Aerial Photographs in Forestry

Stephen 74. Spurr

Associate Professor of Forestry UNIVERSITY OF MINNESOTA

The Ronald Press Company - New York

AERIAL PHOTOGRAPHS IN FORESTRY

By

STEPHEN H. SPURR

ASSOCIATE PROFESSOR OF FORESTRY UNIVERSITY OF MINNESOTA

THE RONALD PRESS COMPANY · NEW YORK

PREFACE

AERIAL PHOTOGRAPHS IN FORESTRY is an effort to bring together in one place existing information concerning the use of photographs in forest mapping, inventory, and other phases of forest management. The book is written with the hope that it will find use both as a text and as a manual. It is, in addition, a report on research.

It is not the intention of this book to cover the entire field of photogrammetry. Rather, it touches only those aspects of that science which are considered to be essential to the forester. In chapters dealing with the measurement and inventory of forest stands, the author assumes that the reader has had, or is taking, a course in forest mensuration; that he has at least an elementary knowledge of this field.

Extensive application of aerial photographs in forestry has come about only recently. Consequently, a great deal of the material in this volume, especially in Parts III and IV, appears in published form for the first time, and has been gathered partly from original research at the Harvard Forest made possible by Harvard University and by grants from the Milton Fund of Harvard University and the Research Corporation of New York City. This research was also aided by the cooperation of the Northeastern Forest Experiment Station of the United States Forest Service, Fairchild Aerial Surveys, Inc., Eastman Kodak Co., and other organizations, both public and private. Special acknowledgment is due to C. T. Brown, Jr., who worked closely with the author for three years, particularly in the development of simplified instruments for mapping from and the interpretation of aerial photographs; and to M. A. Phillips, Earl J. Rogers, Myles Standish, and George R. Sonley, who initiated the author into the general subject.

The present volume is, in part, the outgrowth of a series of short courses in the subject given at the Harvard Forest in 1945 and 1946. The instructors who assisted the author in giving these courses were instrumental in making possible the present volume. In particular, Edward S. Wood, Jr. of the Institute of Geographical Exploration, Harvard University, accomplished much in adapting

CONTENTS

CHAPTER					1	PAGE
1 INTRODUCTION						3

PART I

Aerial Photographs

2	Types of Aerial Photographs		9
3	Films, Filters, and Season of Photography .		22
4	Scale and Focal Length		45
5	TAKING AERIAL PHOTOGRAPHS		54
6	OBTAINING AND HANDLING AERIAL PHOTOGRAPHS		64

PART II

Aerial Surveying

7	DISPLACEMENT IN SINGLE AERIAL PHOTOGRAPHS	77
8	Overcoming Displacement by Radial Line	
	TRIANGULATION	89
9	TRANSFER OF DETAIL FROM SINGLE PHOTOGRAPHS .	107
10	Stereoscopy	116
11	DISPLACEMENT IN STEREOSCOPIC PAIRS OF PHOTOGRAPHS	129
12	Stereoscopic Transfer of Planimetric Detail	149
13	TOPOGRAPHIC MAPPING FROM AERIAL PHOTOGRAPHS .	161

PART III

Photo-Interpretation

14	TECHNIQUES AN	d Pr	INCI	PLES	S OF I	Рнот	O-IN	TERI	RETA	TION	175
15	Site										186
16	TREE SPECIES				1						194
17	STAND DENSITY	AND	CRO	WN	DIAM	ETER					209
18	TREE HEIGHTS										223
19	Areas										243

CONTENTS

PART IV

Forestry Applications

CHA	APTER	PAGE
20	Forest Mapping	. 261
21	Indirect Measurement of Trees and Stands	. 281
22	VOLUME ESTIMATION FROM AERIAL PHOTOGRAPHS .	. 290
23	Use of Photographs in Controlling Ground Inventory	a 310
24	Other Phases of Forest Management	. 328
INI	DEX	. 335