P.O. Box 979, Tulsa, OK 74101.

3rd Int'l. Symposium on Computer-Assisted Cartography; 16-21 Jan 78; in San Francisco; Contact: J.E. Chamberlain, USGS, 345 Middlefield Rd., Menlo Park, CA 94025.

REMOTE SENSING PROGRAM (continued)

One other continuing investigation, a Landsat study of aquatic vegetation, is being funded by the Office of Water Research and Technology, USDI. This study follows an OWRT-funded project on assessing changes in aquatic vegetation with aircraft photography--a project which evolved from NASA-sponsored work. OWRT support to extend another NASA-sponsored study on dam safety inspection is scheduled to begin in October.

The staff of the Remote Sensing Program includes Ta Liang, principal investigator, Arthur J. McNair and Warren R. Philipson, co-investigators, Thomas L. Erb, research specialist, Josephine Ng, data analyst, and Deborah Halpern, photographic laboratory technician. Donald J. Belcher and Ernest E. Hardy are general consultants, and Carl Diegert, a computer consultant, to the Program; and, for specific projects, assistance has been provided by many Cornell and non-Cornell personnel. Students who have contributed to the Program staff effort over the summer include Brian L. Markham, Ronald J. Linkenheil, Ann E. Russell, Laurie B. Schuller, Paul Pirkl and David Fernandez.

SELECTED ARTICLES AND PUBLICATIONS

Nealey, L.D. 1977. Remote sensing/photogrammetry education in the United States and Canada. Photogram. Eng'g. and Remote Sensing 43:3:259-291.

Towery, N.G. and G.M. Morgan Jr. 1977. Hailstripes. Bull. Amer. Meteorological Soc. 58:7:588-591.

Applied Optics 1977. v.16, n.2 (Feb.). Several papers on atmospheric radiation measurements.

IEEE Jour. Oceanic Eng'g. 1977. v.OE-2, n.1. Special issue on radio oceanography. Joint issue with IEEE Transac. Antennas & Propagation.

Photogrammetria 1977. v.32, n.5.
-Speight, J.G. Landform pattern description from aerial photographs.
-Rhody, B. A new, versatile stereo-camera system for large-scale helicopter photography of forest resources in central Europe.

Photogrammetric Eng'g. & Remote Sensing 1977. v.43, n.4 (April)
-Walker & Trexler. Low sun-angle photography.
-Piech et al. Terrain classification using color imagery.
-Odenyo & Pettry. Land-use mapping by machine processing of Landsat-1 data.

The Newsletter is made possible by a grant from the NASA Office of University Affairs. Comments or correspondence should be directed to Dr. Warren R. Philipson, Remote Sensing Program, Cornell University, 464 Hollister Hall, Ithaca, New York 14853 (tel. 607-256-4330).

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LET'S STOP THROWING AWAY GOOD WORK

by
Clifford W. Greve

Dr. Greve, Vice President of Autometric, Inc., in Arlington, Virginia, obtained his doctorate in Geodesy and Photogrammetry at Cornell in 1969. The views expressed here are those of Dr. Greve and do not necessarily reflect the views or policy of the Cornell Remote Sensing Program.

Recently, Autometric, Inc. undertook the development of a geographic-based data management system for the National Wetlands Inventory of the U.S. Fish and Wildlife Service. At the beginning, we were under the assumption that there was a wealth of working software which would be useful for our task. The Federal Government has certainly funded many ventures into this area. These efforts were performed by both private industry and the academic community, but they shared certain common attributes. (continued, page 2).

CALL FOR POSTER PRESENTATIONS

The 12th International Symposium on Remote Sensing of Environment will be held in Manila, 20 to 26 April 1978. Hosted by the Environmental Research Institute of Michigan and the Philippine Natural Resources Management Center, the symposium will stress topics related to the application of remote sensing for development, especially as regards the Southeast Asian and Pacific regions. In addition to conventional sessions of invited papers, the symposium will feature numerous poster sessions. Poster presentations are requested in the following areas: data collection technology; data processing, analysis and interpretation; environmental quality; geology and mineral resources; hydrology and water resources; land and cultural resources; meteorology and climatology; ocean and marine resources; technology transfer; terrestrial and marine pollution; and vegetation and soil resources.

Persons interested in contributing to a poster session should submit 20 copies of a 300 to 1000 word summary to: Dr. Jerald Cook, ERIM, P.O. Box 8618, Ann Arbor, Mich. 48107 (tel. 313-994-1200). Summaries should designate a specific area for evaluation (from list of topic areas noted above), and they must be received by 1 December 1977.

SEMINAR IN REMOTE SENSING

The Seminar in Remote Sensing is held on Wednesdays, at 4:30 p.m., in 162 Hollister Hall. Anyone is welcome to attend. Seminars scheduled for October are as follows:

Wed., 5 Oct — Use of Aerial Thermography for Heat Loss Detection from Buildings: Dr. Josef Cihlar, Canada Centre for Remote Sensing, Ottawa, Canada

Wed., 12 Oct — (Topic on Pattern Recognition): Dr. Shin-Yi Hsu, State University of New York at Binghamton, Binghamton, New York

Wed., 19 Oct — Bathymetric Mapping--Road Maps of the Environment Beneath the Oceans: Norman E. Banks, National Ocean Survey, NOAA, Rockville, Maryland (seminar was re-scheduled from last year)

Wed., 26 Oct — Discrimination of Rock and Soil Types by Digital Analysis of Landsat Data: Dr. Fred J. Gunther, Computer Sciences Corp., Silver Spring, Maryland

Software Development (continued)

First of all, nothing was adequately documented. The software had been written, and the various problems solved, but through lack of care in specifying the terms of the contracts and grants, and through inadequate administration of the projects by both the government and the performing institution, the documentation which was available was almost nonexistent.

This circumstance is intolerable. It is inexcusable for software to be written without at least sufficient documentation to allow a potential user to determine the function of the software and how to use it. Mathematical documentation is also virtually a requirement, except in those areas in which proprietary developments are involved. Ideas which have been developed using federal money are public property, as many a contractor has learned when he tried to keep such information private. Therefore, it is mandatory that sufficient documentation be provided to allow this public information to be used by others.

The second observation which was made was that most of the software was not really finished. The investigator had determined that his solution was valid--at least he had satisfied himself of its validity--and he dropped the problem, without bringing the software to a level of completion which would make it truly useful to others. Thus, later investigators are faced with the task of completely redoing the previous work, because the work is unusable without the help of the original author. If the original author was an employee of some company, there is a chance that he might be available. If, on the other hand, he was a graduate student, he would probably have long since left the university and be very difficult to locate.

The software which has been developed in the past for data base management, and the software which will be developed in the next few years, represents a considerable investment of time and money. All that is necessary to allow this investment to produce useful products is attention to detail by both the performing individual and the government personnel who oversee the work. If these individuals refuse to accept work which is either undocumented or incomplete, the efforts will produce a valuable legacy for future investigators. If we are to continue as in the past, we might as well end these efforts now, and avoid wasting the manpower and money which will be invested in useless work.

SELECTED ARTICLES

Hartman, G.L. 1977. Channel siltation determined with side-scan sonar. Civil Engineering 47:6:71-73.

Sievers, J. 1977. Density corrections and directional reflectances of terrain objects from black-and-white aerial photos. Photogrammetria 33:3:95-112.

Steiner, D. & M.E. Kirby. 1977. Geometrical referencing of Landsat images by affine transformation and overlaying of map data. Photogrammetria 33:2:41-75.

Turner, H. 1977. A comparison of some methods of slope measurement from large-scale air photos. Photogrammetria 32:6:209-237.

Jour. Water Resources Plan. & Manage., ASCE. 1977. v.103, n.WR1 (May)
-Jackson & Ragan. Value of Landsat in urban water resources planning.
-Jackson et al. Test of Landsat-based urban hydrologic modeling.

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RIL--NEW LOCATION, NEW ADMINISTRATION

The Resource Information Laboratory (RIL), of Cornell's College of Agriculture and Life Sciences, has moved to new quarters at the Cornell Research Park, across from the Tompkins County Airport. In addition, since last January, RIL has performed as a unit of the New York State Cooperative Extension. This change has facilitated more direct activity in developing contacts with local government units, and in particular, in developing training programs and assistance for local staff personnel.

Activities at RIL are now concentrated in areas of service to local county or community organizations. Training programs are offered in aerial photographic interpretation, resource mapping, inventory processes, and resource classification. Projects requiring technical services can also be conducted under various arrangements for sponsorship. (continued, page 2).

CALL FOR PAPERS

The 2nd Annual Conference on the Economics of Remote Sensing Information Systems will be held 16-18 January 1978. Papers are solicited in all areas of cost assessment, cost effectiveness, benefit assessment, or cost-benefit analysis of remote sensing and information systems. Authors wishing to contribute to the conference should submit three copies of a one-page summary to: Dr. Ted Watkins, Economics Dept., San Jose State Univ., San Jose, CA 95192 (tel. 408-277-2758). The papers will be limited to 20 pages, and the summaries must be received by 15 November.

SHORT COURSES

Digital Image Processing of Earth Observation Sensor Data; 14-18 Nov.; $495 fee; Instructors, Ralph Bernstein et al.; Contact: Continuing Engineering Education, George Washington Univ., Washington, D.C. 20052 (tel. 202-676-6106).

Urban Remote Sensing; four consecutive Saturdays, 18 Feb.-11 Mar.; $300 fee; Instructor, Dr. Jerry C. Coiner; Contact: Continuing Education Office, Columbia Univ., 102 Low Library, New York, N.Y. 10027 (tel. 212-280-2288/3237).

SEMINAR IN REMOTE SENSING

The Seminar in Remote Sensing is held on Wednesdays, at 4:30 p.m., in 162 Hollister Hall. Any interested person is welcome to attend. Seminars scheduled for November are, as follows:

Wed., 2 Nov	Remote Sensing of Water Pollution: Dr. Warren A. Hovis, Jr., National Environmental Satellite Service, NOAA, Washington, D.C.
Wed., 9 Nov	Orthophotography: Eugene I. Marley, Vernon Graphics, Inc. (Div. of Halliburton), Elmsford, N.Y.
Wed., 16 Nov	Coastal Wetlands Mapping: Virginia Carter, U.S. Geological Survey, Reston, Va.
Wed., 23 Nov	(NO SEMINAR--Thanksgiving Vacation)
Wed., 30 Nov	The Use of Satellite Data Collection Systems in Managing Flood Control Systems: Saul Cooper, U.S. Army Corps of Engineers, Waltham, Mass.

Resource Information Laboratory (continued)

Research is a major function of RIL, and projects concerning land use change throughout the eastern United States are underway. Satellite image enhancement has been developed to the extent that Landsat imagery is now used regularly as a source of new land use data. Costs of image enhancement have been reduced by this process to less than $200 per scene. Other current research is focusing on low-cost, point analysis techniques with time-lapse photography; interpretation of low-angle oblique photographs; analysis of bird habitat with aerial photography; use of high altitude and satellite imagery for population studies in African societies; and development of density scales for image analysis of seasonal changes of foliage.

For additional information concerning the Resource Information Laboratory, contact Dr. Ernest E. Hardy, Director, or Ms. Eugenia Barnaba, Manager of Technical Services, at the new address, Box 22, Roberts Hall, Cornell University, Ithaca, NY 14853 (tel. 607-256-6529).

SELECTED ARTICLES AND PUBLICATIONS

Kreig, R.A. 1977. Terrain analysis for the Trans-Alaska Pipeline. Civil Engineering 47:7:61-65.

NASA. 1977. Skylab explores the Earth. NASA SP-380. Nat'l Aeronautics & Space Admin., Washington, D.C. 517 pp (hard cover). Avail: Superintendent of Documents, U.S. Gov't Printing Office, Washington, D.C. 20402 (Stock No. 033-000-00674-8, price: $17.50).

Proc. 5th Biennial Workshop on Color Aerial Photography in the Plant Sciences. Held 1975, Sioux Falls, S.D. 168 pp. Amer. Soc. Photogrammetry, 105 N. Virginia Ave., Falls Church, VA 22046 ($5.50 members/$8.00 others).

Photogrammetric Eng'g. & Remote Sensing 1977. v. 43, n.5 (May)

-Robinove, C.J. A radiometric interpretive legend for Landsat digital thematic maps.

-Bartolucci et al. Field measurements of the spectral response of natural waters.

-Klemas & Polis. Remote sensing of estuarine fronts and their effects on pollutants.

-Norton, et al. Optical and modulation transfer functions.

Photogrammetric Eng'g & Remote Sensing 1977. v.43, n.6 (June)

-Hammack, J.C. Landsat goes to sea.

-Welch, R. Progress in the specification and analysis of image quality.

-Tucker & Miller. Soil spectra contributions to grass canopy spectral reflectance.

-Garofalo & Martin. Regional energy availability from conversion of solid waste.

Remote Sensing of Environment 1977. v.6, n.2.

-Parikh, J. A comparative study of cloud classification techniques.

-Vinogradov, B.V. Remote sensing in ecological botany.

-Klemas & Polis. A study of density fronts and their effects on coastal pollutants.

-Gaynor et al. Measurement of vorticity in the surface layer using an acoustic echo sounder array.

-Murthy et al. Feasibility study in using multiband photography for studies in geomorphology, soils and land use.

-Chance, J.E. Applications of Suits spectral model to wheat.

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LANDSAT ASSESSMENT OF AQUATIC VEGETATION

Following earlier work on assessing aquatic vegetation with aircraft photography (Newsletter, Oct 76), staff of the Remote Sensing Program examined the value of Landsat satellite data for providing useful information on vegetation typical of hard-water lakes in New York State and comparable latitudes. A single Landsat scene of central New York was analyzed, using aerial photographic coverage or field data to confirm the interpreted features. Although most beds of freshwater vegetation were too small to be recognized in standard or optically enlarged Landsat images, their size was often compatible with the limiting resolution of the Landsat data, approximately 0.6 hectare. As such, digital rather than visual analysis techniques were normally required for retrieving any vegetative information.

It was found that, with certain limitations, Landsat digital data could be analyzed to chart the distribution of emergent and floating vegetation; surfaced, submersed vegetation; and, in shallower waters, below-surface, submersed vegetation. The reliability with which submersed vegetation could be identified was generally lower than that associated with emergent and floating vegetation. The most serious limitation of Landsat data for assessing freshwater aquatic vegetation was experienced along shorelines. Here, because of the resolution of the data, aquatic vegetation and the land-water interface were sometimes imaged inseparably in the same resolution element (pixel).

This recently completed investigation was supported by the Office of Water Research and Technology, USDI, through Cornell's Center for Environmental Research, and by NASA, through the Remote Sensing Program. For further information, contact B.L. Markham, W.R. Philipson, J. Ng or T. Liang of the Remote Sensing Program.

SEMINAR IN REMOTE SENSING

The final seminar of the fall semester will be held on Wednesday, 7 December, at 4:30 p.m., in 162 Hollister Hall. The guest speaker, John B. Hall, Jr., is an Aero-Space Technologist with NASA's Langley Research Center in Hampton, Virginia. His topic is "NASA Remote Sensing Experiments in the New York Bight."

CALL FOR PAPERS

The 7th Annual Remote Sensing of Earth Resources Conference will be held at the University of Tennessee Space Institute, 27 to 29 March 1978. Proposals for papers on all facets of remote sensing should be submitted to: Dr. F. Shahrokhi, Conference Director, The Univ. of Tenn. Space Institute, Tullahoma, Tenn. 37388. Proposals must be received by 10 January 1978. They should include a titled abstract (approx. 150 words), together with the author's name, address and position.

SEMINAR IN GEOLOGICAL SCIENCES

Floyd F. Sabins, Jr., Senior Research Associate with Chevron Oil Field Research and an American Association of Petroleum Geologists Distinguished Lecturer, will review "Exploration Applications of Landsat Imagery," on Friday, 2 December, at 3:00 p.m., in 205 Thurston Hall.

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SEASON'S GREETINGS FROM THE STAFF OF THE REMOTE SENSING PROGRAM

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ISP CALL FOR PAPERS

An International Symposium on Equipment for Analytic Photogrammetry and Remote Sensing will be held in Paris, 12-14 Sept. 1978. Sponsored by Commission II of the International Society for Photogrammetry, the symposium will cover the performance of analytic photogrammetric instruments and the evolution and performance of equipment for acquiring, processing and viewing remotely sensed data. Prospective contributors should submit a titled abstract (200 words), together with their name and a biographical sketch, to: Lawrence W. Fritz, C343, NOAA/National Ocean Survey, Rockville, MD 20852.

NON-U.S. LANDSAT DATA

Landsat data collected by ground receiving stations outside of the United States can be obtained directly from distribution centers in the countries. The addresses of operating centers are: Instituto de Pesquisas Espaciais, Av. dos Astronautas, 1758, Caixa Postal 515, 12.200 Sao Jose dos Campos, Sao Paulo, BRAZIL; Landsat User Services, Canada Centre for Remote Sensing, 2464 Sheffield Road, Ottawa, CANADA K1A OY7; and Earthnet Business Officer, ESRIN/Earthnet, Via Galileo Galilei, Casella Postale 64, 0044 Frascati (Rome), ITALY. A receiving station in Iran is expected to be operational by early 1978. The address is: Satellite Applications Project, Plan and Budget Organization, Imperial Government of Iran, 80 Sepand Avenue, Tehran, IRAN.

SELECTED ARTICLES AND PUBLICATIONS

Garofalo, D. and F.J. Wobber, 1977. Monitoring coastal development pressure. Pts 1 & 2. Functional Photography 12:4&5.

Verstappen, H. Th. 1977. Remote sensing in geomorphology. Elsevier,52 Vanderbilt Ave., N.Y., N.Y. 10017. 214 pp. ($39.95).

Photogrammetric Eng'g. & Remote Sensing 1977. v.43, n.8 (Aug.)

-Gillespie & Kahle. Construction and interpretation of a digital thermal image.

-Bonn, F.J. Ground truth measurements for thermal infrared remote sensing.

-Anderson et al. Landsat imagery for surface-mine inventory.

-Iranpanah, A. Geologic applications of Landsat imagery.

-Everitt et al. Distinguishing saline from non-saline rangelands with Skylab imagery.

-Whitehurst et al. The use of color infrared imagery for the study of marsh buggy tracks.

-Green et al. Aerial photographic detection of imported fire ant mounds.

-Tucker, C.J. Resolution of grass canopy biomass classes.

Remote Sensing of Environment 1977. v.6, n.3

-Campbell & May. Determination of the optimum field of view and spacing between observations for a satellite-borne scanning radiometer observing the stratosphere.

-Leu, D.J. Visible and near-infrared reflectance of beach sands: A study on the spectral reflectance/grain size relationship.

-Miller et al. Interpretation of airborne spectral reflectance measurements over Georgian Bay.

-Barrick, D.E. The ocean waveheight nondirectional spectrum from inversion of the HF sea-echo Doppler spectrum.

-Fraser et al. The effect of the atmosphere on the classification of satellite observations to identify surface features.

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