

Detection, Monitoring, and Forecasting of Forest Insects and Diseases
Peoples Republic of China
Anhui Province

United Nations Development Grant CPR/91/154

Geographic Information Systems Mission
April 17-May 12, 1997

Technical Report

by

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Table of Contents

Introduction	2
Mission Summary	3
Recommendations	14
Appendix One. Daily Activity Summary	17
Appendix Two: Development of the Pine Caterpillar Population Dynamics and Decision Support Models	19
Appendix Three: Current Metadata for Anhui Province coverages (as of May 4, 1997) ...	25
Appendix Four: ESRI Contacts for Technical Support and General Information in International Applications in China	29
Appendix Five. Selected Map Projection Supplementary Data for Anhui Province	30

List of Figures

Figure 1. ARCVIEW plot of Anhui Province data and interpretations.	4
Figure 2. ARCVIEW plot of Pine Caterpillar infestation risk for Anhui Province.	5
Figure 3. Training aid in the GIS implementation process.	7
Figure 4. Vendor-provided outline of the steps in the GIS implementation process.	8
Figure 5. Check Plot on Field Survey layer for Yuexi County with shape and ID data.	9
Figure 6. Check plot on Field Survey layer for Yuexi County with attribute data for input with corresponding polygons (identified by ID).	10
Figure 7. Trial map for Yuexi County for Field Survey Data	11
Figure 8. Graphics files characteristics	13
Figure 9. Flow chart of the Pine Caterpillar population model.	20
Figure 10. Spreadsheet formulas for the Pine Caterpillar model for a ten-year period from 1989 to 2000.	22
Figure 11. Spreadsheet output values for the Pine Caterpillar model for a ten-year period from 1989 to 2000.	23
Figure 12. Model output population and area summed across classes for the time period for a site.	24

List of Plates

Plate One. Pine Caterpillar Population Dynamics and Management Support Models
Plate Two. Schematic plot of the Anhui Province Information Base
Plate Three. Pine caterpillar Electronic Atlas
Plate Four. Pine Nematode Electronic Atlas

Introduction

The objective of CPR/91/154: Detection, Monitoring, and Forecasting of Forest Insects and Diseases is to improve institutional capacity to detect, monitor, and forecast populations of damaging forest insects and diseases in the People's Republic of China. Overall management and coordination of this project is conducted by the National Director at the Ministry of Forestry, Beijing. Leadership of this project is assigned to the Director of the Anhui Province Forest Biological Control Center (APFBCC), Hefei, Anhui Province.

Funding is provided by the United Nations Development Project and the People's Republic of China. The Food and Agricultural Organization of the United Nations and the US Department of Agriculture Forest Service help as cooperating agencies providing technical assistance, recruiting international technical experts, arranging study tours and fellowships, and subcontracts.

Previous missions under this program have focused on the training of APFBCC personnel in the use of airborne videography for remote sensing and mapping of insect damage, geographic information systems and remote sensing training, and aerial detection surveys. The mission completed last November of last year emphasized equipment installation and testing, information needs assessment (INA), the GIS project process, and ARCVIEW™ training. The focus of the current mission is outlined in the UNDP workplan as:

1. Supervise installation of GIS equipment and conduct appropriate system tests to ensure that all hardware and software are functioning properly.
2. Provide intensive training for three or four officers of the Anhui Province Forest Biological Control Center in systems operation including:
 - a. Digitizing
 - b. Data entry and editing
 - c. analytical procedures
 - d. preparation of maps, data reports, and graphic displays
3. Using forest insect and disease survey information from Anhui Province, prepare a series of maps, reports and graphic displays that respond to the information needs defined during the previous consultation. This shows the range of system capabilities that are available to users.
4. Prepare a technical report that summarizes findings and recommendations that should be reviewed with national counterparts at the end of the consultation.

Mission Summary

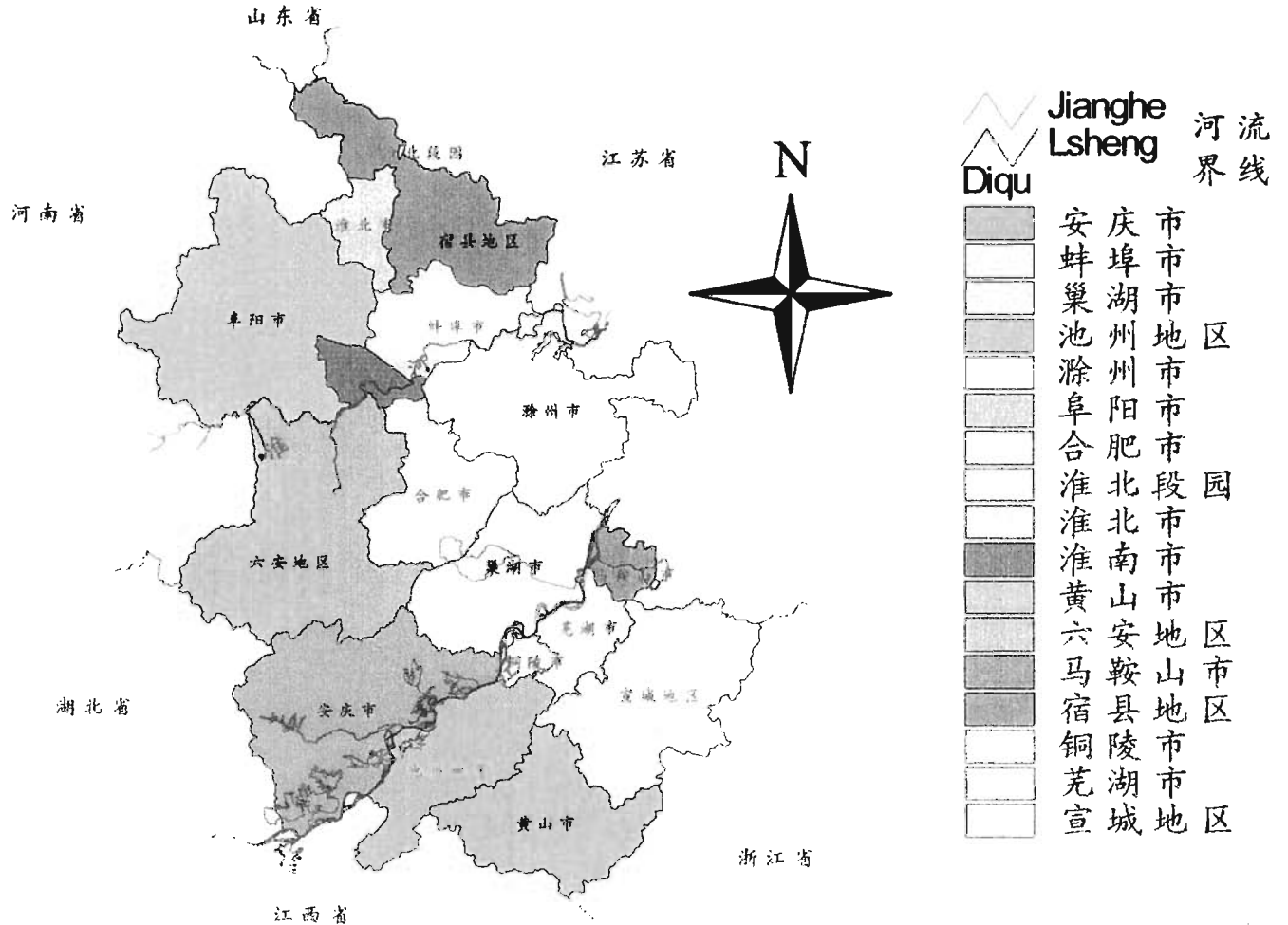
The primary participants from the Anhui Province Forest Biological Control Center were: Mr. Zhou Jian Sheng, Mr. Ding Gui Yin, Mr. Gao Jing Bin, Mme. Zhou Wei, and Mr. Ye Qin Wen. Invaluable assistance was received by Mr. Zhou Jian Sheng in discussing their organization and providing management perspective and priorities. The other participants provided valuable subject matter and technical knowledge.

A great deal of work has been done at the GIS-AFPBCC since my last mission. The digitizer has been repaired and configured. Fifteen coverages have been digitized. Projections have been worked out. Supplies have been ordered. Many recommendations made in the previous mission report have been implemented, including purchasing Windows 95™ for the image processing computer, repairing the power supply, securing storage of media, purchase of PC-ARC/INFO™ and plotter paper. In particular, ARCVIEW™ has been used to produce some graphical products (see Figures 1 and 2).

Our first task was to develop local objectives for this three-week period. Though training and production are important to emphasize, development of an information delivery system based on needs, available data, and system capabilities is important to long-term success in any solution using a geographic information system (GIS). We discussed these concerns and addressed them by aiming our efforts at a mixture of training, creating a basic information infrastructure, project completion (using the prototyping process) using the analytical capability of GIS, and responding to immediate management concerns. With these ideas in mind we agreed to the following:

- Develop an information base for Anhui Province, consisting of an organized set of coverages that can be used together, having a defined quality level and description. This is to be used in controlling pine caterpillar and Pine Nematode infestations now and in the future.
- Develop an electronic atlas for Pine Caterpillar and Pine Nematode, having multiple layers and views of data
- Develop a Pine Caterpillar hazard rating map from habitat parameters established by research.
- Develop and implement a population dynamics model for the Pine Caterpillar capable of predicting infestation area and density based on existing data and research.
- Develop a management information model that can help officials predict control needs by area and intensity for the Pine Caterpillar on a temporal and spatial basis.
- Provide a graphical product for each of the above objectives, suitable for presentation to management (both for scientific visualization and for management decision support).

1996年安徽省森林病虫害发生、防治统计图表

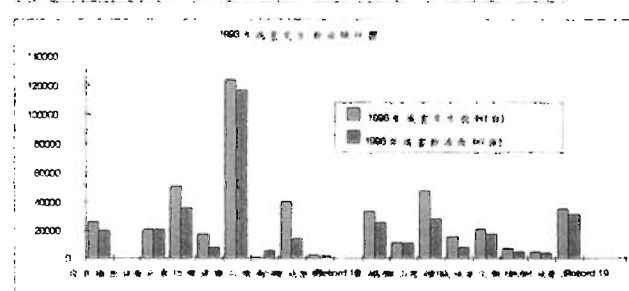
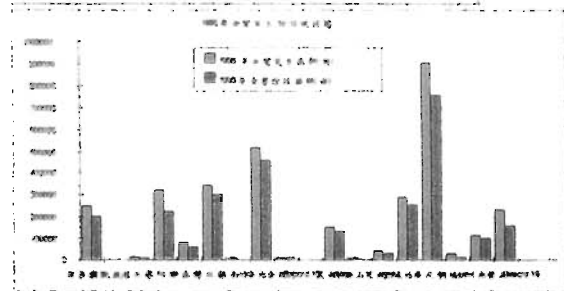
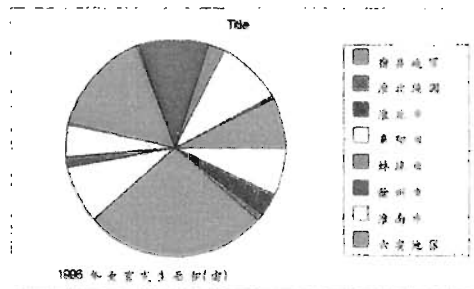


地图比例: 1:5,000,000
50 0 50 100 Miles

主要害虫:
马尾松毛虫



主要病害:
松材线虫病



1996年安徽省病虫害发生、防治统计表

名称	面积(平方公里)	长度(公里)	发生面积(平方公里)	发生株数	防治面积(平方公里)	防治株数
安庆市	15407260000.0	636787.000000	301500	754700	20500	17300
六安地区	18381340000.0	843474.200000	520000	458700	43000	14000
滁州市	11593580000.0	809431.400000	144587	303161	132711	115289
阜阳市	18626970000.0	854047.300000	122600	323200	90193	16500
宣城地区	12369040000.0	717815.100000	290276	257275	15724	8124
滁县地区	10020240000.0	749796.700000	249500	200000	26000	20000
黄山市	37162310000.00	624033.600000	214700	162700	16000	15000
巢湖市	34710660000.00	504651.400000	154000	134000	13000	25000
池州地区	84248430000.00	572822.000000	115600	93000	4300	4300
蚌埠市	59334210000.00	444119.400000	81000	61000	17000	8000
淮南市	33508500000.00	180636.100000	44000	34000	47200	23800
铜陵市	10567000000.00	153442.400000	10700	10500	7100	4500
淮北市	26754480000.00	303735.100000	14400	11300	20410	20450
合肥市	74908570000.00	500028.200000	12900	10800	2700	2000
芜湖市	21310780000.00	244778.800000	11000	3000	1500	6200
马鞍山市	7333550000.00	304117.000000	10900	8000	11400	10400

Figure 1. ARCVIEW plot of Anhui Province data and interpretations

安徽省森林病虫害防治总站 GIS制作
1997年3月16日

松毛虫危险等级划分

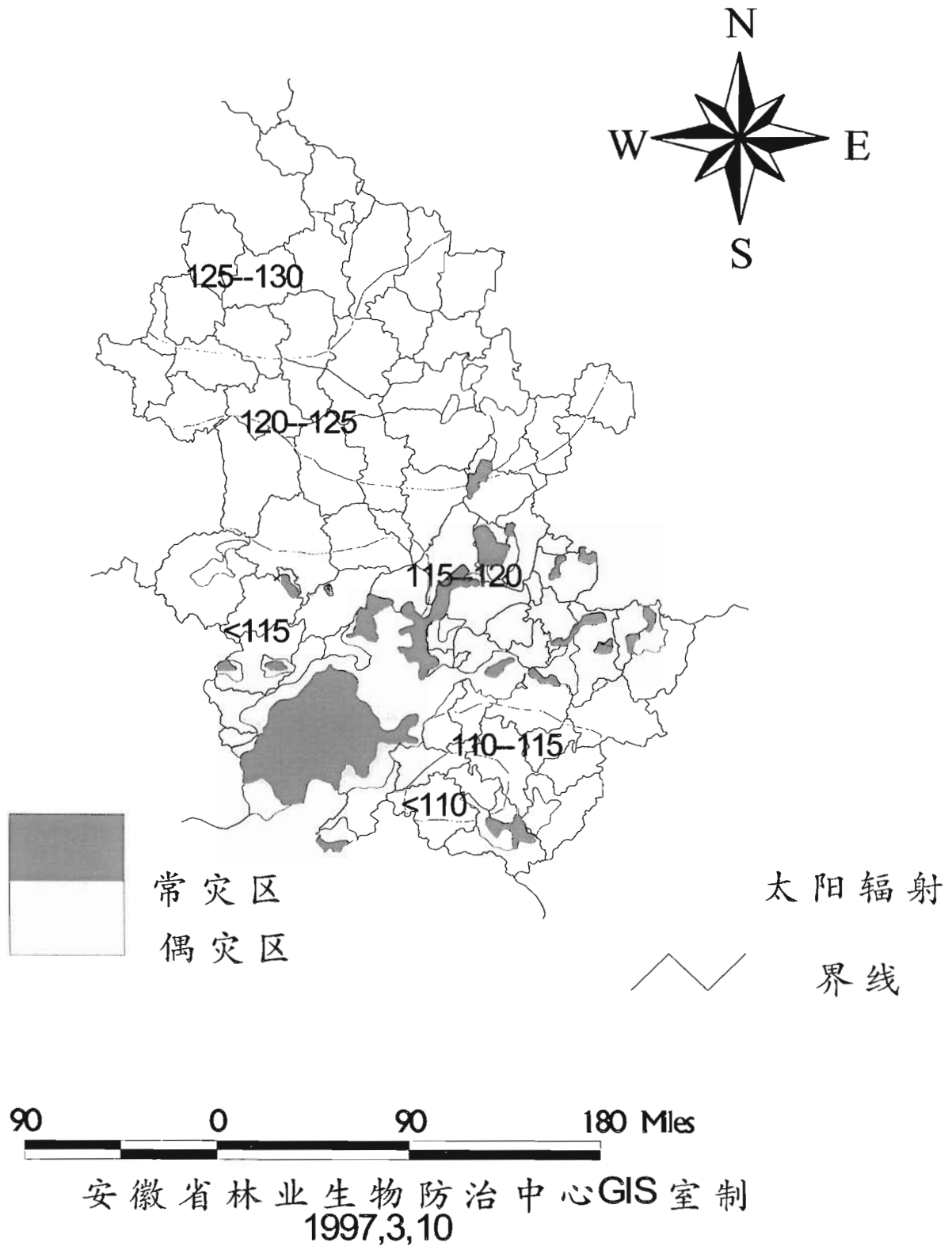


Figure 2. ARCVIEW plot of Pine Caterpillar infestation risk for Anhui Province.

- Provide training for four engineers in all aspects of PC-ARC/INFO, modeling, information bases, and management information systems.
- Provide training in advanced topics including AVENUE™ and SML™ programming languages.
- Maintain and improve existing equipment and software.

This was a very intensive three-week session. To meet the mission's GIS focus, we decided to go through the entire GIS process using as much real data as possible and produce analytical products having a level of "reality" commensurate with that data (the prototype process) using PC-ARC/INFO. ARCVIEW was used for part of the analysis and most display. We combined intensive training with the prototype process and product development. Following is a description of activities in support of the above objectives. See Appendix One for a daily summary.

After discussing modeling theory, we developed a ten-year model of Pine Caterpillar population dynamics. See Appendix Two for a description of this model. It is a "process" model based on local research, consultation with staff, and local county field survey data. See Plate One (left side) for an example of graphical output. Note that this model was developed as a prototype and needs considerable review and testing before use.

We developed a prototype management information system to support control efforts for the Pine Caterpillar. It provides decision support by estimating area and location of critical control infestations, by year for a ten-year period. It is based on the population dynamics model and spatial features of infestation areas. This can be used to forecast budgetary requests and personnel needs, as well as give province-wide projections when aggregated from county level data, available in the electronic atlas described below. See Plate One (right side) for an example of graphical output.

We completed command-based training in all major aspects of ARC/INFO, including setting objectives, entering data, making data usable, managing data, analyzing data, and presenting results. We used the outline in Figure 3 and vendor-provided graphics (Figure 4) for guidance. We emphasized layer digitizing, map projections, and quality control using check plots (Figures 5 and 6) for cartographic and attribute accuracy, and trial map production (Figure 7) by clients.

We developed an information base of 15 coverages on the PC platform for Pine Caterpillar and Pine Nematode, digitized at a scale of 1:700,000. This is schematically displayed in Plate Two. The final map is 36" by 50'. This information base includes the metadata listed Appendix Three.

I addressed AVENUE and SML in separate sessions for an interested client. We discussed concepts of program control and object-oriented programming, and reviewed local references and a few basic applications. Though these languages are high-level in nature, and advertise "no programming experience needed," they are still quite difficult to comprehend and use without a more extensive training session.

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