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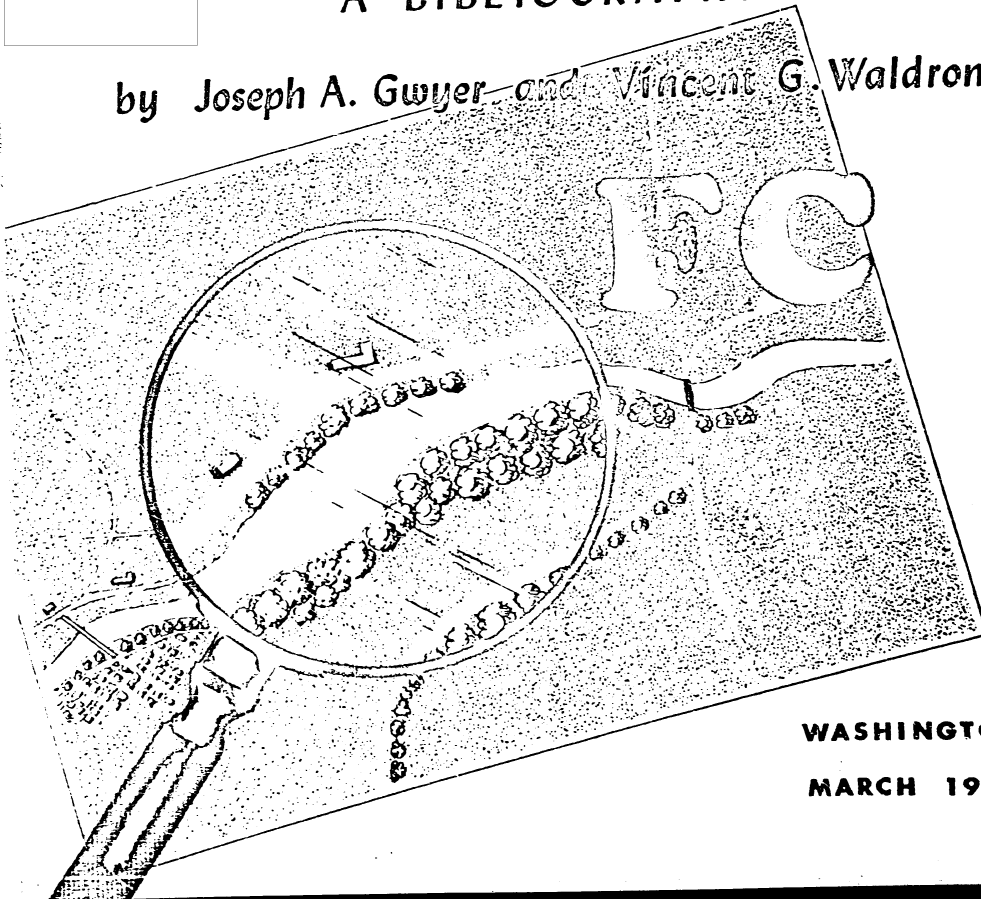
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# Photo Interpretation Techniques

A BIBLIOGRAPHY

by Joseph A. Gwyer and Vincent G. Waldron



WASHINGTON

MARCH 1956

Library of Congress  
Technical Information Division

PHOTO INTERPRETATION TECHNIQUES  
a bibliography

b.

Joseph A. Gwyer and Vincent G. Waldron

Washington  
March 1956

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## PREFACE

The bibliography on photo interpretation techniques has been prepared at the request of the Wright Air Development Center as a task under Delivery Order (33-616) 52-20.

### Scope

The bibliography, compiled in conjunction with a larger bibliography on vegetation and other land-surface phenomena important to photo interpretation, consists of annotated references to published literature on the subject issued during the approximate period of 1935-1953. Material on the theory, principles, methods and techniques of photo interpretation and the application of the techniques in various scientific and technological fields, has been included. Information on cameras, lenses, and other photographic equipment has been excluded, unless the reference had a definite bearing on photo interpretation.

The bibliography is not as complete as it might have been. For administrative reasons, it has been necessary to terminate the project before all possible sources could be searched and annotated. It is felt, however, that the material compiled to date meets the original objectives of the task sufficiently to merit publication.

### Sources searched

A systematic search was made of the following abstract sources for pertinent material:

Bibliography of Agriculture  
Biological Abstracts  
Forestry Abstracts

Searches were also made of selected journals in the fields of photogrammetry, geography, forestry, geology, and engineering. Further material was obtained from the bibliographies listed in Section I-1a of this volume, from literature references appended to various publications included herein, and from the Official Catalog of the Library of Congress. For reasons stated above, verification and processing of pertinent material was confined largely to holdings in the Library of Congress and the Library of the Department of Agriculture.

### Form of Entry

The normal form of entry for periodical references is author, title, and journal, giving volume, date, and pagination; for books and pamphlets the form is author, title, place of publication, publisher, year, and pagination. The abbreviations for journal titles are based on those used in the World List of Scientific Periodicals, with such modifications as were found to be necessary. A list of the abbreviations used for words commonly appearing in serial titles

follows immediately after this Preface. The book or journal call number given at the lower right of the citation is that of the Library of Congress, unless otherwise designated by the following code:

DA Department of Agriculture  
 LP Purdue University  
 NN New York Public Library  
 NNU New York University

#### Classification

The bibliography is arranged according to a subject classification which is designed to permit rapid location of references. The broad fields of principles, methods, and specific applications of photo interpretation techniques are subdivided further to permit a grouping of about 40 or less references in each section.

Each reference has been classified on the basis of its major field of interest; cross references at the end of each section have been used to indicate other references containing material pertinent to that section. As a further aid to finding material, it is suggested that the table of contents be consulted for related subject material.

#### Annotations

The annotations are of two types. Full, informative abstracts have been given for those references in foreign languages, or for material not readily available. Shorter, descriptive annotations have been given for references to readily available American literature. In both cases, emphasis has been on the subject matter of the bibliography. In describing photo interpretation techniques and their applications, no attempt has been made to evaluate methods critically.

#### Acknowledgments

The compilers wish to acknowledge the assistance of other members of the Technical Information Division, particularly Mabel H. Eller, Arnold J. Jacobius, and Arthur G. Renstrom for considerable aid in searching and abstracting, Doris C. Yates for preparing the volume for publication, and the staff of the Publication Section for its work on the reproduction. Thanks are also due Major L. S. Karably, Capt. R. E. Stevenson, Capt. Wallace R. Smith, Lt. R. W. Stute, Lt. R. Smith, and Lt. W. N. Wilson of Wright Air Development Center for initiation and guidance of the project, and to Dr. Hugh T. O'Neill for valuable advice on the techniques of photo interpretation of vegetation.

Washington, D. C.  
 March 1956

## JOURNAL TITLE ABBREVIATIONS

The following is a key to the abbreviations for words used in the journal titles cited in this publication:

acad.	academy, académie
aeronaut.	aeronautics
agric.	agriculture
akad.	akademiya
allgem.	allgemein..
Amer.	American
arkt.	arkticheski..
arsb.	arsbok
assoc.	association
Austral.	Australian
bibliogr.	bibliografija, bibliographic, bibliograficheski..
biol.	biologicheski..
biull.	biulleten
bot.	botanicheski.., Botanika
Brit.	Britain, British
bull.	bulletin
bur.	bureau
Canad.	Canadian
coll.	college
comm.	committee
compt. rend.	compte rendu
conf.	conference
congr.	congress
dept.	department
deutsch.	deutsche
div.	division
ecol.	ecology
eng.	engineering
exper.	experimental

forstarch.  
franç.

forstarchiv  
française

geod.  
geofiz.  
geogr.

geodez..  
geofizichesk..  
geographical, geografiâ,  
geografichesk..., geografisk,  
geographic..  
geologique, geologic(al),  
geologichesk..

geol.

geophys.  
gesell.  
gidrol.  
glav.  
gosud.  
gov.  
gravimetr.

geophysics  
gesellschaft-  
gidrologichesk..  
glavn..  
gosudarstvenn..  
government  
gravimetr..

helv.  
holzwirt

Helvetic..  
holzwirtschaft

indus.  
inst.  
internat.  
ispyt.  
issled.  
izd.-vo  
izvest.

industriiâ, industri  
institut., institute  
international  
ispytalel..  
issledovanie, issledovatel'sk..  
izdatel'stvo  
izvestiia

jahrb.  
jour.

jahrbuch  
journal

Kazakhsk.  
kartogr.  
khoz.

Kazakhsk..  
kartograf..  
khozialstv..

lab.  
les.

laboratoriia, laboratory  
lesn..

lesoeksploat.  
lesotech.  
luftfahrtforsch.

lesoeksploatatsiia  
lesotechnichesk..  
luftfahrtforschung

mag.  
mater.  
metall.  
milit.

magazine  
materialy  
metallurgical  
military

nat.  
nauch.

national  
nauchno

obshch.  
odt.  
olenevod.

obshchestv..  
odtelenie  
olenevodstv..

photogramm.  
poliar.  
prir.  
proizvod.  
promyshl.  
proc.  
publ.

photogrammetric  
polfarn..  
prirod..  
proizvodstvenn..  
promyshlennost'  
proceedings  
publication

quart.

quarterly

rec.  
refer.  
rept.  
res.  
rev.

record(s)  
referaty  
report  
research  
review, revue

sci.  
sect.  
ser.

science  
section  
seriia, series, serie

skogindus.  
skogsvardsfor.  
skovfor.  
soobshch.  
sovet.  
sta.

skogindustri  
skogsvardsforeningen  
skovforening  
soobshchenifa  
sovetsk..  
station

technol.  
tekh.  
tidskr.  
tidsskr.  
topogr.  
trans.  
tsentr.

technology  
tekhnicheck.., tekhnika  
tidskrift  
tidsskrift  
topografi..  
transactions  
tsentral'n..

univ.  
upravl.

university  
upravlenie

vsesoiuz.

vsesoiuzn..

zeitschr.  
zemledel.  
zhur.

zeitschrift  
zemledeli..  
zhurnal

skogindus.  
 skogsvardsfor.  
 skovfor.  
 soobshch.  
 sovet.  
 sta.

skogindustri  
 skogsvardsforeningen  
 skovforening  
 soobshchenia  
 sovetsk..  
 station

technol.  
 tekhn.  
 tidskr.  
 tidsskr.  
 topogr.  
 trans.  
 tsentr.

technology  
 tekhnichesk.., teknika  
 tidskrift  
 tidsskrift  
 topografi..  
 transactions  
 tsentral'n..

univ.  
 upravl.

university  
 upravlenie

vsesoiuz.

vsesoiuzn..

zeitschr.  
 zemledel.  
 zhur.

zeitschrift  
 zemledeli..  
 zhurnal

## PHOTO INTERPRETATION TECHNIQUES

I. PRINCIPLES AND THEORY OF PHOTO INTERPRETATION

## 1. General

- 1 Abrams, T.  
 ESSENTIALS OF AERIAL SURVEYING AND PHOTO INTERPRETATION. New York, McGraw-Hill, Inc., 1944, 289 p., incl. photos, maps, diags., tables. TA593.A54, 1944
- The treatise on aerial surveying and photo interpretation includes: a short exposition of the mathematics involved in aerial surveying, cartography, orientation, topographic drafting, aerial photographs, stereo vision, interpretation, ground form lines, plotting instruments, relief models, restitution and rectification of aerial photographs, template methods of radial line control, construction of mosaics, and trimetrogon charting. A glossary of terms, and a short bibliography are included.
- 2 Andrews, G. S.  
 NOTES ON INTERPRETATION OF VERTICAL AIR PHOTOGRAPHS. Forestry Chronicle, v. 16 (3) 1940: 202-215. DA-99.8 F7623, v. 16
- Items discussed in this paper include: (1) The pictorial elements such as tone, texture, shadows, and outlines which together build up a comprehensive picture; (2) the influences of central perspective and scale; (3) outstanding terrain features which include water, rock outcrops, alpine slides, snow, ice, and forest types. Relatively detailed notes are given on forest types, with particular reference to those found in British Columbia. (Forestry Abstr. in part)
- 3 Bagley, J. W.  
 AEROPHOGRAPHY AND AEROSURVEYING. New York, McGraw-Hill, Inc., 1941, 324 p., incl. photos., diagr., tables. TR810.B25, 1941

The following subjects are treated in this text on aerial photography and surveying: cameras and their accessory instruments, lenses, filters, and shutters; requirements and preparation for photographic flights; laboratory equipment and its use; reading and interpretation of photographs; geometrical characteristics of aerial photographs; principles of photographic transformations, and transforming printers; principles of stere-



## Photo interpretation

oscopy and photogrammetry; tilt-determining methods; methods of obtaining elevations and contours from aerial photographs; plotting methods and instruments; mosaic maps and aerial photographs as illustrations; methods of horizontal and vertical control by ground survey; map projections, grids, forms, and reproduction; errors and correction measures, and calibration of cameras.

- 4 Brown, I. W.  
MANUAL OF CLASSROOM INSTRUCTIONS IN AERIAL PHOTO INTERPRETATION;  
SHORT COURSE OF STUDY. Jackson, Miss., Miss. State Highway  
Dept., Traffic and Planning Division, 1952, 239 p., incl. diags.,  
tables. TA593.B75, 1952

The manual, designed for a short introductory course of study in aerial photo interpretation stereoscopic work, is presented.

- 5 Colwell, R. N.  
PHOTOGRAPHIC INTERPRETATION FOR CIVIL PURPOSES. In Amer. Soc.  
Photogramm., Manual of Photogrammetry, 2d ed., Washington,  
D. C., 1952, p. 535-602, incl. illus., tables, diags.  
TA593.A63, 1952

The value and scope of photographic interpretation are briefly outlined. Basic considerations such as characteristics of photographic images, means of obtaining the desired photographic image, viewing of the image, qualifications of a good photo interpreter, and aids to photo interpretation are reviewed. Specific applications to geology, forestry, agriculture, engineering, and geography are discussed.

- 6 Colwell, R. N., K. E. Bradshaw, H. T. U. Smith, R. Thoren, and  
C. A. J. von Drabbe.  
REPORT OF COMMISSION VII (PHOTOGRAPHIC INTERPRETATION) TO THE  
INTERNATIONAL SOCIETY OF PHOTOGRAMMETRY. Photogramm. Eng.,  
v. 18, June 1952: 375-451, incl. photos, maps, diags., tables.  
TA593.A2P5, v. 18

Recent progress in the field of photo interpretation is outlined with a general survey of photographic reconnaissance and photo interpretation equipment, material and techniques. The desirable characteristics of a photographic interpreter are given. The world progress in photo interpretation in natural resource inventories as well as photo interpretation in applied earth science and in military intelligence are also summarized. [160 refs.]

## Principles and theory

## 7 Colwell, R. N.

A SYSTEMATIC ANALYSIS OF SOME FACTORS AFFECTING PHOTOGRAPHIC INTERPRETATION. Photogramm. Eng., v. 20, June 1954: 433-454, incl. photos, diags., table. TA593.A2P5

Photo interpretation, the act of examining the photographic images of objects to identify them and deduce their significance is affected basically by factors governing the quality and the perception of photographic images. The primary factors considered as governing the quality of photographic images are tone and color characteristics, image sharpness characteristics, and stereoscopic parallax characteristics. Conditions affecting each of these factors are discussed. Factors governing the perception and interpretation of photo images are the visual and mental acuity of the photo interpreter, his equipment, and his technique. Conditions modifying each of these factors are also discussed. [18 refs.]

## 8 Fersman, A. E., ed.

[THE DATA ON THE PHOTO INTERPRETATION OF AERIAL PHOTOGRAPHS] Materialy po deshifirovaniu aerosnimkov. [Sbornik. Sverdlovsk?], Izdatel'stvo Akad. Nauk SSSR, 1942, 95 p., incl. illus. TA593.F4

The various aspects and uses of photo interpretation include discussions concerning photo interpretation theory and its problems (Gaveman, A. V., 1942), geographical analysis of deserts (Fedorovich, B. A., 1942) and of marshlands (Galkina, E. A., 1942) for military operations, as well as the application of photo interpretation in the research fields of geology (Miroshnichenko, V. P., 1942), hydrology (Predtechenski, N. P., 1942), and forestry (Samolovich, G. G., 1942).

## 9 Frost, R. E.

DISCUSSION OF PHOTO RECOGNITION, ANALYSIS, AND INTERPRETATION AND PHOTO KEYS. Photogramm. Eng., v. 18, June 1952: 502-505. TA593.A2P5

A brief review and discussion emphasizes three methods of photo study: recognition, analysis, and interpretation, each with different requirements for successful use. A photo interpretation key serves to aid identification of objects and analysis of patterns; it does not interpret.

## Photo interpretation

- 10 Frost, R. E.  
 THE AIRPHOTO-INTERPRETATION PROGRAM OF RESEARCH AND INSTRUCTION  
 AT PURDUE UNIVERSITY. Photogramm. Eng., v. 18, Sept. 1952:  
 701-719, incl. photos, maps, diagrs. TA593.A2P5

The purpose, scope, and some of the results of the major programs of research and instruction in the field of airphoto interpretation at Purdue are briefly reviewed. A bibliography of 87 titles of papers prepared by staff members is included.

- 11 Frost, R. E.  
 FACTORS LIMITING THE USE OF AERIAL PHOTOGRAPHS FOR ANALYSIS OF  
 SOIL AND TERRAIN. Photogramm. Eng., v. 19, June 1953: 427-436.  
 TA593.A2P5

Limitations to successful and reliable evaluation of aerial photographs for soil and terrain analysis are considered to stem from the type and coverage of the photography, its scale, stereo-optics, film-filter combinations, and print type and quality. Human factors, which constitute the most important limiting element to successful analysis, include stereo-vision and study area, plus the background, training, and experience of the photo reader. Natural, environmental limitations, including anomalies imposed by climate, produce variation in grey tones, erosional features, and vegetation. Other factors discussed include methods used, speed, and application of supplementary information.

- 12 Gaveman, A. V.  
 [ON THE THEORY OF AERIAL PHOTO INTERPRETATION] K voprosy o  
 teorii deshifirovaniia aerofotosnimkov. Izvest. Gosud. Geogr.  
 Obshch., v. 71 (3), 1939: 428-438, incl. tables.  
 G23.R6

The principles of photo interpretation are briefly reviewed. A knowledge of the photographic processes involved are considered necessary to the photo interpreter to permit detailed analysis of the various factors affecting the photographic image. A knowledge of the physical and other environmental factors are also required as aids to interpretation. It is concluded that the preparation of general keys for the photo interpretation of ground objects is useless, due primarily to individual differences of vision, imagination, and interpretative technique.

## Principles and theory

- 13 [Gaveman, A. V.] Havemann, A. V., and V. A. Faas.  
ON THE DEVELOPMENT OF THE STUDY OF AEROLANDSCAPE. [English  
text] Compt. rend. Acad. Sci. URSS, n.s., v. 26 (4), 1940: 409-  
412. G60.A52

A brief discussion of the principles involved in the study of landscapes from the air, and of the principles of aerial photo interpretation is presented.

- 14 Gaveman, A. V.  
[SOME THEORETICAL PROBLEMS IN INTERPRETATION OF AERIAL PHOTO-  
GRAPHS] Nekotorye voprosy teorii deshifirovaniia aerosnimkov.  
In Materialy po deshifirovaniiu aerosnimkov. Ed. by A. E.  
Fersman. [Sbornik. Sverklvsk?], Izdatel'stvo Akad. Nauk SSSR,  
1942, p. 6-16, incl. illus., tables. TA593.F4

A review is made of some theoretical problems of photo interpretation to determine their importance in terms of practical interpretation and possible future trends in the solution of these problems. The basic objectives of the photo interpretation theory are: (1) an establishment of a set of rules based on geometric, photographic, geophysic and other factors affecting the image on the photograph; (2) an establishment of a relationship between objectives and their images on photographs and their actual natural characteristics; setting up of keys; and an establishment of a common terminology.

- 15 Gaveman, A. V.  
[AERIAL METHODS, THEIR SCOPE, AND FUTURE PROSPECTS OF DEVELOPMENT] Aerostody, ikh sodержanie i perspektivy razvitiia.  
[English summary]. Izvest. Akad. Nauk SSSR., Ser. Geogr.  
Geofiz., No. 4, 1943: 183-194, incl. illus., tables. AS262.A6246

Aerial photographs reproduce an image of the shape, brightness, and the structure of the earth's surface. The photo interpretation has as its objective the proper identification of these features and is aided by a constant set of relationships existing between the features of the earth and their representation on an aerial photograph. Tables showing types of vegetation and relief forms recognizable in 1:25,000 scale photos are included.

- 16 Hagen, T.  
[SCIENTIFIC AERIAL PHOTO INTERPRETATION] Wissenschaftliche  
Luftbild-interpretation. Geogr. Helv., v. 5 (4), 1950: 209-276,  
incl. photos, maps, diags., tables. G1.G328

## Photo interpretation

The historical background, the objectives, and the techniques of photo interpretation are described. Applications of photo interpretation, in particular the study of geology, topography, vegetation, as well as land utilization and management, are surveyed. The work is illustrated with a series of 19 photographs, reproduced as anaglyphs, of New Guinea, South Africa, the Swiss plateau, and the Jura Mountains.

- 17 Hart, C. A.  
 INTERPRETATION OF AIR PHOTOGRAPHS: MOSAICS AND PHOTOGRAPHIC MAPS: SCOPE AND COST OF AIR SURVEYS. In his Air Photography Applied to Surveying. London, Longmans, Green and Co., 1940, p. 24-42, incl. illus., tables, diag. TA593.H3

The identification of detail from air photographs and the interpretation of information is discussed. The comparative value of oblique and vertical photographs in aerial surveying is reviewed. The use of various types of filters and film and their respective merits are discussed.

- 18 Hart, C. A.  
 SCIENTIFIC INTERPRETATION OF AIR PHOTOGRAPHS AND THEIR ECONOMIC APPLICATIONS. In his Air Photography Applied to Surveying. London, Longmans, Green and Co., 1940, p. 74-89, incl. illus., maps. TA593.H3

The application of air photography to ecological surveys, soil studies, agriculture, and geology is reviewed. Tree growth and variation are the most easily recognized features on an air photograph. A definite correlation of the types of tree with the moisture-content of the soil and the rock conditions is established. Some practical surveys conducted in South Africa, Canada, and the U. S. are described.

- 19 Heavey, W. F.  
 MAP AND AERIAL PHOTO READING SIMPLIFIED. Harrisburg, Military Service Publishing Co., 1943, 111 p., incl. photo, maps, diagrs. UG470.H4

The manual gives a brief discussion of location and coordinates, distance and time, direction and azimuth, orientation, elevation and relief, map reading in the field, and reading of aerial photographs.

- 20 Hoffman, P. R.  
 INTERPRETATION OF RADAR SCOPE PHOTOGRAPHS. Photogramm. Eng., v. 20, June 1954: 406-411, incl. photo, diagr. TA593.A2P5

## Principles and theory

Elementary phases of radar photo interpretation, such as classifying the general types of images and then determining as far as possible the factors which are responsible for the appearance of the image, are briefly outlined.

- 21 Hotine, M.  
SURVEYING FROM AIR PHOTOGRAPHS. London, Constable and Co. Ltd., 1951, 250 p., incl. illus., diagr., tables, plates.  
TA593.H6

Description is given of the general characteristics of aerial photography together with some of its economic uses. Simple stereoscopes and the principles of stereoscopic examination are explained. Other subjects covered include plane perspective, calibration of surveying cameras, the theory and practice of photo mapping, mosaics, the Fourcade stereogoniometer, and stereoscopic plotting apparatus.

- 22 Istomin, G. A.  
[ELEMENTS OF THE AERIAL PHOTOGRAPHIC THEORY] Elementy teorii aerofotografii. [Moskva] Izd. VVIA im. Prof. N. E. Zhukovskogo, 1949, 116 p., incl. map, diagrs., tables.  
TR810.I68

A discussion of aerial photographic theory includes a consideration of the illumination and the spectrophotometric characteristics of the landscape. The atmosphere and atmospheric optics are also treated, and a bibliography of 24 references included.

- 23 Katz, A. H.  
CONTRIBUTIONS TO THE THEORY AND MECHANICS OF PHOTO-INTERPRETATION FROM VERTICAL AND OBLIQUE PHOTOGRAPHS. Photogramm. Eng., v. 16, June 1950: 339-386, incl. illus., diagr.  
TA593.A2P5

A study of the theory and techniques of aerial photo interpretation includes the following topics: photo interpretation, intelligence and information; a program for improving photo interpretation; theory and systems for measurements and computations in vertical and oblique photographs; with conclusions and comment.

- 24 Konshin, M. D.  
[AERIAL PHOTOGRAPHY] Aerofototopografiia. Moskva, Geodezizdat, 1952, 360 p., incl. photos, diagrs., tables, + diagr.  
TA593.K6

## Photo interpretation

The manual discusses photographic principles, aerial surveying operations, the basic elements of an aerial photograph, compilation of the contour sections of a map, topographic photo interpretation in regard to theory, indicator features and procedure, topographic and geodetic functions in a contour-combining aerial survey, as well as various other aspects of photogrammetry and a brief review of the development of aerial photo topographic processes in the USSR. [16 refs]

- 25 Lobeck, A. K., and W. J. Tellington,  
MILITARY MAPS AND AIR PHOTOGRAPHS. New York, McGraw-Hill, Inc.,  
1944, 256 p., incl. photos, maps, diags., tables.  
GA151.L6

The use and interpretation of maps and air photographs are discussed. Part VI of the study dealing with aerial photography surveys the following subjects: black and white, colored, and infrared photographs; identifying specific objects from aerial photographs: surroundings, shade, shadows, shape, size, scale, pin points; viewing photographs stereoscopically; ridge and stream lines; oblique air photographs; deception; and lines of sight.

- 26 Lüscher, H.  
[MAPPING BY THE USE OF AERIAL PHOTOGRAPHS] Kartieren nach Luft-  
bildern. Berlin, E. S. Mittler und Sohn, 1937, 97 p., incl.  
photos, maps, diags., tables, 9 plates. TA593.L78

The manual discusses general concepts of photography and customary methods employed in photo interpretation. The objectives of interpretation, interpretation of plains and highlands, and use of the stereoscope are covered. [16 refs.]

- 27 Macdonald, D. E.  
INTERPRETABILITY. Photogramm. Eng., v. 19, March 1953: 102-107,  
incl. diags. TA593.A2F5

The process of photographic interpretation involving the identification of objects and the deduction of their significance is briefly discussed. [5 refs.]

- 28 MANUAL OF MAP READING, PHOTO READING, AND FIELD SKETCHING, 2d ed.,  
London, H. M. Stationery Office, 1939, 116 p., incl. diags.,  
maps, diags. UG470.G79

## Principles and theory

The manual includes a treatment of aerial photo interpretation which discusses various types of photography, use of the stereoscope, the various steps preliminary to interpretation, data required for orientation, and the various factors involved in photo interpretation. Examples of the appearance of topographic features on aerial photos are given.

- 29 Pettijohn, F. J.  
AERIAL PHOTOGRAMMETRY, A SYLLABUS FOR USE IN AN ENGINEERING, SCIENCE, MANAGEMENT WAR TRAINING COURSE OFFERED AT THE UNIVERSITY OF CHICAGO UNDER THE AUSPICES OF THE U. S. OFFICE OF EDUCATION IN COOPERATION WITH ILLINOIS INSTITUTE OF TECHNOLOGY. Chicago, Ill., Univ. Chicago, 1943, [78 p.], incl. tables, diags.  
TA593.C55

The manual comprises a course offered at the University of Chicago in methods of mapping from aerial photographs. [55 refs.]

- 30 Putnam, W. C.  
PHOTO-INTERPRETATION. In Amer. Soc. Photogramm. Manual of Photogrammetry. New York, Pitman Publishing Co., 1945, p. 332-353, incl. photos.  
TA593.A63

The brief introduction to photo interpretation is divided as follows: identification of cultural features (roads, bridges, canals, urban areas, agricultural patterns), vegetation (tropical, desert, Mediterranean, temperate, arctic, and alpine), terrain features, erosion processes, and identification of shoreline features.

- 31 REPORT OF THE AIR SURVEY COMMITTEE NO. 2-1935. London, H. M. Stationery Office, 1936, 183 p., incl. diags., tables, plates.  
TA593.G7

A report is made of activities, conducted over a 10 year period, to secure cooperative research in the research and development of aerial photography and its survey methods for a variety of civil and military uses. A short description of survey techniques, of uses and characteristics of aerial photography, is coupled with a statement concerning the present status, possibilities, and limitations in the two phases of air survey, photography and cartography. Examples of work done are outlined for areas in the Aden Hinterland, Somaliland, Trans-Jordan, the Anglo-Ethiopian boundary, Africa, Australia, India, Brazil, and Iraq.



## Photo interpretation

- 32 Schatzley, B. L., and L. S. Karably.  
AN INTRODUCTION TO PHOTO INTERPRETATION PROBLEMS AND RESEARCH.  
Photogramm. Eng., v. 20, June 1954: 428-430. TA593.A2P5

The problems of military photo interpretation and the current research being undertaken to remedy its many shortcomings are discussed. This paper establishes the photo interpreter's place in the photo reconnaissance field and outlines his essential qualifications, guidance for his training, utilization, equipment requirements, and the method or aids which may improve his performance. (Authors' Abstract)

- 33 Sharonov, V. V.  
(STUDY OF THE DISCERNIBILITY FACTOR) Issledovanie razlichaemosti.  
Trudy Tsentr. Nauch.-Issled. Inst. Geod., Aeros"emki i Kartogr.  
(Moskva), No. 20, 1937: 40-57, incl. photo, diags., tables.  
QB275.M64

The study covers the determination of the magnitude of the discernibility factor, the elements affecting discernment, contrasts produced by fields at various levels, units of discernibility, an experimental study of the relationship between discernment and the coefficient of brightness of objective-forming contrasts, changes in discernment with changes in the angular diameter, and measurements of discernibilities of natural contrasts.

- 34 Shevalin, D. V.  
[READING OF AERIAL PHOTOGRAPHS] Chtenie aérofotosnirkov. In his  
Voennaiá topografiá, [Moskva], Voenizdat NKO SSSR, 1942,  
p. 156-174, incl. photos, maps, diags. UG470.S55

The discussion covers the elements of aerial photographic surveying, determination of scale, the various factors and steps involved in photo interpretation and mapping, and the photographic mosaic. Ten aerial photographs are included; 5 of these are identified as to location. (Translation RT-1362)

- 35 Smith, H. T. U.  
AERIAL PHOTOGRAPHS AND THEIR APPLICATIONS. New York, Appleton-Century Co., Inc., [1943], 372 p., incl. photos., diags., tables. TA593.S53

The manual covers characteristics of aerial photographs, stereoscopic study of such photography, general principles of photo interpretation, geographic and topographic interpretation,

## Principles and theory

planimetric mapping from vertical and oblique photos, photo mosaics, contour maps from aerial photos, geologic and physiographic interpretation, as well as use of aerial photos in economic geology, engineering, and other fields, including military applications. A glossary of photogrammetric terms, aerial photos for teaching purposes, and suggested laboratory exercises are appended.

- 36 Spurr, S. H.  
AERIAL PHOTOGRAPHS IN FORESTRY. New York, Ronald Press Co., 1948, 340 p., incl. illus., tables, graphs.

SD551.S7

Basic information is provided on taking and processing aerial photographs, as well as on aerial surveying, photo interpretation, and the application of aerial photography to forestry. The treatment of photo interpretation takes into consideration the basic elements of vertical and oblique aerial photography, pictorial qualities of photographic images, shape and dimension, tone, texture, shadow pattern, object identification, resolution in detail, and limitations of photo interpretation in forestry. Site classifications, identification of tree species, measurement of tree heights, crown density, and stand density are discussed.

- 37 Talley, B. B., and P. H. Robbins.  
INTERPRETATION OF AERIAL PHOTOGRAPHS. In their Photographic Surveying. New York, Pitman Publishing Co., 1945, p. 52-63, incl. illus.

TA593.T32

The interpretation of aerial photographs is aided by the identification of the following factors: shape, shadows, tone, texture, seasonal effects, and the elevation of photos. The identification of a known shape or object from the air is relatively easy. An observation of a shadow often permits positive identification of objects which may have the same photograph tone as an adjacent detail or object. Studies of black and white prints of topography show that much of the detail results from gradations in the gray tones of the print; the gray color indicates the amount of light reflected from the photographed object. The texture of the object determines the angles at which the light will be reflected. Summer pictures show a distinct contrast between deciduous woodland growth and other adjacent areas. Winter pictures show much of the ground detail in the wooded areas since the deciduous form will appear as a skeleton through which can be seen the ground detail.

See also items 368, 490, 492, 493, 499, 502.

## 1a. Bibliographies

- 38 Buttrick, J.  
 THE USE OF AERIAL PHOTOGRAPHS IN FOREST SURVEYS, a selected bibliography for restricted distribution. June 1, 1944, rev. Oct. 1, 1944. Philadelphia, Allegheny Forest Exper. Sta., U. S. Dept. Agric., Forest Service, 1944, 5 p. Z5853.S89U57

A list is presented of approximately 200 selected references (1887-1944) on the use of aerial photographs in forest surveys, forest type classification, methods of estimating timber volume, land classification, etc.

- 39 Cobb, G. C.  
 BIBLIOGRAPHY ON THE INTERPRETATION OF AERIAL PHOTOGRAPHS AND RECENT BIBLIOGRAPHIES ON AERIAL PHOTOGRAPHY AND RELATED SUBJECTS. Bull. Geol. Soc. Amer., v. 54, Aug. 1943: 1195-1210. QEL.G2

A selected list of references is presented on the interpretation of aerial photographs and a list of bibliographies. The subject index includes a rough classification of eleven general groups.

- 40 Garrard, C. W.  
 AN ANNOTATED BIBLIOGRAPHY OF AERIAL PHOTOGRAPHIC APPLICATIONS TO FORESTRY. Bull. New York State Coll. Forestry (Syracuse), No. 26, 1951, 81 p. DA-99.9N486B

Approximately 300 English titles of aerial photographic studies applied to forestry, published since 1916, are listed. The following periodicals were searched: Forestry Abstracts, Forestry Chronicle, Journal of Forestry, Photogrammetric Engineering, Timberman, and West Coast Lumberman. The material is arranged under the following headings: aerial photography, mensuration, survey, interpretation, equipment and techniques, films and filters, fire protection, recreation, wildlife management, range survey, and flood control.

- 41 Gaveman, A. V.  
 [AERIAL PHOTOGRAPHIC SURVEY] Aerofotos"emka. Izvest. Akad. Nauk SSSR, Ser. Geogr. Geofiz., v. 8 (1), 1944: 57-60. AS262.A6246

A bibliography of 130 items on the application of aerial photographic surveys to the study of natural resources is presented. Sixty-four titles are in Russian, and 66 titles in English, French, German, and Dutch.

## Bibliographies

- 42 Haquinius, E., and E. A. Shuster, Jr.  
BIBLIOGRAPHY OF PHOTO-MAPPING AND ALLIED SUBJECTS. Washington,  
D. C., U. S. Geol. Surv., 1929, 84 p. Z5853.S89U58

A list of approximately 1200 foreign and domestic selected references are presented, covering the period of 1776 to 1929 and including literature on the uses of aerial photography as applied to surveying, map-making, and allied subjects.

- 43 Hughes, K. W.  
FORESTRY THESES ACCEPTED BY COLLEGES AND UNIVERSITIES IN THE  
UNITED STATES, 1900-1952. Oregon State Coll. Bibliogr. Ser.,  
No. 3, 1953, 140 p. DA-240.90r3

A bibliography of 2638 forestry theses is presented.  
Thirty-seven theses relate to aerial photography.

- 44 [MONOGRAPHS OF THE FIRST ALL-UNION CONFERENCE ON AERIAL SURVEY]  
Materialy. Vsesofuznoe soveshchanie po aeros"emko, 1st.,  
Leningrad, 1929. Trudy Gosud. Nauch.-Issled. Inst. Geod. i  
Kartogr. Glavn. Geod. Uprav., v. 1, 1929, 264 p., incl. illus.,  
diagr., tables. TA593.V8

The papers delivered during the All-Union Conference on Aerial Survey held in Leningrad on June 14-16, 1929 include: Objectives of the First Conference on Aerial Survey, F. N. Krasovskii; On the Problem of the Aerial Survey in Connection with the Five-Year Plan for Industrialization, I. S. Morozov; On the Objectives of the Conference, A. I. Artanov; Near Perspectives of the Development of Phototopographical Works, D. S. Ershov; On the Aerial Photo-Surveying Work by the Military Topographic Administration, A. I. Artanov; On the Aerial Photographic Work of the Military Topographic School, A. A. Martiagin; On the Aerial Surveying Work by the Ukrainian Air Lines, D. P. Rudin; On the Scientific Research in the Field of Aerial Surveying by the Russian Volunteer Air Fleet Society, N. N. Veselovskii; On the Aerial Surveying Work by the Leningrad Division for Communal Farming, A. P. Sokolov; On the Works Conducted by the Moscow Cadastral Institute, A. S. Chebotarev; Aerological Conditions of an Aerial Survey, P. A. Molchanov; Atmospheric Optics and Aerial Surveying Problems, N. N. Kalitin; Recent Aerial Camera and Research Work Connected with Its Development, G. N. Vandel'; Airplane for Aerial Surveying, V. B. Shavrov; Quantitative Photographic Method and Its Importance to Aerial Photography, K. V. Chibisov; Scientific Research Problems in Aerial Surveying in Reference to Geodetic Preparation. A. V.

## Photo interpretation

Breivo; Scientific and Research Problems in Aerial Surveying in Reference to Topography, O. G. Difs; Scientific and Research Problems in Aerial Surveying in Reference to Ground Works, D. P. Rudin; Scientific and Research Problems in Connection with the Application of Aerial Surveying in Forestry, A. E. Novosel'skii; On Methods of Municipal Planning Using Aerial Survey, A. P. Sokolov; On the Possible USSR Production of Photographic Lenses for Geodetic Work, A. I. Tudorovskii; Combined Aerial Survey, N. M. Aleksopol'skii; Electrical Adapter for Optical Coupling of the Converter, S. O. Maksimovich; On the Aerial Surveys Conducted by the Chief Geodetic Committee, B. K. Cheshke; Lowest Point (Nadir) Triangulation Using Aerial Survey, F. V. Drobyshev; Optical Intensification of Contrast During an Aerial Survey, G. A. Tikhov; A Five-Year Plan for Scientific and Research Studies in the Field of USSR Aerial Survey, N. A. Rynin; An Aerial Photographic Polygon as a Base for Scientific Studies in the Field of Aerial Surveying, N. A. Rynin; Studies of Photographic Paper in the Experimental Laboratory of the Leningrad State Photographic School, S. O. Maksimovich; On the Alignment (Compensation) of Film by Pressing it Against the Camera Plates, A. A. Mel'nikov; Data for the Conduct of Planned Stereoscopic Aerial Survey, P. P. Khandozhko. A bibliography of 1515 titles dealing with aerial surveying prepared by N. A. Rynin is appended.

- 45 Robertson, W. M.  
 SELECTED BIBLIOGRAPHY OF CANADIAN FOREST LITERATURE, 1917-1946.  
 Misc. Silvicultural Res. Note, Dominion Forest Serv., Canad.  
 (Ottawa), No. 6, 1949, 332 p. DA-99.9C16 M

An extensive bibliography on forestry is presented. The bibliography, which contains 3744 references arranged by subject with author and subject index, includes 91 entries pertinent to aerial survey methods.

- 46 SELECTED BIBLIOGRAPHY ON FOREST SURVEYS WITH AERIAL PHOTOS. REVISED  
 MARCH 1949. [Portland, Ore.] Pacific Northwest Forest Range  
 Exper. Sta., 1949, 4p. DA-1.9622.P28e4

The bibliography consists of 53 selected English-language references published during the period 1925 to 1948. Eleven publications relate to general photogrammetry; 42 cover the basic forestry applications of aerial photographs. [53 refs.]

## Bibliographies

See also items 1, 6, 7, 10, 22, 26, 29, 76, 92, 95, 96, 101, 112, 131, 164-166, 178-181, 195, 200, 204, 207, 209, 218, 230, 231, 239, 248, 249, 260, 262, 264, 265, 268, 269, 273, 288, 298, 299, 301, 304, 310, 314, 318, 320, 323, 326-328, 330, 333, 334, 336, 337, 378, 389, 406, 414, 423, 425, 431, 452, 471, 474, 504, 507.

## 2. Photographic characteristics of vegetation and terrain

- 47 Anuchin, N. P.  
[INTERPRETATION AND GROUND EVALUATION OF FORESTS FROM AERIAL PHOTOGRAPHS] Lesnoe deshifrirovaniye i nazemnaya taksatsiya lesa s aerofotosnirkami. In his Lesnaya taksatsiya, Moskva, Goslesbumizdat, 1952, p. 467-489, incl. tables; plate.  
SD551.A49

The author presents a list of criteria for identification on aerial photographs of inhabited areas, pastures, meadows, railroads, improved and unimproved roads, forest roads, irrigation ditches, water bodies, sand bars, rocks, mountains, marshes, cut-over forest areas, burned-out forest areas, wind-falls, coniferous stands (spruce, fir, and pine), and deciduous stands (aspen and birch).

- 48 Bartholomäus, G.  
[SOME GERMAN CULTIVATED LANDSCAPE FORMS] Einiger Formen der deutschen Kulturlandschaft. Zeitschr. Erdkunde-Unterricht, v. 2 (3), 1950: 143-144; 4 plates.  
Gl.E73

Eight aerial photographs showing features of various types of cultivated lands, forest areas, and human settlements are presented. An explanatory analysis of each picture is included.

- 49 Bonch-Bruevich, M. D.  
[INTERPRETATION OF AERIAL PHOTOGRAPHS OF A FOREST] Deshifrirovaniye aerofotosnirkov lesa. Les. Khoz. (Moskva), Apr. 1939: 38-47, incl. illus.  
SD1.L595

Aerial photographs of forest vegetation are characterized by distinctive textures and shades depending on the forest species, their height, and their crown density. Deciduous forests usually appear lighter than coniferous forests, especially when mat-finish, high-quality printing paper is used. Spruce forests are characterized by varied height, long conical

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crowns, and very dark intra-crown spaces. Pine forests are characterized by a uniform crown surface, oval-shaped crowns, and the absence of well defined differences between individual crowns and intra-crown spaces.

- 50 Carls, Norman.  
HOW TO READ AERIAL PHOTOGRAPHS FOR CENSUS WORK. U. S. Bur.  
Census, Washington, D. C., U. S. Gov. Printing Office, 1947,  
44 p., incl. photos, maps. TA595.U6

An introduction to the subject of aerial photography is followed by general tips on aerial photo reading and a discussion of line features, dwellings, road patterns, and other special features discernible on aerial photographs. Forty-eight aerial photographs and 2 maps are included in the text.

- 51 Hallert, B.  
[ON THE CONSTRUCTION OF PHOTOGRAMMETRIC MAPS] Über die Herstellung photogrammetrischer Pläne. [German text] [Stockholm, Esselte aktiebolag, 1944], 118 p., incl. photos, map, diags., tables; 5 plates. TA593.H25

The treatise, dealing with double-point interpolation in space through the use of stereoscopes and with experimental photogrammetric work, is illustrated with 7 aerial photographs of the Swedish countryside. Three aerial photographs in the form of anaglyphs are appended.

- 52 Koepfel, R.  
[PALESTINE: THE LANDSCAPE IN MAPS AND PHOTOGRAPHS] Palestina; die Landschaft in Karten und Bildern. Tübingen, J. C. B. Mohr, 1950, 174 p., incl. photos, maps, diags. GB309.P2K6

The geological structure, morphology, landscape, climatic conditions, and vegetation of Palestine are portrayed in 195 maps and photographs, a majority of which are aerial photographs.

- 53 Krinov, E. L.  
[SPECTRAL REFLECTIVITIES OF NATURAL FORMATIONS] Spektral'naiâ otrazhatel'naiâ sposobnost' prirodnykh obrazovaniï. Moskva-Leningrad, Akad. Nauk SSSR, Lab. aerometodov, 1947, 271 p., incl. photos, diags., tables. [Nat. Res. Council, Canad. Tech. Translation, TT-439, 1953, 268 p.] QC911.K7

The method employed in determining the visible and near infrared reflectance of natural formations is described. The basic principles of photographic spectrophotometry as used in

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the field, the materials and equipment used, as well as the selection and preparation of observational material, are outlined and described. The general characteristics of the landscape under study are discussed; data on the reflectivity of wooded areas, grasslands, fields, exposed soils, water, roads, and various types of structures are presented. The relationship between the spectral reflectivity of natural formations and their orientation and configuration is reviewed. [45 refs.]

- 54 Lindquist, B.  
(THE ECOLOGY OF THE SCANDINAVIAN BEECH WOODS) Den skandinaviska bokskogens biologi. Stockholm, Centraltryckeriet, 1931, 532 p., incl. photos, maps, tables, map. SD397.B4L5

The study is based on a series of aerial reconnaissance flights carried out over Southern Sweden during the period 1927-1930. Weekly flights were undertaken during spring when the beech is distinguishable from other forest trees by its characteristic light-green foliage. Results show that during this period it was possible to differentiate all of the principal forest trees in southern Sweden. A 1:500,000-scale map showing the distribution of the southern Swedish beech forests is appended.

- 55 Losee, S. T. B.  
PHOTOGRAPHIC TONE IN FOREST INTERPRETATION. Photogramm. Eng., v. 17, Dec. 1951: 785-799, incl. illus., tables. TA593.A2P5

The importance of photographic tone to the interpreter of forested areas is emphasized. Analysis of the tone of photographic images, as well as the factors controlling the amount and quality of light reflected from tree crowns, are discussed and evaluated. [8 refs.]

- 56 [AERIAL PHOTOGRAPH READER] Luftbild-Lesebuch. Luftbild u. Luftmessung, no. 13, 1937: 5-66, chiefly photos. TA593.A2L8

A series of aerial photographs, analyzed in great detail, illustrate general types of topography (beaches, lakes, streams, forests, cultivated areas, mines), and outstanding cultural features (roads, railroads, dwellings, etc.).



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- 57 [TOPOGRAPHIC AERIAL PHOTOGRAPHY Luftbild-Topographie. Luftbild u. Luftbild-messung, no. 14, 1936: 2-60, chiefly photos. TA593.A2L8

A wide variety of aerial photographs is presented and analyzed for outstanding topographic features. The effect on photography of such factors as shadow, seasonal phenomena, as well as of landscape relief, is indicated.

- 58 Mangney, M.  
AIR PHOTOS AID FOREST MANAGEMENT. Conservation Volunteer, v. 15 (90), Nov.-Dec. 1952: 14-15, incl. photo. DA-279.8C765

The identification of Minnesota tree types on aerial photographs is briefly discussed.

- 59 Moessner, K. E.  
PHOTO CLASSIFICATION OF FOREST SITES. Proc. Soc. Amer. Foresters, 1949: 279-292, incl. photos, map, diags. DA-99.9S013

Topographic features and soil patterns are used as a basis for the classification of forest sites. Aerial photographs of 15 counties in Western Kentucky were used for the interpretation study. Since species identification is difficult and subject to change, and site classification is relatively easy and more stable, the latter is recommended in making aerial surveys in hardwood regions. [1 ref.]

- 60 Pleshkova, T. T.  
[ALBEDO OF GROUND FORMATIONS] Al'bedo zemnykh obrazovani. Priroda (Leningrad), v. 37 (10), 1948: 44-49, incl. photos, diags., tables. Q4P8

Radiation measurements were made with a calibrated albedometer and the reflectance of various exposed surfaces was determined. The reflection from snow cover varied from 45 per cent for discolored and melting snow to 94 per cent for dry and freshly fallen snow. The values obtained for sea ice varied from 31 to 36 per cent depending upon its transparency. The reflection from grassy fields varied from 10 to 32 per cent. Smaller values were obtained for grain fields. The reflectance of soil was found to be about 8 per cent for wet chernozem and 35 per cent for yellow sand. Soil moisture reduced the reflectance considerably. Radiation measurements of the water surface showed reflectance values of about 8 per cent. The reflection of cloud formations varied from 54 to 76 per cent

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depending on the wave lengths and the position of the sun. The average reflection of the human skin was 35 per cent. [12 refs.] (From SIPRE Abstracts)

- 61 Rief, A.  
[AERIAL PHOTOGRAPHY IN THE SERVICE OF FOREST MANAGEMENT (APPRAISAL)]  
Das Luftbild im Dienst der Forsteinrichtung (Taxation). Luft-  
bild u. Luftbild-messung, no. 10, 1936: 3-7, incl. photos.  
TA593.A2L8
- The differentiation of spruce, beech, and oak stands on aerial photographs of mixed forests is exemplified on four aerial photographs taken in the forest district of Bettbrunn in 1935. The original scale was 1:7500; after correction of distortion the scale was 1:5000.
- 62 Ryker, H. C.  
AERIAL PHOTOGRAPHY. METHOD OF DETERMINING TIMBER SPECIES.  
Timberman (Portland, Ore.), v. 34 (5), Mar. 1933: 11-17, incl.  
photos, diagrs.  
HD9750.II65
- The results of a study conducted in California in 1931 and 1932 are presented. Equipment and photographic techniques are briefly described. An Eastman panchromatic film employed in combination with a green filter admitting only light rays of wave lengths from 460 to 620 millimicrons to reach the emulsion gave best results. The physical characteristics and photographic appearance of four species of the tested area (sugar pine, western yellow pine, Douglas fir, and incense cedar) are described and compared. The significance of color or shading of the crown image and of the shape of the crown for identification purposes is pointed out.
- 63 Sager, R. C.  
INDEX TO AERIAL AND GROUND PHOTOGRAPHIC ILLUSTRATIONS OF GEO-  
LOGICAL AND TOPOGRAPHIC FEATURES THROUGHOUT THE WORLD. Photo-  
gramm. Eng., v. 19, June 1953: 472-473. TA593.A2P5
- Information on the contents and availability of the above index is provided.
- 64 Samoilovich, G. G.  
[AN ATTEMPT TO INTERPRET RELIEF FROM AERIAL PHOTOGRAPHS] Opyt  
Deshifrirovaniia rel'efa po aerosnimkam. Geogr. obshch. SSSR,  
Izvest. (Moscow-Leningrad), v. 67 (2), 1935: 244-251 incl. illus.  
G23.R6

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An aerial photographic survey of an area in the vicinity of Stalinsk is described. The photomapped area extends from 52°31' to 53°45' N. Lat., and from 87° to 89° E. Long. The aerial photographs were of a scale of 1:15,000, and had a 60-70% overlap. Stereoscopic studies of the aerial photos showed distinct differences in the shade and tone between coniferous stands and groves consisting of birch and alder. Aerial photographs of the mountainous landscape, individual ridges, and alluvial deposits are reproduced.

- 65 Samoilovich, G. G.  
 [THE USE OF AVIATION IN THE STUDY OF SEASONAL CHANGES IN NATURE]  
 Primenenie aviatsii dlia izucheniia periodicheskikh izmenenii prirody. Izvest. Geogr. obshch. SSSR. (Moscow-Leningrad), v. 69 (2), 1937: 268-275, incl. illus. G23.R6

Observations of the vegetational cover were conducted during spring, summer, and fall aerial flights to determine to what extent individual species could be recognized. April studies from altitudes of 300 to 500 m. permitted an easy recognition of blooming maple trees, elm trees, larch, and mature pine stands. Oak and linden, although still void of leaves, were recognized by the shape and the structure of their crowns. Aerial photographs of a 1:8400 scale taken during the spring using a yellow filter offered much detail and satisfactory contrasts between various species.

- 66 Seely, H. E.  
 SOME DEVELOPMENTS IN THE USE OF AIR PHOTOGRAPHS FOR FOREST SURVEYS. Photogram. Eng., v. 13, Sept. 1947: 443-452. TA593.A2P5

Attempts to differentiate species in air photographs were less successful than to estimate timber volume; it was often necessary to depend on ground identification. Hardwoods can usually be distinguished from softwoods, with some exceptions, in midsummer photographs. The desired distinctions may be obtained by a process of elimination, in cases where very few species are present; by the aid of site classification from air photographs; by knowledge of the forest associations and successions; by shape and texture of crowns; by tone of foliage, particularly in the autumn; and by phenological changes. The variation in glossiness of foliage in broad-leaved species may provide a valuable means of differentiation in color photography. Infra-red photographs clearly distinguish softwoods and hardwoods in midsummer. Panchromatic photographs provide very

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distinctive spring and autumn tones. Variations in crown texture in individual species complicate the use of infra-red for softwood identification. Experiments indicated that particularly distinct tones can be obtained using a minus-blue filter with infra-red film.

- 67 Sisam, J. W. B.  
THE USE OF AERIAL SURVEY IN FORESTRY AND AGRICULTURE. Oxford, Imperial Forestry Bureau, 1947, 59 p., 67 aerial photos.  
TR810.55

The recognition of broad vegetation types on aerial photographs is based on (1) variations in tone and texture of the photograph with respect to the vegetation itself and to related soil and topographic conditions, (2) characteristic spacing and patterns of associations or individual tree crowns, and (3) position with respect to features in the landscape and to other vegetation. The amount of detail depends on the scale and quality of photographs, sharpness of boundary and height variation between sub-types, phenological and weather conditions at the time the photographs are taken, topographic conditions, and the extent to which photographs were correlated with ground conditions. The necessity to define, within limits, the photographic appearance of each species and combination of species, and to assemble this information into a key is emphasized. Experiments using panchromatic film and a green filter resulted in photographs showing (1) boundaries of areas predominantly pine as opposed to those predominantly fir, (2) identification of species of each individual mature tree, and (3) location of trees whose foliage was affected by insects. Experiments using various types of film and various filters show that the best combination of photographic materials for forestry is the infra-red film with a light-colored filter, probably a minus blue or slightly darker. Scales of 1:9600 or smaller are necessary for an identification of individual trees; scales of 1:18,000 are sufficient for delineating types predominantly of one species. (96 refs.)

- 68 Sulakvelidze, G. K.  
[SOME RADIATION PROPERTIES OF DRY SNOW] Nekotorye radiatsionnye svoistva sukhogo snega. Soobshch. Akad. Nauk Gruzinskoi SSR (Tiflis), v. 12, 1951: 467-473, incl. diags., tables.  
DLC Slavic

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The radiation properties of snow were studied at elevations of 2000-5600 m. from 1946-1950. The reflectance of snow varied from 49-97% and depended on water content and purity. The albedo of pure, dry snow was 90-97% and decreased to about 75% when slightly wet. The albedo of damp, contaminated snow was 49%. Radiation transmission in snow was studied to depths of 95 cm. About 35.2% of solar radiation penetrated to a depth of 5 cm., 4.82% to 15 cm., and 1.76% to 50-90 cm. Wave lengths of 6500-6600 Å were completely absorbed within the upper 5.7 cm. of snow. Formulas are suggested for calculating albedo and illumination at various snow depths. [3 refs.] (SIPRE Abstracts)

- 69 Szüts, L.  
[AN AERIAL PHOTOGRAPH] A légi fénykép. [Hungarian text]  
Budapest, M. Kir. Allami Térképészet, 1931, 51 p., incl. photos,  
diags. TA593.S9

Twenty-seven aerial photographs of Hungarian cities, villages, and countryside are included.

- 70 Tikhov, G. A.  
[SPECTRAL ANALYSIS AND FLUORESCENCE OF THE GREEN PARTS AND THE FLOWERS OF PLANTS] Spektral'nyi analiz i fluoretsentsifa zeleni i tsvetov rastenii. Priroda (Leningrad), v. 38 (6), 1949: 3-7, incl. illus., diags. Q4.P8

Spectral studies of various plants show that Peonia intermedia and Ceranium grandiflorum exhibit maximum brilliancy in the infrared band. Viola altaica reaches its maximum brilliancy at a wave length of 694 mu; similar brilliancy was observed at wave lengths above 750 mu for Cortusa altaica.

- 71 THE USE OF AERIAL PHOTOGRAPHS AND MOSAICS WITH PARTICULAR REFERENCE TO FLOOD CONTROL SURVEYS. In Proceedings of Seminar on Aerial Photography in Flood Control Surveys, December 6-8, 1939. Washington, D. C., U. S. Dept. Agric., Flood Control Advisory Comm. [1939], Appendix A, 19 p. DA-1.915F2P94

The preparation, interpretation, and use of aerial photographs for flood control surveys are discussed. Common variations recognizable in the following types of forested lands are described: well stocked lands, understocked stands, closely cut-over and burned areas, and forest plantations. Classes of open land distinguished include: cultivated fields in river and

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stream valley areas, or on gently rolling to moderately steep slopes; lands idle for several years; pasture lands; miscellaneous lands including cities, towns, highways, railroad right-of-ways, river channels, and mine pits.

- 72 Wieslander, A. E., and R. C. Wilson.  
CLASSIFYING FORESTS AND OTHER VEGETATION FROM AIR PHOTOGRAPHS.  
Photogramm. Eng., v. 8, July-Sept. 1942: 203-215, incl. illus.,  
diagr. Also in Amer. Soc. Photogramm. Manual of Photogram-  
metry. New York, Pitman Publishing Co., p. 716-727.

TA595.A2F5

Extensive studies of photographic characteristics of the vegetation permitted a basic classification of elements and features using contrasts as a means of identification. Trees, both timber and cordwood, down to minimum sizes usually appear more irregular in pattern and darker in tone than other vegetation. The pattern and tone in timber-tree canopy are more regular and often darker than in cordwood stands. The individual tree crowns are longer and more pointed or tapering, as revealed by shadows. Stereoscopic images of individual crowns are more nearly circular and narrower than images of cordwood trees of comparable heights. The pattern and tone of hardwood canopy are usually irregular, tree crowns blending together so that individual crowns are indistinguishable in dense stands. Individual crowns in open stands are usually broader and have a more irregular spread than timber trees of comparable heights, and the crowns are definitely more rounded or flat on top. Non-timber conifers such as Digger pine, pinon pine, and juniper are sometimes difficult to distinguish from timber conifers. Shrubs form patterns varying in regularity, with various tones of gray, depending largely on species composition. The stereoscopic height of shrubs is negligible.

See also items 2, 22, 28, 37, 84, 109, 112, 181, 186, 192, 203,  
211, 219, 246, 258, 266, 273, 277, 280, 287, 289, 296, 301,  
311, 315, 327, 338, 343, 349, 362, 379, 404, 426, 430, 432,  
464, 481, 485, 486, 490, 165, 275.

## 3. Photographic materials and equipment

- 73 Aquino, R. R.  
GLOSSY PHOTOGRAPHS VERSUS POSITIVE TRANSPARENCIES FOR TREE HEIGHT MEASUREMENTS. Filipino Forester, v. 5, 1953: 20-33, incl. tables. DA-99.8F47

Tree height measurements, made from glossy aerial photographs and from positive transparencies of 500 sample trees, are statistically analyzed. The positive transparencies provided consistently better results than the glossy photographs. [8 refs.]

- 74 Aschenbrenner, C. M.  
PROBLEMS IN GETTING INFORMATION INTO AND OUT OF AIR PHOTOGRAPHS. Photogramm. Eng., v. 20, June 1954: 398-401, incl. photos., diags. TA593.A2P5

Information is considered to be stored in aerial photographs essentially in the form of a non-random distribution of "density specks". A laboratory model is described which simulates this phenomenon, and is used to study the limits of photographic information potential. A difference between the limitation imposed by emulsion grain and that imposed by lens performance is demonstrated. The seemingly random distribution of density specks is found valuable, in photogrammetry, for the definition of a surface through the use of a stereoscope which permits retrieval of otherwise invisible information stored in a photograph. (Author's Abstract in part)

- 75 Ask, R. E.  
ELEMENTS OF PHOTOGRAMMETRIC OPTICS. In Amer. Soc. Photogramm. Manual of Photogrammetry, 2d ed., Washington, D. C., 1952, p. 535-602, incl. illus., tables, diags. TA593.A63

The study of optical equipment employed in photogrammetry covers lenses in general, lenses for photogrammetry, errors caused by glass plates, simple optical systems, compensation of lens distortion, color filters, prisms, and mirrors.

- 76 Backström, H., and E. Welander.  
[A PRELIMINARY INVESTIGATION OF THE POSSIBILITIES OF DISTINGUISHING DIFFERENT TREE SPECIES ON AERIAL PHOTOGRAPHS] En preliminär undersökning rörande möjligheterna att skilja olika träslag på flygbilder. Svenska Skogsvarvsför. Tidskr., v. 46 (3) 1948: 180-200. DA-99.8Sk5

## Materials and equipment

The reflecting capacity of leaves, from 19 different tree species, in light of wavelengths between 4000 and 1000 A, was studied at the Inst. of Photography of the Swedish College of Technology with the aid of a Beckman spectrophotometer. Diffuse reflection curves for the various species show a strong resemblance in their general trend, having a low peak in the visible spectrum in the green. The spectral range important to infrared photography appears to be 7500-8500 A. From a consideration of the results in relation to photographic contrast (density of negative) it is concluded that hardwood and conifers will be readily distinguishable in infrared aerial photographs; contrast between Norway spruce and Scotch pine will be close to the limit of distinguishability. Satisfactory contrast could be obtained between species showing little contrast in infrared, e.g. spruce and pine, oak and beech, in green light (panchromatic film and green filter) in spite of the low reflection capacity in this range. The practical difficulty is that use of the filter would demand great sensitivity of the film, and it is probably impossible at present to achieve the necessary combination of filter density and film sensitivity. Very valuable work could be done with aerial photographs if it were possible to have regions photographed in both the green and the infrared ranges. [18 refs.] (Forestry Abstr. in part)

- 77 Bertele, L.  
RE NEW LENS OF HIGH OPTICAL PERFORMANCE FOR AERIAL PHOTOGRAMMETRY. *Photogrammetria*, v. 1, No. 2, 1949: 52-53.  
TA593.A2P48

Detailed description is given of a new lens, the Aviotar, with a 1:4.2 aperture and a 60° angular field, designed for photogrammetric use to provide complete freedom from distortion. The lens, of complete asymmetric construction, is composed of 9 elements cemented together in 4 sections which are separated by air spaces. The correction of image errors permits use of the lens for color photography.

- 78 Clark, W.  
PHOTOGRAPHY BY INFRARED; ITS PRINCIPLES AND APPLICATIONS. New York, John Wiley, 1939, 397 p., incl. diags., tables; plates (photographs)  
TR755.C55

Infrared aerial photography is briefly discussed (p. 257-262) and forest- and geological aerial survey techniques are described.



## Photo interpretation

- 79 Deeg, J. J.  
AERIAL CAMERAS AND ACCESSORIES. In Amer. Soc. Photogramm.  
Manual of Photogrammetry, 2d ed., Washington, D. C., 1952,  
p. 69-137, incl. illus., tables, diagrs. TA593.A63
- The requirements for aerial cameras, their design and construction are described, and general principles of their operation are outlined. A detailed description is presented of some military and nonmilitary aerial cameras and their accessories, including specifications for the T-11 camera.
- 80 Ermolaev, M. M.  
[ON THE FACTORS AFFECTING LONG-RANGE VISIBILITY IN THE ARCTIC]  
Ob usloviakh vidimosti na dalekoe rasstoianie v Arktike. Biull.  
Arkt. Nauch.-Issled. Inst. (Leningrad), No. 7, 1931: 123-126,  
incl. diagrs., tables. G600.L42
- Visibility observations were carried out at the Polar Geophysical Station on the Lyakhov Islands (73°11' N. Lat. and 143°14' E. Long.). Mount Ulakhan Suriuk-Tas, about 200 m. high and 95 km. away from the observation point was selected to determine the visibility. The observations lasted 16 mos. during which period the mountain was seen on 111 days. The best visibilities at long and short ranges did not coincide in time. Optimum visibility at long range was obtained during months of July and August, while minimum visibility was noted during May. The distribution of visibility days according to months is tabulated.
- 81 Fagerholm, E.  
[THE APPLICATION OF THE AERIAL PHOTOGRAPH TO MAPPING] Flygbildens  
användning för kartframställning. Ymer, v. 63, 1943: 182-201,  
incl. photos, diagrs. GNL.Y5

The characteristics of aerial photographs are discussed, and a comparison is made between oblique and vertical photographs. Map-making techniques and equipment, including that of the Wild and of the Zeiss companies of Switzerland, are discussed. A brief historical survey of the development of photogrammetry introduces the study. The importance of aerial photographs for the work of the Swedish General Staff Lithographic Inst. in its mapping of Sweden is noted. Eight representative photographs and illustrations of the equipment mentioned are included.

## Materials and equipment

- 82 Gramms, G.  
 [STUDIES OF THE STABILITY OF PANCHROMATIC AEROFILMS] Untersuchungen der Haltbarkeit von panchromatischen Fliegerfilmen. Jahrb. Deutsch. Luftfahrtforsch., sect. 3, 1940: 49-58, incl. photo, diags., tables. TL503.J15
- The stability of the following commercial films exposed over a prolonged period to temperatures of 50°, 35°, and 20°C and relative humidity of 75% was tested: Agfa-Aeropan "Normal", Agfa-Aeropan "Höhere Empfindlichkeit", Zeiss-Ikon aerial film, Perutz-Pervola aerial film, and Kodak panatomic film. Results of these tests are tabulated and plotted graphically.
- 83 Gramms, G.  
 [COMPARATIVE AERIAL PHOTOGRAPHS IN VISIBLE AND INFRARED SPECTRAL RANGE OF A SINGLE EMULSION] Vergleichs-Luftbildeaufnahmen im sichtbaren und infraroten Spektralbereich auf einer einzigen Emulsion. Jahrb. Deutsch. Luftfahrtforsch., sect. 3, 1942: 57-61, incl. photos, diags., tables. TL503.J15

Phototechnical properties of the Infrapan emulsion, which combines infrared-sensitive and panchromatic materials in a single emulsion, are briefly reviewed. Tests of this emulsion for its applicability in aerial photography are described. Six photographs taken with Aeropan B, Infrarot 850, Infrapan II, and Infrapan III are compared for contrast.

84. Jensen, H. A., and R. N. Colwell.  
 PANCHROMATIC VERSUS INFRARED MINUS-BLUE AERIAL PHOTOGRAPHY FOR FORESTRY PURPOSES IN CALIFORNIA. Photogramm. Eng., v. 15, June 1949: 201-223, incl. illus., tables, diags. TA593.A2P5

A review of systematic tests regarding the relative merits of various film-filter combinations for forestry purposes shows that the chlorophyll content of foliage is more a function of the age and vigor of a tree than of its species. Experiments have shown that the best distinction of tree species is obtained using Eastman Supersensitive Panchromatic film in combination with a green filter which transmits only light with wave lengths of 460 to 620 mu. Other studies indicate that infrared photography with a minus-blue filter is superior both to panchromatic with minus-blue and to color photography for differentiating forest tree species by tonal contrast, since differences in photographic tone between species are greater in the infrared range than in the visible part of the spectrum. Tests conducted

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to determine applicability of these findings to local growth conditions showed panchromatic minus-blue photography to yield more information than the panchromatic green. Optimum results were obtained using infrared minus-blue photography. Instrumentation and methodology employed in California tests are described.

- 85 Kudriavtsev, M. K.  
[THE USE OF LIAR-6 LENS IN A CONTOUR-COMPOSITE AERIAL SURVEY]  
Primenenie ob"ektiva LIAR-6 pri konturno-kombinirovannoi  
aeros"emke. Moscow, Izdanie Voenno-inzhenernoi Akad. imeni  
V. V. Kuibysheva, 1938, 98 p., incl. illus., tables, graphs,  
diagrs. TR810 K8

A description is given of the LIAR-6 lens which has an aberration of 2 mm., astigmatism of 2 mm., the curvature of the image of 1.5 mm., distortion of 0.34 mm., and a resolution of 66 lines per 1 mm. in the center and 10 to 12 lines per 1 mm. along the edges. The lens is considered to have practical application for photogrammetric use on scales greater than 1:50,000.

- 86 Mason, B., Jr.  
THE HOTSPOT IN WIDE-ANGLE PHOTOGRAPHS. Photogramm. Eng., v. 19,  
Sept. 1953: 619-625, incl. photos, diagrs. TA593.A2P5

The phenomenon known as "hotspot", "no-shadow area", or "hazy spot" in wide-angle vertical aerial photographs contributes greatly to increased mapping costs and lower map accuracy. The spot is caused by absence of shadows and by halation near the prolongation of a line from the sun through the exposure station. Its major effect is the destruction of fine image detail over a considerable portion of the wide-angle photograph. It is not a serious problem in normal or narrow-angle photographs in the temperate zones. The most practical method of overcoming the hotspot is to avoid it. The position of the hotspot on the photograph at any given time may be accurately predicted and flights may be planned to avoid it. [2 refs.] (Author's Abstract)

- 87 Miller, V. C.  
SOME FACTORS CAUSING VERTICAL EXAGGERATION AND SLOPE DISTORTION  
ON AERIAL PHOTOGRAPHS. Photogramm. Eng., v. 19, Sept. 1953:  
592-607, incl. diagrs. TA593.A2P5

## Materials and equipment

The study discusses the qualitative aspects of photographic variables such as focal length, camera height, air base, relief, tilt, and optical imperfections which may contribute to a vertical exaggeration. [2 refs.]

- 88 Nagel, M.  
[STUDIES OF THE RECOGNITION OF SMALL DETAILS ON AERIAL PHOTOGRAPHS] Untersuchungen über die Erkennbarkeit kleiner Details in Luftbilddaufnahmen. Jahrb. Deutsch. Luftfahrtforsch., sect. 3, 1940: 59-60. TL503.J15

The report summarizes results of investigations in which the relationship between the picture quality of photographs taken at various focal lengths, the photographic material, and film-development methods were studied.

- 89 Rozhdestvin, N. P.  
[AERIAL PHOTOGRAPHY] Aérofotografiia. Moskva, Voenizdat, 1947, 331 p., incl. photos, maps, diagrs., tables; 4 plates. TR810.R67

The manual on aerial photography presents a consideration of the fundamentals of sensitometry, light filters and film for aerial photography, exposure and its determination for such photography, development of the film, the positive process in aerial photography, reproduction of photographic data, the photographic laboratory of the Aerial Photographic Service, processing data obtained in aerial reconnaissance, and a discussion of aerial color photography.

- 90 Schmieschek, U.  
[THE APPLICATION OF INFRARED RAYS IN PHOTOGRAPHY] Die Anwendung infraroter Strahlen in der Photographie. Jahrb. Deutsch. Luftfahrtforsch., sec. 3, 1937: 93-98, incl. photos, diagrs. TL503.J15

A description is given of development of a photographic emulsion technique; of infrared-sensitive emulsions and filters employed in infrared photography; photography in darkness; principal fields of infrared photography; penetrability of various light wavelengths through air, haze, mist, and smoke, as well as penetrability of infrared through photographic equipment; photographing through artificial and natural haze; and distant photography using super-sensitive, infrared-sensitive emulsions. Eleven aerial photographs taken using various films and filter combinations are included.

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- 91 Schmieschek, U.  
 [SYSTEMATIC INVESTIGATIONS OF THE VARIABLE SUITABILITY OF ORTHOCHROMATIC, PANCHROMATIC, AND INFRARED-SENSITIVE EMULSIONS FOR THE USE IN AERIAL PHOTOGRAPHY] Systematische Untersuchungen über die unterschiedliche Eignung orthochromatischer, panchromatischer und infrarotempfindlicher Emulsionen für Luftbildzwecke. Jahrb. Deutsch. Luftfahrtforsch., sect. 3, 1937: 84-92, incl. map, diagrs., tables. TL503.J15

Tests of orthochromatic, panchromatic, and infrared-sensitive emulsions regarding the film speed, gradation, fogging, and color sensitivity are described. Results of these tests are tabulated and presented in graphic form. Aerial photographs of the same objective, employing the above emulsions and a combination of light filters, are compared for resolution.

- 92 Schulte, O. W.  
 THE USE OF PANCHROMATIC, INFRARED, AND COLOR AERIAL PHOTOGRAPHY IN THE STUDY OF PLANT DISTRIBUTION. Photograph. Eng., v. 17, Dec. 1951: 688-714, incl. illus., map, diagr. TA593.A2P5

A comparative study of the use of three kinds of aerial photographs made with panchromatic, infrared, and color film for identifying species of trees is presented. The tone, resolution of tree details, texture of individual tree crowns, texture of stands of trees, and location and distribution of trees as reproduced on aerial photographs is discussed. Keys to species as they appear on infrared, panchromatic, and color photographs are appended. [Approx. 50 refs.]

- 93 Segemark, K. R.  
 [THE AERIAL PHOTOGRAPHY SEASON: NOTES ON SHADOW LENGTH AND LIGHT CONDITIONS] Flygfotograferingssäsongen, några synpunkter med avseende på skugglängd och ljusbetingelser. Skogen (Stockholm), v. 36 (3), 1949: 35-36. DA-99.8 Sk51

The study contains a table showing, for Sweden, the daily period suitable for aerial photography in clear weather, at 5-day intervals from April until Sept., for latitudes of 55-66°N. and assuming the limiting altitude of the sun to be 33.9° (shadow length 150% that of the object casting the shadow). A sketch map showing variation in local time and approximate dates for the disappearance of snow in spring is included. [1 ref.] (Forestry Abstr.)

## Materials and equipment

- 94 Seymour, T. D.  
THE AERIAL OBLIQUE VIEW. Photogramm. Eng., v. 20, June 1954:  
401-406, incl. photos, diagrs. TA593.A2P5

The application of aerial obliques, their advantages and disadvantages are briefly reviewed.

- 95 Sharonov, V. V.  
(PRINCIPLES OF THE THEORY OF SPECTRAL CALCULATION IN AERIAL PHOTOGRAPHY) Osnovy teorii spektral'nykh raschetov v aerofotografii. Trudy Tsentr. Nauch.-Issled. Inst. Geod., Aéros"emki i Kartogr. (Moskva), No. 20, 1937: 19-39. QB275.M64

A formula is given for the selection of the best image of an aerial photograph. The photographic brightness is expressed as a function of the spectral-brightness factor of the portion of the earth's surface photographed, the monochromatic illumination, and the spectral sensitivity of the photographic film. [45 refs.]

- 96 Sonley, G. R.  
INTERIM REPORT ON EXPERIMENTAL AIR PHOTOGRAPHY FOR FOREST-COVER CLASSIFICATION. Forestry Chronicle, v. 22 (2), 1946: 157-158. DA-99.8 F7623

The RCAF made an experiment in infrared photography for the purpose of forest-cover classification using infrared and Aerokodacolor films; control exposures were made on Super XX, the standard film now used. The color film was so underexposed that no conclusions could be drawn from it. The infrared film gave very good results. It is concluded that infrared photography can be used to separate hardwood and softwood stands, although it may not distinguish conifers scattered singly through hardwoods. It apparently has no disadvantages in the matter of storage and development, and when the minus-blue filter is used the infrared film has the same speed as Super XX. (Forestry Abstr. in part)

- 97 Spurr, S. H., and C. T. Brown, Jr.  
SPECIFICATIONS FOR AERIAL PHOTOGRAPHS USED IN FOREST MANAGEMENT. Photogramm. Eng., v. 12, June 1946: 131-141, incl. ill.:s., tables. TA593.A2P5

Studies were conducted to determine the focal length of lens, type of photography, type of print, season of photographs, film and filter, and scale of photography most satisfactory for

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the aerial photography of forests. Various combinations of films, filters and scales were tried experimentally in widely separated forest areas. Each of the areas photographed was surveyed on the ground to determine what species were present and whether they could be distinguished on the various photographs. Results indicate that for most forestry purposes infrared film with a light-colored filter produces pictures with well-resolved detail and with marked differentiation in tone between the major timber species.

- 98 Spurr, S. H.  
FILMS AND FILTERS FOR FOREST AERIAL PHOTOGRAPHY. Photogramm.  
Eng., v. 15, Sept. 1949: 473-481, incl. illus. TA593.A2P5

The study of negatives and prints prepared from various films under variable conditions shows that the type of film used had the greatest effect on the resulting picture. Infrared produced best pictures for forestry purposes. These showed high pictorial quality and differentiated clearly between most of the forest types, especially between hardwoods and softwoods. The haze-penetrating qualities of infrared film were excellent and superior to panchromatic film. The panchromatic photographs were of high quality but failed to provide sufficient pictorial contrast to distinguish hardwoods from softwoods. Slightly overexposed panchromatic negatives produced best contrasts, accentuating species differences. Normal exposure appeared the best for infrared film.

- 99 Tarkington, R. G.  
AN ASPECT OF COLOR PHOTOGRAPHY AND INTERPRETATION. Photogramm.  
Eng., v. 19, June 1953: 418-421, incl. diagrs. TA593.A2P5

The three-color aspect of human vision and its application to modern color photographic processes is briefly reviewed. Some of the spectrophotometric characteristics of the dyes used in modern subtractive color photographic materials are outlined. As no simple direct relationship exists between the spectrophotometric characteristics of an object photographed and the spectrophotometric characteristics of the dyes forming the image of that object, the use of these materials for interpretation purposes in aerial photography is limited.

## Materials and equipment

- 100 Tsyganov, M. N.  
[HANDBOOK (MANUAL) OF AN AERIAL PHOTO LABORATORY TECHNICIAN]  
Spravochnik (posobie) aerofotolaboranta. Moskva, Geodezizdat,  
1943, 183 p., incl. photos, diags., tables. TR810.T8

The manual covers the description and methods of testing light-sensitive materials, photographic solutions and equipment, types of photographic surveys, negative and positive photographic processes in field and laboratory operations, retouching and other auxiliary processes. Information on the preparation of light filters and of reproduction plates is appended.

- 101 Tsyganov, M. N.  
[FUNDAMENTALS OF PHOTOGRAPHY AND AERIAL PHOTOGRAPHY] Osnovy  
fotografii i aerofotografii. Moskva, Geodezizdat, 1952, 294 p.,  
incl. photos, diags., tables. TR200.T8

The manual treats such subjects as optics, basic chemical data, the photographic emulsion, sensitometry, photographic materials and the special methods employed in their preparation, characteristics of ground objects and their illumination affecting aerial photography, the negative and positive processes, clearing and intensification of negatives, and elementary data on color photography. [21 refs.]

- 102 Tupper, J. L., H. A. Miller, W. Clark, and J. M. Calhoun.  
PHOTOGRAPHIC MATERIALS AND LABORATORY TECHNIQUES. In Amer.  
Soc. of Photogramm. Manual of Photogrammetry, 2d ed.  
Washington, D. C., 1952, p. 271-308, incl. illus., tables,  
graphs, diags. TA593.A63

The general structure and properties of photographic materials, the detailed structure and properties of materials particularly suited for aerial photography, and the general principles and practices employed in film processing are described.

- 103 Vavilov, S. I.  
[OPTICS IN THE MILITARY APPLICATION. A COLLECTION OF THESES]  
Optika v voennom dele. Sbornik statei. Moskva-Leningrad,  
Izd-vo Akademii Nauk SSSR, 1945, v. 1, 392 p., incl. photos,  
diags., tables. QC371.073



Photo interpretation

A brief survey of the optical industries introduces studies concerning the nature and properties of light, geometrical optics and calculation of optical systems, optical glass, light filters, photo-elements, luminescent materials used by the military, basic data on the function of the eye, light conditions at night and night vision, visibility range and atmospheric transparency, concealment of light, principles of military optical concealment and disclosure, photographic lenses, photographic process, optical telephony, and optical blocking. [115 refs.]

See also items 17, 66, 67, 115, 129, 191, 200, 353, 377, 384, 390, 403, 406, 444.

## II. METHODS AND TECHNIQUES OF PHOTO INTERPRETATION

### 1. General

104 Andreev, V. N.

[APPLICATION OF AERIAL METHODS TO GEOBOTANICAL CHARTING AND INVENTORY TAKING OF PASTURE AREAS] *Primenenie aerometodov dlia geobotanicheskogo kartirovaniia i inventarizatsii kormovykh ploshchadef. Bot. Zhur. (Moskva), v. 37 (6), 1952: 843-847.*

QK1.V713

The report presents a brief discussion of aero-visual methods employed during 1936-38 in the investigation of reindeer pastures, compares these methods with aerial photographic methods, and considers the possible application of both procedures in future botanical investigations.

105 [AVIATION IN THE PLANNING AND ORGANIZATION OF FORESTS] *Aviatsiia pri rabotakh po planirovaniu i organizatsii lesnogo khozifaistva. Leningrad, Goslestekkhizdat, 1936, 224 p. SD1.F66*

The publication, issued by the Forest Aviation Division of the Central Forestry Research Institute, describes methods used during 1933-35 to survey 55,000,000 ha. of forest land in the northern regions of European Russia, Siberia, Kasakstan, and the Urals. Three methods were used: aerial survey supplemented by ground checks, ground survey supplemented by aerial reconnaissance, and an intermediate method making approximately equal use of aerial and ground surveys. The first method, used during early stages of forest management, consists of ground surveys made along lines at least 4 km. apart which were established in a preliminary aerial reconnaissance. Strips containing these lines were then photographed at a scale of 1:15,000, and a preliminary scheme of forest types set up from the vertical and oblique photographs thus obtained. A final tracing of survey lines was then made to include a sufficient number of plots in each category. The line surveys determine the foresttype, composition (only species representing at least 20 percent of a mixture being taken into account), age, quality class, density, volume, etc. of the stands. The volume of readily exploitable crops was divided into groups according to commercial possibilities. The data was then systematized with similar stands grouped into final categories, each of which was represented by a separate file containing its description and a key of sample photographs. These files were the basis for the final stereoscopic interpretation and description of the area surveyed. The

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second method, emphasizing ground surveys is used in areas where relatively intensive exploitation is expected. Ground surveys were conducted along lines usually not more than 1 km. apart. Vertical aerial photographs were prepared at a scale of 1:10,000, or 1:5,000 in the case of mixed stands which are to be subjected to irregular fellings. These were used for laying out survey lines, locating and extending crop contours plotted during the ground survey, and as an aid to the study of the topography. Data on the nature and content of the stands were obtained exclusively from the ground studies. This method may also be used for areas previously surveyed, with the photographs used to locate areas in which essential changes have occurred since the last survey, and to estimate the work required in such areas. In the intermediate method use was made of vertical photographs at a scale of 1:15,000, and ground surveys conducted along lines 2 km. apart. Data on the forest stands situated between the survey lines were obtained from the photographs, a key of sample photographs being used wherever required. (Forestry Abstr.)

## 106 Baranov, N. I.

[IS AN OBJECTIVE INTERPRETATION BASED ON CALCULATION AND MEASUREMENT POSSIBLE?] Vozmozhno li ob"ektivnoe deshifirovanie, osyovnyvayushcheesya na schete i izmarenii? Les. Khoz. (Moskva), Feb. 1940: 40-46, incl. diag., tables. SD1.L395

The factors affecting the quality of aerial photographs such as the resolving power of the lens, film, paper, and that of the eye are reviewed. Type and scale of photography, exposure time, velocity, altitude, banking, and skewing of the airplane during the photographing process, vibration of the photographic equipment, and laboratory processing of the film are discussed. The interpretation techniques employed by the Russians are considered less developed and relatively ineffective when compared with West European techniques.

## 107 Boraya, IS. M.

[DEVELOPMENTS IN LABORATORY PHOTO INTERPRETATION] Puti razvitiia kameral'nogo deshifirovaniia. Glavn. Upravl. Geod. i Kartogr. SNK-SSSR, Sbornik Nauch.-Tekh. i Proizvod. Statei po Geod., Kartogr. Topogr., Aéros"emke i Gravimetr., v. 4, 1944: 54-61; map. QB301.R8

Laboratory methods and techniques of photo interpretation developed since 1936 are briefly reviewed.

## Methods and techniques

- 108 Bishop, J. M.  
AERIAL SURVEYS SECTION. Sylva (Toronto), v. 8 (4), July-Aug.  
1952: 25-29, incl. photos. DA-99.8Sy5
- The aerial photographic techniques and methods employed by the Aerial Surveys Section, Department of Lands and Forests of Ontario are described.
- 109 Brenot, L. E.  
INTERPRETATION OF VERTICAL AERIAL PHOTOGRAPHS. Canad. Surveyor,  
v. 5 (9), July 1936: 2-7, incl. photos. TA501.G3
- A review of airphoto interpretation as practiced in Canada is presented. Significant topographical features which aid in the interpretation of drainage patterns, clearings, swamps, buildings, highways, forest types, and rock formations are indicated.
- 110 Church, E.  
DETERMINATION OF THE SCALE DATA FOR TWO AERIAL PHOTOGRAPHS FROM ONE CONTROL LINE AND THREE ADDITIONAL ELEVATIONS. Bull. Aerial Photogramm., Syracuse Univ., No. 13, 1942, 25 p.  
SD1.F66
- An analytical method is described for determining scale data for 2 overlapping aerial photographs. The control data consists of the length of one line, the elevations of the terminal points of this line, and the elevations of 3 additional points, all 5 points appearing in the area of the overlap of the 2 photographs. (Forestry Abstr.)
- 111 Colwell, R. N.  
DETERMINING RELATIVE ILLUMINATION FOR OVERLAPPING PHOTOS FOR MAXIMUM STEREOSCOPIC EFFECT. Jour. Forestry, v. 48, May 1950: 369, incl. diagr. SD1.S63
- Methods of illumination-intensity determination to compensate for inadequate vision are discussed.
- 112 Hagberg, N.  
[AERIAL PHOTOGRAPHS AND THEIR INTERPRETATION] Flygbilder och flygbildläsning. Svenska Skogsvardsför. Tidskr., v. 31 (3), 1933: 335-373, incl. photos; plates. DA-99.8 Sk5

## Photo interpretation

Results of a study of aerial photographs of southern and western Sweden are reported. A color scale developed for use in identifying objects is presented. Methods based mainly on tone, on shadow variations and contrasts, and on differences of light absorption, are described. Numerous aerial and ground photographs illustrate the appearance of various forest species in mature, immature, and reproduction stands. Methods of identifying other terrain features, such as boundary and survey lines, are also discussed and illustrated. [34 refs.]

- 113 Hasel, A. A.  
ESTIMATION OF VEGETATION-TYPE AREAS BY LINEAR MEASUREMENT.  
Jour. Forestry, v. 39, Jan. 1941: 34-40, incl. maps, tables.  
SD1.863

The estimation of vegetation-type areas by linear measurement of parallel survey lines through each type, and the conversion of these measurements to an area basis by using a factor which varies with the spacing of the lines, has certain advantages over mapping as a method for determining type areas. It limits the error due to personal causes, makes possible the recording of as much detail as desired, and is relatively easy to apply and less costly than mapping. Its use is discussed in connection with detailed studies of plots. (Forestry Abstr.)

- 114 Johnson, E. W.  
"SHADOW-HEIGHT" COMPUTATIONS MADE EASIER. Jour. Forestry,  
v. 52 (6), June 1954: 438-441, incl. diags., tables.  
SD1.863

A method of determining tree heights from the tree shadows on aerial photographs is described. Computation sheets are developed to facilitate the computations of the photo interpreter. [7 refs.]

- 115 Kint, A.  
[THE INTERPRETATION OF AERIAL PHOTOGRAPHS] Het lezen van lucht-  
foto's. Tectona (Bogor), v. 29 (11-12), Nov.-Dec. 1936: 934-  
960, incl. photos, diags., tables. DA-99.8B65

The techniques of photo interpretation are described. Films, filters, cameras, light, shadow, the stereoscope, and scale are discussed in their relation to interpretation results.

## Methods and techniques

116 Nash, A. J.

SOME TESTS OF THE DETERMINATION OF TREE HEIGHTS FROM AIR PHOTOGRAPHS. Forestry Chronicle, v. 25 (4), 1949: 243-249.

DA-99.8 F7623

Results of an investigation of the degree of accuracy obtainable in the determination of tree heights from air photographs are presented. The quality of the photographs used in the study was very high, a snow background giving good contrasts to both tree images and shadows. The methods of measurements are given in detail, and a comparison was made between photogrammetric results and field-check measurements. Measurements of height from tree images on obliques gave better results than those from shadows on vertical photographs, but both gave reasonably accurate results for the purpose of preparing stand-volume estimates. The same is true of measurements of crown widths. The chief sources of error are enumerated. [7 refs.] (Forestry Abstr.)

117 Rogers, E. J.

ESTIMATING TREE HEIGHTS FROM SHADOWS ON VERTICAL AERIAL PHOTOGRAPHS. Sta. Paper. Northeastern Forest Exper. Sta. (Philadelphia), No. 12, 1947, 16 p. DLC-Govt. Periodical Room

Practical hints on the use of the shadow technique, based on the station's experience in applying such technique to forest surveying in the Northeast, are described. Present information shows that an experienced person can usually estimate tree heights to within 7 ft. at photo scales of 1:20,000. [3 refs.] (Forestry Abstr. in part)

118 Rogers, E. J.

A SHORT CUT FOR SCALING AERIAL PHOTOS. Sta. Paper. Northeastern Forest Exper. Sta. (Philadelphia), No. 20, 1948, 10 p. DLC-Govt. Periodical Room

The method described involves selecting 10 photos at random from a big project, and computing average scale at sea level for the entire project. From this average scale, adjustments can be made for different elevations. (Forestry Abstr.)

119 Rogers, E. J.

ESTIMATING TREE HEIGHTS FROM SHADOWS ON VERTICAL AERIAL PHOTOGRAPHS. Jour. Forestry, v. 47, March 1949: 182-191, incl. diagrs., tables. SD1.S63

## Photo interpretation

A short-cut method of estimating the height of trees by measuring the shadows on aerial photographs is presented.

- 120 Rogers, E. J.  
A SHORT CUT FOR SCALING AERIAL PHOTOS. Jour. Forestry, v. 47,  
Oct. 1949: 819-822, incl. diagrs., tables. SD1.S63

The elevation of land is considered to be the most important factor affecting the photo scale. A method for determining the scale of any point on any individual photo of a photo project is described.

- 121 Sammi, J. C.  
LIMITATIONS ON TREE HEIGHT MEASUREMENTS BY PARALLAX. Photo-  
gramm. Eng., v. 19, Sept. 1953: 617-619, incl. diagr.  
TA593.A2P5

The study attempts to find the limitations of consistency of tree height values obtained from differential parallax measurements.

- 122 Seely, H. E.  
PLOTTING THE FOREST MAP FROM VERTICAL AIR PHOTOGRAPHS. Forestry  
Chronicle, v. 17 (1), 1941: 79-80. DA99.8 F7623

A note on a simplified procedure for constructing a map from aerial photographs, by which only about 33% of the photographs were plotted by the radial intersection method, is presented. A sample map illustrates the procedure. (Forestry Abstr.)

- 123 Seeley, H. E.  
TREE HEIGHTS FROM SHADOWS. Photogramm. Eng., v. 8, Apr.-June  
1942: 100-109, incl. illus., table, diagrs. TA593.A2P5

The technique of employing the shadow method involves the use of accurately-measurable index trees which may be compared, under the stereoscope, with the adjoining stands. The method is applied to vertical air photographs only. The prerequisites are level ground and sharply defined shadows, such as may be secured in winter when slender-tipped evergreens are found scattered among deciduous trees. The height is calculated as a function of the shadow's length and the sun's altitude.

## Methods and techniques

- 124 Seely, H. E.  
THE FORESTRY TRI-CAMERA METHOD OF AIR PHOTOGRAPHY. Forest Air  
Survey Leaflet (Ottawa), No. 3, 1948, 11 p; diagrs.  
DA-99.9C16Fa

A description of the tri-camera method of aerial photography for forestry purposes and its advantages are presented. The method was first applied in Canada in the winter of 1946-1947 in photographing Riding Mountain National Park. Specifications for tri-camera photographs are included.

- 125 Talley, B. B.  
COMPILATION OF DETAIL FROM AERIAL PHOTOGRAPHS. In his Engi-  
neering applications of aerial and terrestrial photogrammetry.  
New York, Pitman Publishing Co., 1938, chap. 14, p. 382-405,  
incl. maps, photo, diagrs. TA593.T3

Methods of compiling topographic features, man-made objects, and of determining elevations on aerial photographs are briefly outlined.

- 126 Teneta, G. I., and A. S. Muradova.  
[FOR A HIGH QUALITY INTERPRETATION OF AERIAL PHOTOGRAPHS] Za  
vysokokachestvennoe dashifirovanie aerofotosnimkov. Geodezist,  
v. 15, Feb. 1940: 51-55. GB296.R813

Improper photographic interpretation techniques leading to erroneous plotting of data on topographic maps are reviewed. Correct identification of transportation routes, marshes, rivers, vegetation, and relief elements is emphasized.

See also items 44, 166-168, 171, 174, 197, 217, 219, 239, 256, 269,  
299, 305, 312, 340, 355, 378, 383, 405, 413, 445, 510.

## 2. Instruments and aids to photo interpretation

- 127 Aitken, J. D., and N. Hall.  
A NOTE ON THE INTERPRETATION OF FOREST INFORMATION FROM AIR  
PHOTOGRAPHS. Austral. Forestry, v. 6 (1), 1951: 9-16, incl.  
diagrs. DA-99.8Au74



## Photo interpretation

Stereograms and density scales, adapted from American practice for use in Australia, are described and illustrated. Stereograms were used to determine height classes; density scales were used to determine forest density. Forest cover classes are classified as open, scattered, moderate, and dense. [2 refs.]

- 128 Carow, J.  
THE UNIVERSITY OF MICHIGAN PHOTO-INTERPRETERS SCALE. Michigan Forestry, No. 6, Apr. 1954, 2 p. DA-99.8M58

The device is an assembly of a number of simple measuring devices on a single piece of film.

- 129 Colwell, R. N.  
NEW TECHNIQUE FOR INTERPRETING AERIAL COLOR PHOTOGRAPHY. Jour. Forestry, v. 48, Mar. 1950: 204-205. SDL.S63

The advantages of color transparencies, when viewed through appropriate filters, over black-and-white photos are discussed. Long wave lengths of visible light which are almost completely absorbed by water, are largely reflected by foliage. The use of filters which transmit only these long wave lengths while examining color photography, may increase tonal contrast between water and vegetation, and thereby facilitate the recognition of swampy areas or the determination of the exact course of streams overhung by trees.

- 130 Daehn, R. E.  
A STANDARDIZED TONE SCALE AS AN AID IN PHOTO INTERPRETATION. Photogramm. Eng., v. 15, June 1949: 287. TA593.A2P5

A standardized tone scale showing ten degrees of tone quality is suggested for adoption as an aid to photo interpretation.

- 131 [HANDBOOK OF PHOTOGRAPHIC MEASUREMENTS] A fényképmérés kezikönyve. Honvéd Térképészeti Intézet, Budapest, 1940, 216 p., incl. photos, diagrs., tables; photos, maps. TA593.H9

The handbook includes data on instrumentation, aerial photographic processes, and photographic interpretation as applied to military and nonmilitary fields. Numerous aerial photographs of the Hungarian countryside are included. [12 refs.]

## Instruments and aids

- 132 Hartman, F. J.  
A SIMPLIFIED METHOD FOR LOCATING SAMPLE PLOTS ON AERIAL PHOTOGRAPHS. Sta. Notes. Northeastern Forest Exper. Sta., Philadelphia, No. 3, 1947, 3 p. DLC-Govt. Periodical Room
- Transparent celluloid templates are used to avoid the concentration of sample plots on the higher elevations. This tendency is apt to occur where differences in relief are great, since mountain and ridge tops appear on the photographs on a larger scale than valleys and lowlands. (Forestry Abstr. in part)
- 133 Hutchinson, O. K.  
AERIAL PHOTO ALIGNMENT GUIDE. Sta. Notes. Central States Forest Exper. Sta., Columbus, Ohio. No. 50, Dec. 1948, 2 p., incl. diagr. DA-1.9F76252S
- The construction of an aerial photograph alignment-guide is described. The guide was developed to assist the photo interpreter in properly orientating the photographs of stereo pairs for measurements with the parallax wedge. The guide also aids in orienting photographs for stereoscopic vision. Recommended procedures for the use of the alignment guide are given.
- 134 Jensen, C. E.  
DOT-TYPE SCALE FOR MEASURING TREE-CROWN DIAMETERS ON AERIAL PHOTOGRAPHS. Sta. Notes. Central States Exper. Sta., Columbus, Ohio. No. 48, 1948, 1 p., incl. diagrs., table. DLC-Govt. Periodical Room
- A scale in which dots of various sizes are used for measuring tree crowns on aerial photographs is described. (Forestry Abstr.)
- 135 Katz, A. H.  
THE PHOTO-INTERPRETATION PROBLEM or "FIFTEEN BLIND MEN EXAMINE THREE DIFFERENT ELEPHANTS." Photogramm. Eng., v. 18, June 1952: 497-500. TA593.A2P5
- A discussion is given concerning the use of potential aids to photo interpretation. Interpretation can be improved and facilitated through the use of optical, mechanical, and computational aids, and such reference material as keys and manuals.

## Photo interpretation

- 136 Miller, C. I.  
THREE-DIMENSIONAL PHOTOGRAPHY FOR THE FORESTER. Jour. Forestry,  
v. 41, June 1943: 406-410. SD1.S63

Usage of three-dimensional photography in the field of forestry is reviewed. Some practical suggestions that should enable any forester to make successful stereograms with little or no special equipment are described.

- 137 Moessner, K. E.  
A CROWN DENSITY SCALE FOR PHOTO INTERPRETERS. Jour. Forestry,  
v. 45, June 1947: 434-436, incl. illus. SD1.S63

A method using a crown density or per cent of crown closure scale for accurate estimates of crown density is described and illustrated.

- 138 Moessner, K. E.  
THE AERIAL PHOTO-SCALE. Jour. Forestry, v. 46, Nov. 1948: 843-844,  
incl. diagr. SD1.S63

A scale designed to measure the distance between photo images and to convert this to a usable approximation of the true representative fraction is described and explained.

- 139 Moessner, K. E.  
STEREOGRAMS ILLUSTRATING FOREST SITES. Misc. Release, Central  
States Forest Exper. Sta., Columbus, Ohio. No. 4, Mar. 1949,  
21 p., incl. photos, map, diagrs. DA-1.962203M68

A set of 7 stereograms is presented to facilitate instruction and training in the interpretation of aerial photographs for forestry purposes. The stereograms were prepared from 1:20,000-scale AAA photographs of representative forest types in the Central States region. The accompanying descriptions indicate location, forest types, soil conditions, tree heights, data of photography, and approximate scale. [3 refs.]

- 140 Moessner, K. E.  
A CROWN DENSITY SCALE FOR PHOTO INTERPRETERS. Jour. Forestry,  
v. 47, July 1949: 569, incl. diagr. SD1.S63

A crown density scale designed as an aid in the estimates of crown coverage is described.

## Instruments and aids

- 141 Moessner, K. E.  
A PERCENT SLOPE SCALE FOR PHOTO INTERPRETERS. Sta. Notes.  
Central States Forest Exper. Sta., Columbus, Ohio. No. 53, 1949,  
2 p. DLC-Govt. Periodical Room
- A scale which permits the measurement of slope percentage on aerial photographs, regardless of the line of flight is illustrated and explained. (The parallax wedge can only be used where the slope is at right angles to the line of flight). (Forestry Abstr.)
- 142 Moessner, K. E.  
A STEREOGRAM FOR TRAINING IN THE USE OF PARALLAX WEDGE. Sta. Notes. Central States Forest Exper. Sta., Columbus, Ohio. No. 60, Mar. 1950, 2 p., incl. photos. DA-1.9F76252S
- A description is presented of a simple training aid designed to facilitate the determination of the graduated, sloping line of the parallax wedge under the stereoscope. The device is prepared by mounting a 2.3-inch parallax wedge (printed on film) over a pair of 1:6,400-scale photos, correctly oriented for stereo viewing. The assembly is then copied. [2 refs.]
- 143 Moessner, K., F. D. Brunson, and C. E. Jensen.  
THE ACCURACY OF STAND-HEIGHT MEASUREMENTS ON AIR PHOTOS. Sta. Notes. Central States Forest Exper. Sta., Columbus, Ohio. No. 59, 1950, 2 p., incl. tables. DA1.9F76252S
- In a study covering nearly 100 tree stands, parallax wedge measurements made independently by 3 photo interpreters, were compared with Abney level field measurements of tree heights. Reasonably accurate stand-height measurements were obtained from recent, good-quality air photos, even though the scale was as small as 1:20,000. Recent (1949) 9- x 9-inch photos were found superior to all others tested.
- 144 Nash, A. J.  
SOME VOLUME TABLES FOR USE IN AIR SURVEY. Forestry Chronicle, v. 24 (1), Jan. 1948: 4-14, incl. photo, diagrs., tables. DA-99.8F7623
- A formula, based on the relationship between crown diameter and tree height, is used in developing volume tables. Volume tables for white pine and white spruce in 2-ft. diameter classes and 10-ft. heights are included. The tables were successfully

## Photo interpretation

applied by the Forest Air Survey of the Dominion Forest Service in making quantitative estimates of scattered large softwood trees from aerial photographs.

145 Nash, A. J.

THE NASH SCALE FOR MEASURING TREE CROWN WIDTHS. Forestry Chronicle, v. 24 (2), June 1948: 117-120, incl. photos.  
DA-99.8F7623

An instrument for measuring crown width in the field is described and illustrated. The device was developed to facilitate the checking of measurements made on aerial photographs. A main body, graduated arm, and slider, are moved in unison to obtain direct readings of crown diameter when the observer is 100 ft. from the base of the tree.

146 Robinson, J. M.

THE DOT-READING OVERLAY FOR THE MEASUREMENT OF MAP AREAS. Forest Inventories Publ. (Ottawa), No. 8, 1952, 2 p.  
DA-99.9C16Fa

A device consisting of a transparent material marked with regularly spaced dots, each of which represents a known area, is described. The overlay was prepared by the Canadian Forestry Branch to give measurements in sq. in. at various map scales.

147 Sanders, R. G.

ORIENT YOUR STEREOSCOPE CORRECTLY. In Amer. Soc. Photogramm. Manual of Photogrammetry. New York, Pitman Publishing Co., 1945, p. 321-326, incl. photos.  
TA593.A63

Basic steps to avoid the pseudoscopic effect are outlined.

148 Schwidofsky, K.

THE DEVELOPMENT OF PHOTOGRAMMETRIC INSTRUMENTS IN GERMANY SINCE 1938. Photogrammetria, v. 2 (3), 1950-1951: 137-145, (5), 1950-1951: 149-159, incl. illus., tables, diagrs., graphs.  
TA593.A2P48

The report presents a general summary of the status of photogrammetric instrument construction prevailing in 1945. The review is limited to the instrument field and covers the survey cameras and their accessories, single-picture and stereo mapping instruments.

## Instruments and aids

- 149 Seely, H.  
PHOTOGRAMMETRIC EQUIPMENT. SPECIAL APPARATUS EMPLOYED IN THE INTERPRETATION OF AERIAL PHOTOGRAPHS. Pulp & Paper Mag. Canada, v. 41 (11), Oct. 1940: 731-732. TS1080.P85
- A suggested list of instruments intended for the forest engineering staffs of timber-owning companies is presented. The instruments discussed include the stereoscope, planimeter, stereometer, transfer devices, and base mapping aids.
- 150 Seely, H. E.  
THE POLE SCALE. Forest Air Survey Leaflets (Ottawa), No. 1, 1948, 3 p. DA-99.9C16Fa
- A scale is described in which small lines of various lengths are used to measure tree images on air photographs.
- 151 Seely, H. E.  
THE SHADOW HEIGHT CALCULATOR. Forest Air Survey Leaflet (Ottawa), No. 2, 1948, 7 p. DA-99.9C16Fa
- The description and a diagram of a device for determining tree heights from shadows on air photographs are presented. Instructions for its use are included. (Forestry Abstr.)
- 152 Spear, G. A.  
THE SEELYSCOPE. Forest Air Survey Leaflet (Ottawa), No. 4, Mar. 1949, 7 p., incl. photos. DA-99.9C16Fa
- A device for transferring detail from air photographs to maps is described. The instrument consists of 2 long bars supported horizontally, 2 large first-surface mirrors set at 45°, and a center assembly. The Seelyscope also is used as a mirror stereoscope for studying general topography and determining drainage.
- 153 Spurr, S. H.  
PHOTO-INTERPRETATION AIDS. Michigan Forestry, No. 3, Oct. 1953, 3 p. DA-99.8M58
- The following photo interpretation aids are described: lens and reflecting stereoscopes, parallax devices, and area measurement devices.

## Photo interpretation

- 154 Steigerwaldt, E. F.  
STEREOTYPES FOR AERIAL PHOTO INTERPRETERS. Jour. Forestry,  
v. 48, Oct. 1950: 693-696, incl. illus., table, diagrs.  
SD1.863

A description of stereotype cards designed to correlate the aerial view with the ground view and plot data is presented.

- 155 Welander, E.  
[A NEW STEREO SCOPIC INSTRUMENT FOR AERIAL PHOTOGRAPHS] Ett nytt  
stereoinstrument för flygbilder. Skogen, v. 40 (9), Sept. 15,  
1953: 101, incl. photos. DA99.8Sk51

An adaptation of the stereoscope developed by the Swedish firm Mo and Domsjö AB is briefly described. The stereoscope can be tilted, and through the use of individual lighting of photographs it provides added convenience to the photo interpreter. The use of a parallax wedge and an engraved line on a plexiglass sheet with a millimeter scale make the calculation of tree heights possible.

- 156 Wilcox, F. R.  
GAMMELAU SCALE RATIO METER FOR USE WITH VERTICAL PHOTOGRAPHS IN  
DETERMINING SCALE AND RATIO. Jour. Forestry, v. 34, Dec. 1936:  
1049-1053, incl. illus., map, diagr. SD1.863

The measuring device designed essentially to facilitate the use of individual contact prints in the field is described.

- 157 Wilson, R. C.  
PHOTO INTERPRETATION AIDS FOR TIMBER SURVEYS. Jour. Forestry,  
v. 46, Jan. 1948: 41-44, incl. diagrs. SD1.863

Five simple, transparent, pocket-sized scales are described. They may be used in the field to make rapid measurements of photographic detail, and to estimate size or density of timber stands.

See also items 4, 15, 21, 26, 284, 374.

3. Keys to identification and interpretation of photographs

- 158 Colwell, R. N.  
THE ESTIMATION OF GROUND CONDITIONS FROM AERIAL PHOTOGRAPHIC  
INTERPRETATION OF VEGETATION TYPES. Photogramm. Eng., v. 12,  
June 1946: 151-161, incl. illus., table. TA593.A2P5

A key for the identification of vegetation types in the tropical Pacific area is presented. Knowledge of the ecological site characteristics of each species of the vegetation, identifiable on aerial photographs, is useful in the estimation of ground conditions by the photo interpreter.

- 159 Colwell, R. N.  
PROCEDURE FOR THE CONSTRUCTION OF PHOTO INTERPRETATION KEYS. In  
Comm. on Geophys. and Geogr., Res. and Development Board,  
Washington, D. C., SELECTED PAPERS ON PHOTO GEOLOGY AND PHOTO  
INTERPRETATION. April 1953, p. 135-154, incl. map, diagr.  
(Rept. no. GG 209/1; Unclassified) [TID-L475]

A guide is presented for the Interservice Committee to all persons engaged in the preparation of photo interpretation keys for the U. S. Armed Services.

- 160 Galkina, E. A.  
[UTILIZATION OF AERIAL PHOTOGRAPHS IN DETERMINING THE CHARACTERISTICS OF MARSHLAND] Ispol'zovanie materialov aerofotos"emki dlia vyiasneniia svoistv bolotnykh massivov. In Akad. Nauk SSSR. Materialy po deskifirovaniu aerosnimkov. Ed. by A. E. Fersman. [Sbornik. Sverdlovsk?], Izdatel'stvo Akad. Nauk SSSR. 1942, p. 17-27, incl. illus., tables, graphs, diagrs. TA593.F4

Wartime need for data regarding the characteristics of marshlands in enemy territory was partially solved by the use of aerial photography. A key is presented by means of which wooded peat bogs, grass-covered peat bogs, and moss-covered peat bogs can be identified from the air. Characteristic features of each as seen on aerial photographs are interpreted and compared with actual ground findings. Schemes of most typical bogs as seen on aerial photographs are listed and appended with a key.

- 161 Moessner, K. E.  
FOREST STAND-SIZE-CLASS KEYS FOR PHOTO INTERPRETERS. Jour.  
Forestry, v. 46, Feb. 1948: 107-109, incl. illus. SD1.863



## Photo interpretation

Use of forest classification keys, consisting of stereo-pairs from aerial photographs accompanied by brief explanations, is suggested for the training of foresters in photo interpretation. Such keys, made up of 25-30 stereo-pairs to illustrate various stand-size-class conditions, were found effective in a recent survey completed by the Forest Service in Missouri. (Biol. Abstr. in part)

- 162 O'Neill, H. T.  
KEYS FOR INTERPRETING VEGETATION FROM AIR PHOTOGRAPHS. Photogram. Eng., v. 19, June 1953: 422-424. TA593.A2P5

Various aspects of contrast, tone, texture, and pattern as applied to keys for the interpretation of vegetation from air photographs are briefly reviewed.

- 163 Powers, W. E.  
A KEY FOR THE PHOTO-IDENTIFICATION OF GLACIAL LANDFORMS. Photogram. Eng., v. 17, Dec. 1951: 776-779. TA593.A2P5

A photo interpretation key for the identification of landforms in a glaciated region is presented. Analysis of landforms in 5 selected areas has shown the presence of 11 types of direct glacial origin, as well as 4 types, non-glacial in origin, associated with or adjacent to the glacial types. The glacial landforms include kames, eskers, valley train and kame terraces, glaciated bedrock-controlled plains, drumlins, till knobs, outwash and undulating till plains, moraines, and filled basins. The non-glacial landforms include lacustrine and stream valley plains, stream-dissected plains or hill lands, and dunes. The key, in the form of a series of questions, separates the two general types according to location, stream and landform patterns, and soil characteristics. Further questions differentiate the particular landforms. Typical examples of the various landforms are shown in aerial-vertical and in ground stereopairs to assist in verification of the identification.

- 164 Roscoe, J. H.  
ANTARCTICA. [Washington] Dept. of the Air Force, 1953, 171 p., incl. photos, maps; maps. (U. S. Dept. of the Air Force. Regional photo interpretation series: AFM 200-30, Air Force manual intelligence) TA593.R57

This manual provides Air Force intelligence and operations units with one of a series of keys for the rapid and accurate

Keys

reading and interpretation of aerial photographs. This particular key is intended for use as a subject key for areas covered by continental glaciers, as a regional key for Antarctica, or as an analogous key for Greenland. [87 refs.] (AF summary)

See also items 9, 14, 92, 187, 264, 480, 504.

### III. APPLICATIONS OF PHOTO INTERPRETATION IN VARIOUS FIELDS

#### 1. General

(Includes references to works of a general nature, complex areal studies, archeology, and anthropology)

- 165 Chombart de Lauve, P. H.  
[AERIAL DISCOVERY OF THE WORLD] La découverte aérienne du monde.  
Paris, Horizons de France, 1948, 413 p., incl. diags.; plates  
(photos) GI42.C5

The role of aviation and aerial photography in the fields of geographic exploration, ethnography, archeology, topography, geology, and climatology, forms the topic of a series of articles. Problems of aerial photo interpretation of vegetational and geomorphological features are discussed and illustrated with representative aerial photographs. [Approx. 100 refs.]

- 166 Chombart de Lauve, P. H.  
[AERIAL PHOTOGRAPHY. METHOD, TECHNIQUE, INTERPRETATION. THE STUDY OF MAN ON EARTH] Photographies aériennes. Méthode, Procédés, Interprétation. L'étude de l'homme sur la terre.  
Paris, Colin, 1951, 140 p., incl. photos, maps, diags.  
TA593.C57

A study is presented, concerning the application of aerial photography to the study of man on the earth, in which principles, methods, and specific techniques are developed to facilitate research in such fields as human geograph, ethnology, anthropology, and archeology. Detailed examples are given, illustrated with aerial photograph, of such work done in various parts of France and French Africa. A plan is suggested for the establishment of an aerial photograph library with a classification system for the photographs which would facilitate their retrieval for a variety of purposes. A bibliography, as well as 118 aerial photographs and maps are included.

- 167 Clason, M.  
[AERIAL PHOTOGRAPHS AND SOME EASY WAYS TO USE THEM] Litt om luftfotografier og noen enkle måter å bruke dem på. Skogbrukeren, v. 29 (5), Mar. 1, 1954: 57-59, incl. photo, diags.  
DA-99.83154

## Photo interpretation

The methods and techniques employed by the Widerøe Flyveselskap and by Polarfly A/S in aerial photographic operations in Norway are briefly reviewed. Recommended practices for the use of aerial photographs are presented.

- 168 Crawford, O. G. S.  
 [AERIAL PHOTOGRAPHS OF ARCHEOLOGICAL GROUND FEATURES IN ENGLAND]  
 Luftbildaufnahmen von archäologischen Bodendenkmälern in  
 England. Luftbild u. Luftbildmessung, no. 16, 1938: 9-18, incl.  
 illus. and diagrs.; photos (p. 27-63). TA593.A2L8

Detection methods used to reveal subterranean features by means of analysis of aerial photography are discussed. The analysis is considered of great value to the photo-interpreter and to the archeologist.

- 169 Elias, M. M.  
 THE USE OF AIR PHOTOS FOR TERRAIN INTERPRETATIONS AT LONG RANGE.  
 Photogramm. Eng., v. 19 (3), June 1953: 474-477, incl. photo,  
 maps. TA593.A2P5

The use of aerial photographs to determine terrain and engineering conditions of remote areas when field investigations are impracticable is briefly discussed.

- 170 Engel, F.  
 [HISTORY OF SETTLEMENT AND CULTIVATION] Siedlungs- und  
 Flurgeschichte. Luftbild u. Luftbildmessung, no. 22, 1941:  
 27-60, chiefly photos, incl. map. TA593.A2L8

The use of aerial photography to reveal basic patterns of village planning in historical perspective is discussed. The photographs (1:5000 to 1:13,000) which illustrate the study show the regions around the following villages, all situated in Mecklenburg: Jeese, Alt Gaarz, Defahl, Neuenhagen, Döbbersen, Rubow, Camin, Jülchendorf, Schönfeld, Gutow, Borkenhagen, Vielank, Satow-Niederhagen, Dalberg, Tramm, Goizenburg, Grevesmühlen, Wendorf, Golchen, Hülseburg, Dammereez, Dehmen, Klein Schwansee. These villages are represented on the adjoining map.

- 171 Ewald, E.  
 [EMPLOYMENT OF AERIAL PHOTOGRAPHY IN PREHISTORIC RESEARCH IN GERMANY] Einsatz des Luftbildes für die Vorgeschichtliche Forschung in Deutschland. Luftbild u. Luftbildmessung, no. 16, 1938: 19-22; photos (p. 67-84). TA593.A2L8

## Applications

Factors influencing the detection of subterranean features, such as discoloration of soil, light conditions, vegetation, etc. are discussed and illustrated with aerial photographs. Although the object of the study is to aid the archeologist in the discovery of ancient monuments, the general principle involved is considered applicable to photo-interpretative methodology.

- 172 Ewald, E.  
 [RESULTS OF THE SYMPOSIUM ON AERIAL PHOTOGRAPHY AND PREHISTORICAL RESEARCH ON MARCH 21 AND 22, 1938] Ergebnis der Veranstaltung Über Luftbild und vorgeschichtliche Forschung am 21. und 22. März 1938. Luftbild u. Luftbildmessung, no. 16, 1938: 23-24; photos (p. 27-84). TA593.A2L8

Uses of aerial photography as an aid to archeological research in England (Crawford, O. G. S., 1938) and in Germany (Ewald, E., 1938) are discussed.

- 173 Fagerholm, E.  
 [THE AERIAL PHOTOGRAPH AND SCIENTIFIC RESEARCH. SOME EXAMPLES OF APPLIED AERIAL PHOTOGRAPHY] Flygbild och naturforskning. Några exempel på tillämpad flygfotografering. Ymer, v. 64, 1944: 21-38, incl. photos, maps. GN1.Y6

The advantages and use of aerial photographs for scientific purposes are discussed and some applications are described. Data from the German expedition to New Schwabenland in the Antarctic during the 1938-1939 period, in which 11,600 aerial photographs were taken, are presented. The work of Professor von Gruber of the Zeiss Company in Jena, aimed at solving problems encountered in map-making from these photographs, is described. The use of aerial photographs for documentary purposes, and in the study of forestry and geology, is briefly reviewed. A number of aerial photographs and several examples of maps produced from them are included.

- 174 Gaveman, A. V.  
 [AERIAL PHOTOGRAPHIC SURVEY IN THE COMPLEX INVESTIGATION OF THE TURKMEN SSR TERRITORY] Aérofotos'emka pri kompleksnom issledovanii territorii Turkmenii. In Konferentsiia po izucheniiu proizvoditel'nykh sil Turkmenskoi SSR. 1st, Leningrad, 1933, Problemy Turkmenii, v. 2, 1935, p. 226-243, incl. photos, table. HC487.T84K6

## Photo interpretation

The application of aerial photographic surveys to the investigation of natural resources, topography, and geology of the Turkmen SSR is discussed. The equipment used and the photographic data obtained in these surveys are briefly described. Methods of proper photo interpretation of vegetation and of topographic features are outlined. Eight aerial photographs are included in the study.

- 175 R.A.F. AERIAL SURVEY IN PEACE TIME. Nature (London), v. 156, July 7, 1945: 2-3. Q1.N2

The role of the R.A.F. in the peace time aerial survey of forestry, agriculture, and geography is briefly discussed.

- 176 RESOURCES ENGINEERING, AGRICULTURAL PLANNING. Ithaca, N. Y., D. J. Belcher Associates, 1949, 12 p.; plates. DA-325.2B412

The brochure describes uses for aerial photographic analysis.

- 177 Roussilhe, H.  
[PHOTOGRAMMETRY AND ITS GENERAL APPLICATION. Vol. 2] La photogrammetrie et ses applications générales. Tome II. Paris, Librairie de l'Enseignement Tech., 1936, 211 p., incl. photos, maps, diags. TA593.R63

The treatise includes a treatment of the following: ground and aerial stereo-photogrammetry, double projection, photographic reproduction, the industrial importance of photogrammetry, and its application in such fields of study as archeology, architecture, criminology, medicine, astronomy, geography, zoology, agriculture, urban planning, and engineering.

- 178 Troll, C.  
[THE AERIAL MOSAIC AND ECOLOGICAL GROUND STUDIES] Luftbildplan und ökologische Bodenforschung. Zeitschr. Gesell. Erdkunde (Berlin), v. 1939 (7-8), 1939: 241-298, incl. maps, diags.; plates. G13.G5

An introduction giving the history of photogrammetry is followed by a treatment of the applications of aerial photography to such fields as archeology; geology; geodesy; studies of vegetation, soils and forests; economic and settlement studies; regional land planning; limnology; and oceanography. The advantages and results of such applications, and their further use, in various earth sciences, geography, ecology, mapping, and

## Applications

other fields of research are discussed. Twenty-one aerial photographs, some with overlays, are appended to the study. [112 refs.]

- 179 Troll, C.  
[ADVANCES IN SCIENTIFIC AERIAL PHOTOGRAPHIC RESEARCH] Fortschritte der wissenschaftlichen Luftbildforschung. Zeitschr. Gesell. Erdkunde (Berlin), v. 1943 (7-10), 1943: 277-311; plates, incl. maps, diags., tables. G13.G5

A review of achievements in the field of aerial photography covers briefly the following subjects: (1) aerial photography applied to land-cultural studies; (2) aerial photographic studies in the Dutch colonial empire; (3) aerial photographic studies in polar regions; (4) ecological and agriculture-geographical studies through the use of aerial photographs; (5) Russian aerial photographic research; (6) the techniques of aerial photographic survey; (7) geomorphological studies by means of aerial photography; (8) geology in relation to aerial photography; (9) aerial photography and hydrology; (10) aerial photographic studies of vegetation; and (11) aerial photography in relation to archeology. [69 refs.]

- 180 Zonneveld, J. I. S., B. J. Beltman, A. Cohen, D. Heinsdijk, and J. J. v.d. Eijk.  
THE USE OF AERIAL PHOTOGRAPHS IN A TROPICAL COUNTRY (SURINAM) - A SYMPOSIUM. Photogramm. Eng., v. 18, Mar. 1952: 144-168, incl. photos, maps. TA593.A2P5

The symposium includes papers on topographic maps, geological reconnaissance, forest photo-interpretation in Surinam, and soil mapping from aerial photographs. [15 refs.]

See also items 5, 6, 8, 16, 35, 255, 257.

## 2. Ecology

(Includes references to types, extent, and distribution of vegetation, and interrelationships between vegetation and terrain)

- 181 Andreev, V. N.  
[AIRPLANE STUDIES OF TUNDRA PASTURES FOR REINDEER] Obsledovanie tundrovyykh olen'ikh pastbishch s pomoshch'yu samoleta. [English summary] Trudy Nauch.-Issled. Inst. Poliar. Zemledel. Zhivotnovodstva i Promyslovogo Khoz. (Leningrad), Ser. Olenevod., v. 1, 1938: 7-132, incl. illus., tables, maps, diags. SF401.R4L45

## Photo interpretation

A history of the expedition is presented, with a description of the tundra area covered by the flights, and of the aerial observation methods, objectives, and organization of the geobotanical survey. The aerial aspect of the vegetation of the region is characterized, and visually-recognized types of reindeer pasture are differentiated. The problems involved in geobotanical cartography, as well as experiments with aerial photography are outlined in the work. Ground and aerial photographs from the survey area, and a bibliography are included.

- 182 Benninghoff, W. S.  
 USE OF AERIAL PHOTOGRAPHS IN MAPPING VEGETATION AND SUPERFICIAL GEOLOGY IN SUBARCTIC REGIONS. Photogramm. Eng., v. 16, June 1950: 428-429.  
 TA593.A2P5

Aerial photographs are used for orientation and guides to poorly mapped areas, for planning ground sampling of areas, plotting sample localities, and interpretation of areas remote from sampled areas. Permafrost can be detected by polygonal patterns in soils and vegetation, by sinkholes, fallen or tilted trees, and microrelief forms. In permafrost areas the vegetative cover acts as an insulator determining the depth of the seasonally thawed layer above the permafrost. Seasonal thaw under mats of tundra seldom exceeds 18 in. The thaw under white spruce forest ranges from 2 - 6 ft. Under birch, aspen, and grass types of cover seasonal thaw usually attains greater depths. The destruction of insulating vegetation by fire or clearing permits seasonal thaw to penetrate to much greater depths.

- 183 Besaire, H.  
 [USE OF THE AIRPLANE FOR THE GEOLOGICAL SURVEYING OF MADAGASCAR]  
 L'Emploi de l'avion pour les levés géologiques à Madagascar.  
 Chronique Mines Coloniales (Bur. Etudes Géol. Minières Coloniales), v. 6 (62), 15 Mar. 1937: 264-265.  
 NN-3VHA

The correlation between vegetational features as they appear on an aerial photograph and the underlying geological structure is briefly discussed.

- 184 Bonch-Bruevich, M. D.  
 [AERIAL PHOTOGRAPHIC SURVEY] Aerofots"emka. Moskva, Transpechat' NKPS, 1931, 152 p., incl. photos, diagrs. TR810.B6



In ecology

A discussion is presented of the merits and applications of the aerial photographic survey method, with a description of the organization of such a survey. Details concerning such aspects as the geodetic processes, aerial surveying, photogrammetry, functions of the field and laboratory units, and photographic processes are included. Thirteen aerial photographs of the USSR countryside supplement the work.

- 185 Burks, G. F., and R. C. Wilson.  
A VEGETATION INVENTORY FROM AERIAL PHOTOGRAPHS. Photogramm. Eng., v. 5, Jan.-Mar. 1939: 30-42, incl. illus., diags.  
TA593.A2P5

The applicability of vertical aerial photographs to a vegetation survey was tested in a 15-mi. quadrangle located in Lake County, Calif. An accurate base map was compiled from aerial photographs taken at 10,000 ft. Stereoscopic observations of the photographs permitted an accurate outline of vegetation types, and a recognition of characteristics of individual classes of vegetation. Outlines of the boundaries of old growth or virgin timber, uneven-aged and even-aged young growth timber were prepared, and the relative densities of the even-aged stands were determined. The final determination of all type classifications and stand variations was made using ground checks.

- 186 Chapman, V. J.  
THE APPLICATION OF AERIAL PHOTOGRAPHY TO ECOLOGY AS EXEMPLIFIED BY THE NATURAL VEGETATION OF CEYLON. Indian Forester, v. 73 (7), 1947: 287-314; plates.  
SD1.I3

A study made in 1945 in Ceylon, in order to explore the possibilities of aerial survey for ecological work is described. A description is given of the different soil types and natural vegetation types of the island. Photographs were taken in May, using an f.8 lens and a green filter, at an elevation of 6000 ft. above the ground level, giving a relatively uniform scale of 1:9000. Further photographs (1:7,200) were taken with an f.6 lens, and with a green filter during August, a normal yellow filter during September. Results of the interpretation of these photographs, as checked by ground studies, are given in detail. The photographs, reproduced as illustrations, are mostly stereo-pairs. (Forestry Abstr. in part)

## Photo interpretation

- 187 Colwell, R. N.  
 AERIAL PHOTOGRAPHIC INTERPRETATION OF VEGETATION AS AN AID TO  
 THE ESTIMATION OF TERRAIN CONDITIONS. In Comm. on Geophys.  
 and Geogr. Res. and Development Board, Washington, D. C.,  
 SELECTED PAPERS ON PHOTO GEOLOGY AND PHOTO INTERPRETATION. April  
 1953, p. 109-133, incl. photos. (Rept. no. GG 209/1; Unclassi-  
 fied) [TID-L475]

Experiences in aerial photographic interpretation of tropical  
 vegetation and associated terrain conditions in the Pacific are  
 briefly reviewed. Numerous photographs and a key for the photo  
 identification of natural vegetation types found in tropical  
 Pacific areas are included in the text.

- 188 Fedorov, P. V.  
 [A STUDY OF THE USE OF AERIAL PHOTOSURVEY DATA IN GEOGRAPHICAL  
 INVESTIGATIONS] Opyt ispol'zovanifa materialov aerofotos'emki v  
 geograficheskikh issledovaniyakh. Izvest. Vsesoiuz. Geogr. -  
 Obshch., v. 72 (2), 1940: 261-267, incl. maps, table.  
 G23.R6

Aerial photographic studies of the Kama and Kosa River  
 valleys, accompanied by ground survey control, showed the  
 presence of relatively constant relationships between vegetation  
 and soils. Dense spruce and fir forests, with some admixture  
 of birch, were found growing on morainic loams. Aspen was found  
 on fluvioglacial sands, pine on old alluvial sands, pure spruce  
 on alluvial deposits, and sphagnum bogs covered with dwarf pine  
 on old peat-covered alluvial deposits.

- 189 Galkina, E. A.  
 [THE APPLICATION OF AERIAL PHOTOGRAPHY IN STUDYING MARSHLANDS]  
 Primeneniye aeros'emki pri izuchenii bolotnykh massivov. Trudy  
 Vsesoiuz. Geogr. S"ezda, 2nd, Leningrad, 1947, v. 2, p. 443-449,  
 incl. diags. G56.V8

Studies of aerial photographs taken over the Leningrad  
 Oblast' and the northern part of the European USSR between the  
 60° and 64° N. Lat. and 36° and 58° E. Long. revealed the  
 presence of large areas of moss-covered marshlands. Interpre-  
 tation of aerial photographs permitted the determination of the  
 geographical distribution pattern of various types of marsh  
 landscapes, and their probably origin.

In ecology

- 190 Gorodkov, B. N.  
 [GEOBOTANY AND AVIATION IN THE NORTH] *Geobotanika i aviatsiia*  
*na Severe. Sovet. Bot.*, v. 3 (2), 1935: 3-7. QK1.S85

Geobotanical studies of the Chukchi Peninsula, conducted from airplanes flying at altitudes of 100-150 m., permitted a rough evaluation of ground conditions in regard to emergency aircraft landings and take-offs. The following are the basic characteristics of the ground as seen from the air. A greenish-yellow, grain-like appearance of the surface indicates the presence of Eriophorum vaginatum: landings and take-offs impossible. Smooth and leveled plains having a greenish-yellow color (E. vaginatum widely distributed) and showing frost fissures characteristic of polygonal soils: landings and take-offs possible only during late summer when the bogs are relatively dry. Ground, having a yellow-green color in summer which changes to a brownish color in fall, with individual gray spots of exposed ground 1-2 m. in diameter and absence of frost fissures: landings and take-offs possible during dry seasons. Ground, having a gray-brown surface, with obvious presence of rocks, very narrow strips of tundra, and spots of exposed ground: good for landings and take-offs during all seasons. Ground, dark gray to black, with uneven surface frequently covered with large rocks: cannot be used for landings. Ground, dark gray, relatively flat surface covered with gravel, frequently found along sea shores: good for landings, poor for take-offs. Ground, dark brown with smooth and flat surface covered with Polytrichum and Hierochloa alpina: excellent for landings and take-offs. Reddish meadows, along sea shores and lagoons, covered with Carex subspathacea and DuPontia fisheri: good for landings.

- 191 Ives, R. L.  
 INFRA-RED PHOTOGRAPHY AS AN AID IN ECOLOGICAL SURVEYS. *Ecol.*,  
 v. 20, July 1939: 433-439, incl. illus. QH540.E3

Differences in the infra-red reflecting power of different plant types, as shown on infra-red photographs, may be used to expedite ecological field work. Standard photographic equipment, carefully used, is adequate in most instances. The useful range of the infra-red camera in ecological work, as determined by field tests, is seldom over 10 miles. The useful range may be somewhat greater in some cases: timberlines on mountain ranges 50 miles from the cameras can be quite accurately located in infra-red photographs, but aspen patches known to exist in the spruce-fir forests on the flanks of these ranges cannot be

## Photo interpretation

detected in the pictures. Differences in stages of growth or nutrition of plants in a single group may sometimes be determined from infra-red photographs. In order to avoid serious errors in classification, differences of environment, such as altitude, etc., must be taken into consideration.

- 192 Jenkins, D. W.  
USE OF THE AIRPLANE IN VEGETATION SURVEYS. Ecol., v. 26, Oct. 1945: 413-414. QH540.E3

The main characteristics used in identification of certain tree species are color, shape, and size of the whole tree and of the leaves, distinctively colored flowers or fruits, type of habitat and relation to physiography, plant associates, and easily recognized indicator plants. Air photographs and mosaics were used with success in ecological surveys. It is considered almost impossible to identify individual tropical species from aerial photographs.

- 193 Jensen, H. A.  
A SYSTEM FOR CLASSIFYING VEGETATION IN CALIFORNIA. Fish and Game, v. 33 (4), Oct. 1947: 199-266, incl. maps, plates, diagrs., tables; map. DA-410.C12

A classification system for use in the interpretation of aerial photographs is presented. The system was developed at the California Forest and Range Experiment Station for its forest survey and vegetation type survey. The system includes basic photo classification of the vegetation species, the type, and the density classifications. Numerous photographs and a colored, 1:100 scale, vegetation map of California are included. [7 refs.]

- 194 Kinloch, J. B.  
MAPPING VEGETATIONAL TYPES IN BRITISH HONDURAS. Caribbean Forester, v. 1 (2), Jan. 1940: 1-4. SD1.C25

The ecological field data obtained from a 3% enumeration survey, is being correlated with aerial photographs taken at 21,000 feet. Certain vegetational types such as open grassland, slash pine forest, mangrove, low shrub-swamp forest, rain forest, and new cultivation are readily distinguished on the photographs. Factors that aid in the differentiation of associations within the rain forest include geology, slope, aspect, relative height of canopy, abundance of canopy palms, and the general appearance of the photographic matrix. (Forestry Abstr. in part)

## In ecology

## 195 Leont'ev, V. L.

[ON THE EMPLOYMENT OF AN AERIAL PHOTOGRAPHIC SURVEY AND AERIAL OBSERVATION OF VEGETATION IN THE PROCESS OF UTILIZING DESERTS] Ob ispol'zovanii aérofotos"emki i aérovizual'nykh obsledovanií rastitel'nosti pri osvoenii pustyn'. Bot. Zhur. (Moskva), v. 37 (6), 1952: 847-849. QK1.V713

Visual and photographic aerial studies conducted in the Kara-Kum and Kyzyl-Kum deserts indicate that photo interpretation is facilitated by the sparsity of vegetation. Thickets of Haloxylon persicum, growing on sand dunes, constitute the basic vegetation. These are distinguished from thickets of H. aphyllum by the blue tone of the crown, and by the relatively small crown density. In winter H. persicum is characterized by the dirty gray tone of the bush. H. aphyllum usually grows in depressions and is characterized by dark green leaves. Salsola richteri and S. paletziana, often found in H. persicum thickets, is distinguished by the absence of the blue tone of the crown. Calligonum eriopodum, common in shelterbelts, on overgrown dunes and along the edges of oases, is characterized by light color, open crowns, and sparsity of ground coverage. Ammodendron conollyi is distinguished by its characteristic shape, resembling the weeping willow. Optimum interpretative results were obtained through the use of photos at a scale of 1:5,000 to 1:15,000.

## 196 Melton, F. A.

VEGETATION AND SOIL MOUNDS. Geogr. Rev. (New York), v. 25, July 1935: 430-433, incl. photos. G1.G35

The modifying effect of clump vegetation on erosion produced by small rivulets is explained and illustrated. Four aerial photographs of vegetation-covered soil mounds are included. [27 refs.]

## 197 Osborn, B.

THE PHOTOGRAPHIC TRANSECT. Chronica Botanica (Leiden), v. 7 (2), 1942: 262-263, incl. table. QK1.C55

In the measurement of the density of vegetation, in order to establish its probable value in erosion control, it is more important to determine the continuity of cover than to distinguish species or decide whether the plant material is living or dead. A transect method, in which survey lines are laid out on vertical photography, is suggested for the measurement of continuity and vertical depth of vegetation. This method was used successfully to measure the effect of grazing in plots on the Wichita Mountain Wildlife Refuge in Comanche County, Oklahoma. (Forestry Abstr.)

## Photo interpretation

## 198 Panfilovskii, A. L.

[A STUDY OF THE PILOT'S TASK IN AERIAL OBSERVATIONS OF TUNDRA PASTURES] Opyt shturmanskoĭ raboty pri vozdušno-glazomernom obsledovanii tundrovnykh pastbish. [English summary] Trudy Nauch.-Issled. Inst. Pol'ar. Zemledel. Zhivotnovodstva i Promyslovogo Khoz. (Leningrad), ser. Olenevedstra, v. 1, 1938: 133-149, incl. illus., tables. SF401.R4L45

The responsibility of the pilot during survey flights in Yamal consisted in plotting an ecological map of existing reindeer breeding grounds, as well as locating new pasture areas suitable for new breeding grounds. Equipment and methods used during the survey are described.

## 199 Petrov, M. P.

[THE IMPORTANCE OF AERIAL SURVEY IN STUDYING THE VEGETATION OF USSR DESERTS] Znachenie aerost'emki v izuchenii rastitel'nogo pokrova pustyn' SSSR. Sovet. Bot., v. 4 (5), 1936: 16-31, incl. illus. QK1.S85

Aerial photo surveys conducted in the southeastern Karakum Desert in the vicinity of Uch-Adzha, Ravnina, Chimchakla, and Chagil-Nederbelent showed that the mapping of desert vegetation simultaneously with the topographical features can be done by this method very efficiently with a minimum loss of time. Photos on a 1:16,000 scale revealed the presence of Psammoarbaretum nudum on the sands near Uch-Adzha. Interpretation of the photographs also showed the presence of Aristida karelini, Salsola richteri, Haloxylon persicum, Calligonum setosum, Ephedra strobilaceae, and Calligonum caput medusae.

## 200 Pronin, A. K.

[INVESTIGATION OF VEGETATION BY MEANS OF AERIAL PHOTOGRAPHY IN VARIOUS RANGES OF THE SPECTRUM] Izuchenie rastitel'nosti putem aerofotografirovaniia v raznykh zonakh spectra. Trudy, Akad. Nauk SSSR., Lab. aerometodov, v. 1, 1949: 69-91, incl. diagra.; photos. TL507.A45

The study discusses various aspects of aerial photography as applied to surveys of the vegetation cover which may be composed of heterogenous species. The use of panchromatic film in spectral ranges of 550 to 690 mu., and 720 to 820 mu. is described. Results show greater detail and greater ease of interpretation of aerial photographs of mixed deciduous and coniferous forests can be obtained with use of film having a spectral range of 720-820 mu. Three aerial photographs of forests taken with films of different ranges are appended. [10 refs.]

In ecology

- 201 Samoilovich, G. G.  
 [AERIAL PHOTOSURVEY FOR A SCIENTIFIC STUDY OF FORESTS]  
 Aerofotos'emka dlia nauchnogo issledovaniia lesov. [English  
 summary]. Izvest. Akad. Nauk SSSR., Ser. Geogr. Geofiz., No. 4,  
 1943: 207-217, incl. illus. AS262.A6246

A review of available data indicates the possibility of wide utilization of aerial photography for studies of forest areal distribution, the distribution of trees in a particular area, as well as forest phenology and species composition.

- 202 Samoilovich, G. G.  
 [NEW METHODS (AERIAL) FOR STUDYING THE GEOGRAPHICAL DISTRIBUTION  
 OF FORESTS] Novye metody (aviametody) dlia izucheniiã geograficheskogo rasprostraneniã lesov. Trudy Vsesoiuz. Geogr. S'ezda, 2d, Leningrad, 1947, v. 2, p. 436-442. G56.V8

Visual reconnaissance with aerial sketching, and aerial photography, as applied to the study of pine forest distribution in the USSR are discussed. The visual method permitted the charting of the northernmost boundary of the pine growth. Data show that pure pine forests cover Ust'-Kuta and Kachuga regions along the upper reaches of Lena river. The Orlenga river basin is covered with forests comprised of 51% pine. The pine trees decrease in numbers to the north of Orlenga. The percentage of pine coverage in the Kirenga river basin is about 20%, Paledul', Nlul', Zherba rivers about 5%. The application of aerial photography at various seasons of the year enabled the charting of coniferous and deciduous forest boundaries in the Kuibyshev Oblast', Bashkir and Mariisk ASSR's. New techniques introduced in aerial photography and in the interpretation of aerial photographs permit greater advantages to be obtained by the use of photo interpretation than by aerial sketching.

- 203 Sigafos, R. S.  
 SOME BOTANICAL PROBLEMS IN THE INTERPRETATION OF AERIAL PHOTOGRAPHS OF TUNDRA AREAS. Photogramm. Eng., v. 16, June 1950: 429-431. TA593.A2P5

Problems confronted by the use of aerial photographs in the interpretation of vegetation and surficial geology center around the identification of patterns. The necessity of setting up criteria describing configuration, texture, shade, and the meaning of patterns is recognized. In studies of permafrost in tundra regions, photographs are of value only so far as the

## Photo interpretation

vegetation and microrelief features indicate the nature of the frozen substratum and to the extent that the photographic representations of these features can be identified.

## 204 Stoeckeler, E. G.

IDENTIFICATION AND EVALUATION OF ALASKAN VEGETATION FROM AIR-PHOTOS WITH REFERENCE TO SOIL, MOISTURE AND PERMAFROST CONDITIONS. A preliminary paper. Dept. of the Army, Corps Engineers, St. Paul District, S. Paul, Minnesota, 1949, 103 p., incl. diags.; plates (68 photos) QK941.A488

The major cover types in the Permafrost Zone of Alaska include the white spruce-paper birch forests, the muskeg-scrub forests, the aspen-poplar stands, the high brush, and the tundra. All are readily discernible on airphotos. Knowing the moisture requirements of the few tree and brush species occurring in the Permafrost Zone of Alaska, the airphoto interpreter is able to determine the moisture conditions of a site mantled with a particular cover type, and to use his findings as an indicator of soil texture. In many cases permafrost conditions may be inferred by correlating cover types with soil texture, drainage and topographic position. From good photographs of a 1:10,000-scale or larger, the spruce-birch forest can be subdivided into distinct site classes. Eight site classes are discussed in this paper. The specific vegetation-permafrost relationships of the major cover types in the Tanana Valley Region investigated by the author are described. It was found that white spruce-paper birch forests occur on both frozen and unfrozen soils; black spruce-tamarack stands grow on frozen muskegs; aspen occurs on dry unfrozen, south-facing slopes; balsam poplar stands are confined to sites, adjacent to active streams, having moist, sandy soils unfrozen to a depth of at least 10 ft.; dense willow stands grow on bare river bars which are unfrozen to a depth of 10 ft. or more; and pure alder brush occurs on wet peaty soils frozen at a depth of 30 in. The presence of the permafrost table at a depth of 6 ft. or more from the ground surface has little or no deleterious effect on tree growth, with the possible exception of deep rooted trees like balsam poplar, cottonwood, and jack pine. [32 refs.]

## 205 Stone, K. H.

AERIAL PHOTOGRAPHIC INTERPRETATION OF NATURAL VEGETATION IN THE ANCHORAGE AREA, ALASKA. Geogr. Rev. (New York), v. 38, July 1948: 465-474, incl. photos. GL.G35



## In ecology

The vegetation of 60,800 acres in the Anchorage area was classified in 5 weeks in 1946 by a team of 5 men through stereoscopic interpretation of aerial photographs. The types of vegetation were identified by comparing the aerial photographs of the area with aerial photographs of known vegetation. The Anchorage area has 7 main types of vegetation as identified by aerial photographs: white spruce - birch, aspen, willow, birch, grass, black spruce, and grass - swamp. Seven aerial stereo-pairs are included. [7 refs.]

- 206 Viktorov, S. V.  
 [A STUDY OF THE DISTRIBUTION AND DISPERSION OF PLANTS BY MEANS OF AERIAL PHOTOGRAPHS] Izuchenie raspredeleniia i dispersii rastenii po aerofotosnimku. [English summary] Biull. Moskc. Obshch. Ispyt. Prir., Otd. Biol., n. s., v. 52 (4), 1947: 71-78, incl. tables. Q60.M8

Methods of using aerial photographs for the interpretation of habitat conditions were investigated. Studies were conducted on tree and shrub communities in depressions of salt lakes in the Kyzyl-Kum, Kara-Kum, and Ust-Urt deserts. Aerial photographs of the communities were subjected to morphologic and morphometric analyses and showed correlation between vegetation and habitat. The growth of Tamarix in concentric rings indicates drying water basins, while growth in strips or chains indicates tectonic lines or lines of contact of different strata. Species distribution in the various desert habitats was found to be fairly constant. Average distribution curves in the different types of habitat were constructed for Haloxylon aphyllum, Tamarix lispida, Nitraria schoberi, and Suaeda physophora. The analyses of distribution carried out on the ground and on aerial photographs (1:10,000 and 1:20,000) showed consistent results. [7 refs.]

See also items 18, 44, 54, 92, 104, 113, 158, 178, 284, 312, 392, 439, 475, 480, 497.

## 3. Geology

- 207 Aprodov, V. A.  
 [GEOLOGICAL MAPPING] Geologicheskoe kartirovanie. Moskva, Gosgeolizdat, 1952, 371 p., incl. photos, maps, diagrs., tables; maps. Q333.A65

## Photo interpretation

The manual presents a brief history of geological mapping in the USSR. Emphasis is placed on analysis of outcrops, route and stationary surveys, and geological mapping of various natural and tectonic conditions. The application of aerial photography in various phases of geological mapping is indicated throughout the manual. Approximately 150 ground and aerial photographs, maps, and figures are included. [About 350 refs.]

- 208 Belcher, D. J.  
 THE STATUS OF INTERPRETATION IN NATURAL RESOURCE INVENTORIES ---  
 PHOTO-MAGNETOMETER INTERPRETATION. Photogramm. Eng., v. 19,  
 June 1953: 421-422. TA593.A2P5

Correlated interpretation of aerial photographs and aeromagnetic maps is briefly discussed.

- 209 Brundall, I.  
 PHOTOGEOLOGY AIDS OIL EXPLORATION. Photogramm. Eng., v. 13 (2),  
 June 1947: 275-285, incl. photos. TA593.A2P5

Recent advances in aerial photography and photogeological techniques, with special regard to their application in petroleum exploration, are reviewed. [12 refs.]

- 210 De Blieux, C.  
 PHOTOGEOLOGY IN GULF COAST EXPLORATION. Bull. Amer. Assoc.  
 Petroleum Geol., v. 33 (7), July 1949: 1251-1259, incl. photos.  
 TN860.A3

The Gulf Coast has long been noted for the absence of surface geology and topographic expression of the subsurface structure. However, with the application of geomorphology as a basic principle, aerial photographic interpretative techniques have been developed for this province. The deltaic plain of the Mississippi River and adjacent coastal marsh are selected for the demonstration; approach to the problem is outlined, and photogeologic criteria are described and illustrated. (Author's Abstr.)

- 211 De Blieux, C., and G. F. Shepherd.  
 PHOTOGEOLOGIC STUDY IN KENT COUNTY, TEXAS. Oil and Gas Jour.,  
 July 22, 1951: 86, 88, 98-100, incl. photos. DGS-GS16-362

## In geology

The anomalies in color, tone, texture, and erosional pattern of the terrain as revealed by photogeologic studies, are described and their significance in reflecting the subsurface structural conditions discussed. Results of drilling on sites exhibiting such photogeologic anomalies are given.

## 212 Desjardins, L.

THE MEASUREMENT OF FORMATIONAL THICKNESS BY PHOTO GEOLOGY.  
Photogramm. Eng., v. 17, Dec. 1951: 821-831, incl. diags.  
TA593.A2P5

The methods for the preparation of stratigraphic columns, and the establishment of a mathematical basis for the measurement of the formational thickness by photogeology are presented.

## 213 Dobrokhotoy, I. S.

[AERIAL SURVEY IN VOLCANOLOGICAL EXPEDITIONS OF THE USSR ACADEMY OF SCIENCES] Aëroa'emka v vulkanologicheskikh ékspeditsiifakh Akademii Nauk Soiuza SSR. Trudy, Akad. Nauk SSSR., Lab. aërometodov, v. 2, 1950: 77-87, incl. illus., maps.

TL507.A45

Investigations and aerial photographic work of volcanological expeditions to the Kamchatka Peninsula and to the Caucasus are briefly described. The following aerial photographs are appended: (1) lava streams of the Zhupanovskaya Sopka, (2) Klyuchevskaya Sopka, (3) crater of the Avacha Sopka, (4) crater of the eastern summit of Mount Elbrus, (5) Mount Elbrus from a height of 7 km., and (6) volcanic cones in Armenia.

## 214 Eardley, A. J.

AERIAL PHOTOGRAPHS: THEIR USE AND INTERPRETATION. New York, Harper, [1942], 203 p., incl. photos, maps, diags., tables.  
QE33.E28

The study presents a comprehensive treatment of the geological interpretation of aerial photographs.

## 215 Eliel, L.

AERIAL RECONNAISSANCE AND CONTOUR MAPPING IN MINING. Trans. Amer. Inst. Mining Metall. Engineers, v. 126, 1937: 560-580, incl. photos.  
TN1.A52

## Photo interpretation

The application of aerial photography to mining and oil exploration is discussed. The equipment used and the preparation of contour maps are briefly described. The particular method employed is shown to be dependent upon the nature of the terrain. Typical photographs are included.

- 216 Fal'kova, E. A.  
 (AN APPLICATION OF AERIAL PHOTOGRAPHIC SURVEY TO GEOLOGICAL MAPPING OF ANCIENT SERIES IN MOUNTAINOUS BASHKIRIA) Opyt primeneniia aérofotos'emki pri geologicheskoi kartirovanii drevnikh svit v Chernoi Bashkirii. [English summary] Biull. Moskov. Obshch. Ispyt. Prir., Otd. Geol., n.s., v. 22 (2), 1947: 45-66, incl. maps, table. A60.M8

The mountainous Bashkiria region is composed of ancient Pre-Ordovician formations as well as Ordovician, Gothlandian, Devonian, and Carboniferous sedimentary series of sandstones, quartzites, conglomerates, schists, limestones, and dolomites. All deposits are dislocated and form a series of almost meridional extended folds, often complicated by overthrusts and faults. The use of aerial photographs (1:25,000- and 1:35,000) during the geological survey and in mapping operations is described. [7 refs.]

- 217 Fisher, W. A.  
 PHOTOGEOLOGIC STUDIES OF ARCTIC ALASKA AND OTHER AREAS. In Comm. on Geophys. and Geogr. Res. and Development Board, Washington, D. C., SELECTED PAPERS ON PHOTOGEOLOGY AND PHOTO INTERPRETATION. April 1953, p. 207-214, incl. maps, diags. (Rept. no. GG 209/1; Unclassified) AD 81996 [TID-L475]

Methods and techniques employed in the photogeologic interpretation of a 87,000-sq. mi. area of northern Alaska are discussed.

- 218 Gerasimova, O. A.  
 [UTILIZATION OF THE AIRPLANE IN GEOLOGICAL RESEARCH STUDIES OF OIL] Ispol'zovanie samoleta v geologo-poiskovykh issledovaniakh na neft'. Glavn. Upravl. Geod. i Kartogr. SNK-SSSR, Sbornik Nauch.-Tekh. i Proizvod. Statei po Geod., Kartogr., Topogr., Aéros'emke i Gravimetr., v. 4, 1944: 31-50. QB301.R8

The achievements of U. S. scientists in the field of aerial photography applied to geological search for oil are briefly reviewed. The adoption of U. S. methods and techniques of surveying to conditions existing in USSR is suggested. [27 refs.]

## In geology

- 219 Hammerle, E.  
[AERIAL PHOTOGRAPHY AND OROLOGY] Luftbild und Gebirgskunde.  
Luftbild u. Luftbildmessung, no. 19, 1941: 7-53, incl. photos,  
diagr. TA593.A2L8

Methods of obtaining data pertaining to the orology, tectonics, hydrology, and soil characteristics of mountainous areas from aerial photographs are described. The pictorial examples include large scale (about 1:10,000) single photos and some stereoscopic views of mountain ranges of the Austrian Alps.

- 220 Helbling, R.  
STUDIES IN PHOTOGEOLOGY IN CONNECTION WITH GEOLOGICAL MAPPING  
IN SWITZERLAND SPECIFICALLY OF THE TODI RANGE. Zurich, Orell  
Füssli, 1949, 137 p., incl. diagrs., tables; maps. QE33.H38

A report is presented of studies conducted in photogeology with suggested applications of such studies. Geological mapping is described, with particular reference to photogeological mapping; the basis and principles of such mapping are outlined. Other topics covered include photogrammetry, use of photogeology in Switzerland, surveys in New Guinea, and development of photogeology in little explored territories. Four photogeological and 3 geological maps, as well as a bibliography of 28 references, are included.

- 221 Johnstone, W. E.  
A GEOLOGICAL INTERPRETATION OF AN AIR PHOTOGRAPH OF BRITISH  
SOMALILAND. Photogramm. Eng., v. 19 (3), June 1953: 466-468,  
incl. photos. TA593.A2P5

An aerial photograph of parts of British Somaliland is presented and its photogeological interpretation discussed.

- 222 Lang, A. H.  
AIR PHOTOGRAPHS IN GEOLOGICAL MAPPING OF CORDILLERAN REGION,  
WESTERN CANADA. Photogramm. Eng., v. 13 (4), Dec. 1947:  
548-550. TA593.A2P5

A brief description is given of the use of aerial photographs for the following steps in geological mapping: preliminary examination, planning traverses, plotting outcrop boundaries, estimating rock types and preliminary plotting of geological boundaries, interpreting structure, extrapolating boundaries and structures between traverses, physiographic studies, and final compilation.

## Photo interpretation

- 223 Melton, F. A.  
PRELIMINARY OBSERVATIONS ON GEOLOGICAL USE OF AERIAL PHOTOGRAPHS.  
Bull. Amer. Assoc. Petroleum Geol., v. 29, Dec. 1945: 1756-  
1765, incl. diags. TN860.A3

Geological interpretation of aerial photographs, photo-indexes and mosaics, as well as the factors affecting stereoscopic vision, are discussed. The ability to recognize geologic structure and correctly interpret the significance of topographic form are considered more important to the geological student than an understanding of the physics, chemistry, and geometry of aerial photography.

- 224 Melton, F. A.  
GEOLOGIC EXPLORATION AND MAPPING WITH AERIAL PHOTOGRAPHS. In  
Comm. on Geophys. and Geogr., Res. and Development Board,  
Washington, D. C., SELECTED PAPERS ON PHOTO GEOLOGY AND PHOTO  
INTERPRETATION. April 1953, p. 219-225. (Rept. no. GG 209/1;  
Unclassified) [TID-L475]

The application of photographic interpretation to geological investigation and mapping is briefly discussed.

- 225 Miroshnichenko, V. P.  
[A NEW FIELD OF PHOTOGRAMMETRIC APPLICATION] Novaia oblast'  
primeneniia fotogrammetrii. Geodexist, v. 15, Sept. 1940:  
13-23, incl. photos, diag. QB296.R813

The application of aerial photographic survey to geological studies is reviewed. Seven aerial photographs of various geological formations are included. External characteristics of these formations as seen on aerial photographs are discussed.

- 226 Miroshnichenko, V. P.  
[EXAMPLES OF GEOLOGICAL INTERPRETATION] Primery geologicheskogo  
deshifirovaniia. In Akademiia Nauk SSSR. Materialy po  
deshifirovaniiu aerostniukov. Ed. by A. E. Fersman. [Sbornik.  
Sverdlovsk?], Izdatel'stvo Akad. Nauk SSSR, 1942, p. 86-96,  
incl. illus., maps. TA593.F4

Topographic expression indicates the response of the rock to erosional processes and outlines the distribution of relatively resistant and relatively weak rock units. Exposed bare rock through its color contrast can be used as an indicator to study the nature and trend of the rocks. Structures such as

## In geology

jointing, stratification, and folding are helpful in distinguishing the broader rock types. The presence of sink holes and similar features, where positively identified, provides a clue to the occurrence of soluble minerals such as limestone, gypsum, or perhaps ground ice.

- 227 Moore, R. C.  
AERIAL PHOTOGRAPHS AS AIDS IN STRATIGRAPHIC STUDIES. Photogramm. Eng., v. 13 (4), Dec. 1947: 550-557, incl. photos, diagr. TA593.A2P5

The usefulness of aerial photography applied to studies of geological strata and rock outcrops, general topographic features, and regional vegetation is outlined.

- 228 Mott, G. P.  
AERIAL MAPPING FOR OIL. World Petroleum (New York), v. 20 (3), Mar. 1949: 66-70, incl. photos, diagr. TN860.W6

The application of aerial photography to the mapping of geological features of an area is described. Aspects of photo interpretation are discussed. It is stated that anticlines, domes, faults, formation contacts, isolated exposures, and other geological conditions of importance are manifested through stream patterns, dipping beds, color changes in the soils, or vegetation changes. The film most commonly used for geological purposes is K2 or minus blue, which minimizes the effect of haze and produces tonal values generally suited to geological and survey requirements.

- 229 Nugent, L. E.  
SOME DEVELOPMENTS IN AERIAL PHOTOGRAPHY DURING THE WAR. Bull. Amer. Assoc. Petroleum Geol., v. 30, May 1946: 725-729. TN860.A3

The improvements in aerial photographic methods resulting from World War II are briefly reviewed.

- 230 Nugent, L. E.  
AERIAL PHOTOGRAPHS IN STRUCTURAL MAPPING OF SEDIMENTARY FORMATIONS. Bull. Amer. Assoc. Petroleum Geol., v. 31, Mar. 1947: 478-494, incl. diagrs. TN860.A3

Factors that control the use of aerial photographs in structural mapping are discussed; the anticipated horizontal and vertical photogrammetric precision is indicated. Geomorphic

## Photo interpretation

and structural relationships are correlated with photogrammetric procedures that most economically produce structural maps of various tolerances. [25 refs.] (Author's Abstr.)

- 231 Putnam, W. C.  
AERIAL PHOTOGRAPHS IN GEOLOGY. Photogramm. Eng., v. 13 (4),  
Dec. 1947: 557-565, incl. photos. TA593.A2P5
- A review of the merits of aerial photography in stratigraphic and geomorphological studies and in military geology is presented. A number of representative aerial photos is included. [16 refs.]
- 232 Rea, H. C.  
PHOTOGEOLOGY. Bull. Amer. Assoc. Petroleum Geol., v. 25, Sept.  
1941: 1796-1799. TW860.A3

The application of aerial photography to geologic exploration is briefly discussed.

- 233 Rich, J. L.  
GEOLOGICAL APPLICATIONS OF OBLIQUE PHOTOGRAPHY. Photogramm.  
Eng., v. 13 (4), Dec. 1947: 565-570, incl. photo, diagr.  
TA593.A2P5
- Stereoscopic obliques combine the advantages of stereoscopic vision with those of broad coverage of the terrain, and facilitate observation and evaluation of its relief features. Where trimetrogon photographs are available, maps of limited areas on a scale as large as 5,000 feet to the inch (1:60,000) can be made with considerable accuracy. Dip and strike measurements can also be carried out with great precision.
- 234 Rooney, G. W., and W. S. Levings.  
ADVANCES IN THE USE OF AIR SURVEY BY MINING GEOLOGISTS. Photogramm. Eng., v. 13 (4), Dec. 1947: 570-584, incl. photos, maps.  
TA593.A2P5

Recent and proposed applications of aerial photography in Canada as well as matters of instruction and training in this field are presented. An aerial photographic survey of pre-Cambrian outcrops in the Beatty and Munro townships (Cochran District) is described. Factors such as seasonal phenomena, filters, photographic scale, etc. are evaluated with regard to their effect on photo interpretation.



In geology

- 235 Sharkov, V. V.  
 [EXPERIMENTAL APPLICATION OF AERIAL METHODS DURING GEOLOGICAL AND  
 GEOMORPHOLOGICAL STUDIES IN THE GOLODNAYA STEPPE OF THE KAZAKH SSR]  
 Opyt ispol'zovaniya aerometodov pri geologo-geomorfologicheskikh  
 issledovaniyakh v usloviyakh Golodnoi stepi Kazakhstana. Trudy,  
 Akad. Nauk SSSR., Lab. aerometodov, v. 2, 1950: 88-105, incl.  
 tables. TL507.A45

Aerial and ground studies of the geological and geomorphic structure of the eastern part of Golodnaya Steppe are described. The application of aerial photography is discussed in reference to the following problems: (1) the importance of aerial photographs in cartographic work during geological and geomorphic studies, (2) the disclosure of features aiding in the photographic interpretation of the geological and geomorphic structure, and (3) the improvement in the utilization of aerial methods.

- 236 Smith, H. T. U.  
 PHOTO INTERPRETATION IN RELATION TO GEOLOGIC RESEARCH. Photo-  
 gramm. Eng., v. 19 (1), March 1953: 108-111. TA593.A2P5

The role of air photos in the successive stages of geologic research is reviewed and resulting advances in geologic knowledge are noted. [1 ref.]

- 237 Smith, H. T. U.  
 PRESENT STATUS OF PHOTO INTERPRETATION IN EARTH SCIENCE.  
 Photogramm. Eng., v. 19 (1), March 1953: 137-143. TA593.A2P5

The report deals mainly with current activities, procedures, and objectives, and is based largely on the replies to questionnaires sent out to numerous geologists and engineers who are conducting research in earth science. [6 refs.]

- 238 Smith, N. C., and S. A. Wengerd.  
 PHOTO GEOLOGY AIDS NAVAL PETROLEUM EXPLORATION. Bull. Amer.  
 Assoc. Petroleum Geol., v. 31, May 1947: 824-828, incl. map;  
 3 plates, map. TN860.A3

The use of aerial photography in geological reconnaissance of the Arctic slope of Alaska is briefly described and illustrated.

## Photo interpretation

- 239 Stokes, W., Jr.  
 REPORT OF A.I.M.E. AVIATION COMMITTEE FOR YEAR 1936-1937. Trans.  
 Amer. Inst. Mining Metall. Engineers, v. 126, 1937: 582-606,  
 incl. photos, tables. TNL.A5

The application of aerial photography to mining and petroleum operations is discussed. Some of the methods and techniques used in the interpretation of the aerial survey photographs are briefly described. [27 refs.]

- 240 Sundberg, K.  
 [THE IMPORTANCE OF AERIAL PHOTOGRAPHY FOR THE LOCATION OF  
 MINERAL DEPOSITS] Flyfotograferingens betydelse för uppletning  
 av mineral fyndigheter. Teknisk Tidskr. (sect. Bergvetenskap),  
 v. 65, 1935: 33-40, incl. photos, maps, diagrs.  
 Th.T28

The use of aerial photographs in prospecting for mineral resources, particularly for ore deposits and for petroleum, are reviewed with special regard to history, techniques, and costs. Examples of their advantages and use in the discovery of gold, silver, and radium deposits in Canada, in archeological studies in Great Britain, and in mining operations in Australia and New Guinea are cited. Illustrative maps and photos are included.

- 241 Thurrell, R. F., Jr.  
 PROCEDURES AND PROBLEMS OF PHOTOGEOLOGIC EVALUATION. In Comm.  
 on Geophys. and Geogr., Res. and Development Board, Washington,  
 D. C., SELECTED PAPERS ON PHOTOGEOLOGY AND PHOTO INTERPRETATION.  
 Apr. 1953: 155-162. (Rept. no. GG 209/1; Unclassified)  
 [TID-1475]

The paper discusses the following procedures and problems of photogeologic evaluation: (1) specifications for photography, (2) regions of interpretation, (3) color film versus black and white photography, (4) ground checking of photo interpretations, (5) identification of lithologic types, (6) visual estimation of dip or slope angles, (7) control problems, and (8) the future of precise geologic mapping.

- 242 Thurrell, R. F., Jr.  
 PROCEDURES AND PROBLEMS OF PHOTOGEOLOGIC EVALUATION. Photogramm.  
 Eng., v. 19, June 1953: 443-449. TA593.A2P5

## In geology

Problems immediately related to methods employed in the photographic processing of large areas for geological exploration are discussed.

- 243 Inwaites, F. T.  
USE OF AERIAL PHOTOGRAPHS IN GLACIAL GEOLOGY. *Photogramm. Eng.*,  
v. 13 (4), Dec. 1947: 584-586, incl. photos.  
TA593.A2P5

Four stereoscopic aerial photographs included in the study exemplify the use of aerial photography in identifying such glaciological features as drumlins, terminal moraines, sandy outwash, lake beds, and esker and ridge formations.

- 244 Trefethen, J. M.  
GEOLOGIC INTERPRETATION OF TOPOGRAPHIC MAPS AND AIRPLANE PHOTOGRAPHS. In *his Geology for Engineers*, New York, Van Nostrand, 1949, p. 531-559, incl. photos, maps; maps. QE33.T7

Characteristics of contour maps and aerial photographs, their geologic interpretations, and topographic structural expression are briefly described. [5 refs.]

- 245 Van Nouhuys, J.  
GEOLOGICAL INTERPRETATION OF AERIAL PHOTOGRAPHS. *Trans. Amer. Inst. Mining Metall. Engineers*, v. 126, 1937: 607-624, incl. photos. 18 p. Also in *Mining Technol.*, v. 1 (4), July 1937: A.I.M.E. Tech. Publ. 825. TN1.A52

The use and interpretation of aerial photographs for geological purposes are discussed. Significant factors involved in geological interpretation of aerial photographs include the continuity of topographic relief; the texture of outcrops, soils, and vegetation; the presence or absence of trees and bushes, and their relative heights and densities; and contrasts of color and of tone values. A series of sample photographs is appended.

- 246 Wanless, H. R.  
DEVELOPMENT OF METHODS AND MATERIALS FOR TEACHING PHOTOGEOLOGIC INTERPRETATION. In *Comm. on Geophys. and Geogr., Res. and Development Board*, Washington, D. C., *SELECTED PAPERS ON PHOTOGEOLOGY AND PHOTO INTERPRETATION*. April 1953, p. 163-205, incl. photos. (Rept. no. GG 209/1; Unclassified)

[TID-I475]

## Photo interpretation

The development of methods and materials for teaching photo-geologic interpretation at the University of Illinois is briefly reviewed. Thirty-six aerial photographs are included in the text.

- 247 Weatherhead, T. D.  
AIR SURVEY AND GEOLOGY. Internat. Geol. Congr., 18th, (Great Britain, 1948), London, 1950, Part VI, p. 92-97.  
DGS-GS49-44

The paper reviews the advantages of air photos, photographic procedures, methods of making maps and mosaics, geological interpretation and mapping, and coordination of air photography with air-borne magnetometer surveys.

- 248 Wengerd, S. A.  
NEWER TECHNIQUES IN AERIAL SURVEYING. World Oil, No. 127, 1947:  
37-40; 42; 46-48; 49-50; 52-54; 131-132; 134-140.  
SD1.F66

The notes describe advances in photogrammetric processes, cameras, laboratory developing and printing. Field control methods and geological interpretation of aerial photographs are discussed. [111 refs.] (Forestry Abstr.)

- 249 Wengerd, S. A.  
GEOLOGIC INTERPRETATION OF TRIMETROGON PHOTOGRAPHS -- NORTHERN ALASKA. Photogramm. Eng., v. 13 (4), Dec. 1947: 586-600, incl. photos, maps.  
TA593.A2P5

The paper presents a summary of a preliminary photo-geological reconnaissance mission over 11,250 sq. miles of the eastern plateau province of Alaska. It involved the study of 2,565 aerial photographs, of which two-thirds were obliques. The prime data sought on the photographs were dip criteria indicative of surface structure in the Upper Cretaceous strata. The tundra, swamp, and talus cover of much of the plateau necessitated interpretation by indirect means. Relations of drainage patterns to the geological structure are shown. Static soil patterns appear to have little relation to the geologic structure where strata are overlain by tundra. However, solifluction patterns were found of value in areas underlain by shales with thin sandstone interbeds. [13 refs.]

See also items 5, 16, 18, 183, 203, 252, 257, 274, 278, 281, 299, 317, 497, 498.

## 4. Geography

- 250 Cameron, H. L.  
AIR-PHOTO INTERPRETATION IN NATURAL RESOURCES INVENTORIES.  
Photogramm. Eng., v. 19, June 1953: 481-486, incl. photos,  
TA593.A2P5  
maps.

A review of Canadian studies in which air-photo interpretation was applied to natural resources inventories is presented.  
[3 refs.]

- 251 Danielsson, F.  
[THE POSITION OF THE PHOTOGRAPHICAL SURVEY IN FOREIGN COUNTRIES.  
GENERAL REVIEW AND HISTORICAL SKETCH] Den fotografiska kart-  
läggningens ställning i utlandet. Översikt och historik.  
[German summary] Svensk geogr. Årsb., v. 11, 1935: 162-190,  
G25.S8  
incl. map.

The extent and use of aerial photography for mapping purposes in 16 countries are reviewed. The countries included are Austria, China, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy, Netherlands, Norway, Poland, Spain, Switzerland, USSR, and the United States. A map showing the degree of utilization of aerial photographs by the European countries is included.

- 252 Fedorovich, B. A.  
[AERIAL PHOTOSURVEY AND THE PROBLEMS OF STUDYING DESERTS] Aero-  
fotos"emka i voprosy izucheniia i osvoeniia pustyn'. [English  
summary] Izvest. Akad. Nauk SSSR., ser. Geogr. Geofiz., No. 4,  
1943: 195-206, incl. illus., map. AS262.A6246

The applications of aerial photography to such problems as cartography, geological structure, soil cover, vegetation, water supply, and trafficability of deserts is presented. Seven photographic plates of desert area are included in the text.

- 253 Foster, F. W.  
SOME ASPECTS OF THE FIELD USE OF AERIAL PHOTOGRAPHS BY GEOG-  
RAPHERS. Photogramm. Eng., v. 17, Dec. 1951: 771-776.  
TA593.A2P5

The value and more effective use of aerial photographs as an aid to geographic research are discussed.

- 254 Fulleton, C. H.  
THE USE OF AERIAL PHOTOGRAPHS IN LAND DESCRIPTIONS. Canad.  
Surveyor, v. 7 (9), July 1942: 2-11. TA501.C3

## Photo interpretation

A summary of surveyor opinions on the practicability of employing aerial photographs for Crown land-survey purposes in Ontario is presented.

- 255 Gaveman, A. V.  
 [AERIAL SURVEY AND THE EXPLORATION OF NATURAL RESOURCES]  
 Aeros"emka i issledovanie prirodnykh resursov. [English summary] Moscow-Leningrad, Izdatel'stvo Akad. Nauk SSSR, 1937, 286 p., incl. illus., tables. TR810.H3

This study of the functions of aerial survey in the exploration of natural resources discusses the present knowledge of such resources, the development of aerial survey procedures, the technical processes involved, and the utilization of information derived from these surveys. Particular treatment is given to uses of aerial survey methods for the estimation of various plant resources and of some species of fauna, for the evaluation of water resources, and as a research aid in such studies as geology, geomorphology, archeology and historical geography, and engineering. An English summary, and an appendix containing 109 photographic plates taken during aerial surveys are included.

- 256 Gaveman, A. V.  
 [AERIAL PHOTOSURVEY FOR THE STUDY OF NATURAL RESOURCES]  
 Aeros"emka v issledovanii prirodnykh resursov. Glavn. Upravl. Geod. i Kartogr. SNK-SSSR. Sbornik Nauch.-Tekh. i Proizvod. Statei po Geod., Kartogr., Topogr., Aeros"emke i Gravimetr., v. 5, 1944: 65-80. QB301.R8

Achievements of USSR scientists in the field of aerial photography and photographic interpretation as applied to natural resources are briefly summarized. Findings regarding the efficiency and exactness of photographic methods are presented. Major studies in above fields are briefly outlined.

- 257 Gol'dman, I. M.  
 [AERIAL PHOTOGRAPHIC SURVEY AND GEOGRAPHY] Aerofotos"emka i geografiia. Geogr. v. Shkole (Moskva), v. 1951 (5), 1951: 28-35, incl. photos. G1.G313

Uses of aerial photography as an aid to the study of geography, physiography, pedology, geology, hydrology, and vegetation are briefly discussed. Vertical aerial photographs of a Ural Mountain foothill, the lower reaches of the Ob River, the Vasyuganye Marsh, a depression in Transbaikalia, and a sector of Kyzyl-Kum sands are included in the study.

## In geography

- 258 Gutkind, E. A.  
OUR WORLD FROM THE AIR; AN INTERNATIONAL SURVEY OF MAN AND HIS ENVIRONMENT. Garden City, N. Y., Doubleday, 1952, photos.  
GF37.G85

The book contains about 400 photographic plates, predominantly oblique air views. Photographs from all parts of the world are assembled to show the various effects of occupancy.

- 259 Kesseli, J. E.  
USE OF AIR PHOTOGRAPHS BY GEOGRAPHERS. Photogramm. Eng., v. 18, Sept. 1952: 737-741.  
TA593.A2P5

The application of aerial photography and photographic interpretation to geographic research is briefly discussed.

- 260 Linton, D. L.  
GEOGRAPHY AND AIR PHOTOGRAPHS. Manchester, Geogr. Assoc., 1947, 32 p.  
G142.L53

Interpretation of aerial photographs and their use in the teaching of geography and in geographical research are discussed. [29 refs.]

- 261 MacFadden, C. H.  
THE USES OF AERIAL PHOTOGRAPHS IN GEOGRAPHIC RESEARCH. Photogramm. Eng., v. 18, Sept. 1952: 732-737.  
TA593.A2P5

Methods of geographic research are considered to have been advanced by the adoption of aerial photography as an important research tool.

- 262 Martonne, E. de.  
[AERIAL GEOGRAPHY] Geographie aeriennne. Paris, Albin Michel, 1948, 237 p., incl. maps, diags.; plates (photos)  
G142.M3

The treatise covers a study of the atmosphere and of cartography in addition to a consideration of the various aspects of physiography, morphology, hydrography, the vegetation cover, human geography, regional units, and aerial traffic. A bibliography of 250 references is included.

## Photo interpretation

- 263 Quam, L.  
THE APPLICATION OF PHOTO-INTERPRETATION TO GEOGRAPHIC RESEARCH.  
Photogramm. Eng., v. 18, June 1952: 500-501. TA593.A2P5

Aerial photography is considered to be a geographic research tool, midway between conventional cartography and field observation or survey, aiding and supplementing the conventional methods of research.

- 264 Roscoe, J. H.  
CONTRIBUTION TO THE STUDY OF ANTARCTIC SURFACE FEATURES BY PHOTO-GEOGRAPHICAL METHODS. [McLean? Va.] 1952, 6 v. incl. photos, plates (tables); maps [in folder]. Thesis -- Maryland Univ. GB397.R6

A study is presented of geographic use of photo interpretation techniques in Antarctica. A description of the area, a system of keys (annotated photographs showing diagnostic features of typical Antarctic landforms and iceforms) for the interpretation of typical surface features, and the application of the photo-geographical method to the reconnaissance of the Ingrid Christensen Coast are given with a summary of findings, and an evaluation of this geographic technique. Bibliographies of photo interpretation bibliographies and of Antarctic bibliographies are included; maps and charts of the Antarctic, and geographic source materials for the Ingrid Christensen Coast are appended.

- 265 Roscoe, J. H.  
PHOTOGEOGRAPHY. In Comm. on Geophy. and Geogr., Res. and Development Board, Washington, D. C., SELECTED PAPERS ON PHOTO-GEOLOGY AND PHOTO INTERPRETATION, April 1953, p. 55-102, incl. table. (Rept. no. GG 209/1; Unclassified) AD 81996 [TID-L475]

The paper defines and describes methods of photo interpretation, presents photo intelligence as the product of photo reading and photo interpretation, traces the development of air-photo interpretation, and discusses photo interpretation keys and the application of photo interpretation to geography. [62 refs.]

- 266 Schumann, H. J., von.  
[AERIAL PHOTOGRAPHY IN THE SERVICE OF GERMAN AGRICULTURAL GEOGRAPHY] Das Luftbild im Dienste der deutschen Landwirtschaftsgeographie. Zeitschr. Gesell. Erdkunde (Berlin), v. 1943 (7-10), p. 374-381; plates. G13.G5



In geography

Economic and technical aspects of a regional survey of agriculture by means of aerial photography are briefly discussed. Twelve aerial photographs of the German countryside are appended to the text. Each photograph is fully annotated regarding its coverage, the geological conditions of the area included in the photo, and the recognizable vegetation.

- 267 Stone, K. H.  
GEOGRAPHICAL AIR-PHOTO-INTERPRETATION. Photogramm. Eng., v. 17,  
Dec. 1951: 754-759. TA593.A2P5

The fundamental uses of aerial photographs and basic steps of photo interpretation employed in geographical analysis are briefly discussed.

- 268 Stone, K. H.  
A SELECTED BIBLIOGRAPHY FOR GEOGRAPHIC INSTRUCTION AND RESEARCH  
BY AIR PHOTO INTERPRETATION. Photogramm. Eng., v. 20, June 1954:  
561-565. TA593.A2P5

A bibliography of about 100 items pertinent to photo interpretation as applied to geographic instruction and research is presented. The list is divided into 6 sections as follows: (1) Lists or collections of air photos, (2) General references, (3) Basic elements of interpretation, (4) Interpretation of physical and biotic features, (5) Interpretation of cultural features, and (6) Bibliographies.

- 269 Tator, B. A.  
SOME APPLICATIONS OF AERIAL PHOTOGRAPHS TO GEOGRAPHIC STUDIES  
IN THE GULF COAST REGION. Photogramm. Eng., v. 17, Dec. 1951:  
716-725, incl. illus. TA593.A2P5

A summary of some of the photo-interpretation techniques employed in terrain and structural studies of the Gulf Coast region is presented. [38 refs.]

- 270 Veselovskii, N. and V. Platon.  
[AERIAL SURVEY OF CITIES] Aeros'emka gorodov. Moskva,  
Gosaviatoizdat, 1932, 168 p., incl. illus., tables, maps;  
photomap. TR810.V4

The text covers the elements of aerial surveying, geodetic operations, base grids, triangulation, determination of grid bearing points, relief sketching, interpretation, photogrammetric processes, mounting operations, organization of work,

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preparation of an estimate for an aerial survey, survey controls, and cost of an aerial survey of a city. Surveys of the Moscow Recreational Park and of the cities of Krasnokokshaysk, Cheboksary, and Alma-Ata are used as examples.

- 271 Walker, F.  
GEOGRAPHY FROM THE AIR. New York, E. P. Dutton, 1953, 111 p.,  
incl. diags., photos. NNC-Geology D551.G296

The text discusses the geographical interpretation of aerial photographs, geological information on such photographs, the study of erosion (river erosion, stream development; glacial action), minor relief features and soils, coasts and shorelines, the various aspects of human and economic geography.

- 272 Zaprudnov, B. D.  
[THE POLAR EXPEDITION IN 1939] Poliarnaiâ ekspeditsiâ 1939g.  
Gedezist, v. 15, Jan. 1940: 48-54, incl. table.  
QB296.R813

Results of the aerial survey of the Lena River delta, conducted during summer of 1939 are briefly summarized and discussed. The photographic survey covered an area of 39,261 sq.km. and was accomplished through the use of T-ZA aerial cameras.

See also items 41, 174, 402, 485, 486.

## 5. Physiography and geomorphology

- 273 [AERIAL PHOTOGRAPHIC TOPOGRAPHY] Luftbild-Topographie. Berlin,  
Hansa Luftbild G.m.b.H., 1936, 79 p., incl. photos, diags.  
TA593.H27

The manual on aerial photographic topography is introduced with a consideration of various factors which influence the photographic delineation of landforms, such as seasonal aspect, scale, and shadows. The landforms discussed and characterized include plains, rolling plains, highlands, mountainous areas, and high mountains of the Arctic. Fifty-eight aerial photographs, some in the form of anaglyphs, and a short bibliography are included.

In physiography

- 274 Bench, B. M., and D. W. Bell.  
 INTERPRETATION OF A STEREO PAIR OF CROSS MOUNTAIN, COLORADO.  
 Photograph. Eng., v. 19, June 1953: 461-463, incl. photo.  
 TA593.A2P5

The geology of the Cross Mountain uplift is described, from data obtained through interpretation of a vertical aerial mosaic. A photograph of the mountain is included in the study. [4 refs.]

- 275 Berman, L. I.  
 [CONTEMPORARY GLACIATION OF THE UPPER REACHES OF THE INDIGIRKA RIVER] Sovremennoe oledenenie verkhov'ev r. Indigirki. Voprosy Geogr. (Moskva), v. 3, 1947: 33-66, incl. photos, maps, tables. G23.V6

A description of the glaciers, topographical features and climate of the upper reaches of the Indigirka River is presented. Eight aerial photographs of the glacier formations, river valleys, and mountain ranges are included. [5 refs.]

- 276 Bobek, H.  
 [THE SEA AS A SHAPER OF COASTLINES] Das Meer als Gestalterin der Kusten. Luftbild u. Luftbildmessung, no. 20, 1941: 12-37, incl. photos, maps (p. 14-37). TA593.A2L8

Aerial photographs of coast lines reveal a variety of shore patterns indicative of their origin and development. Some of the pictures were taken on the Baltic Sea coast. The scale ranges from 1:7500 to 1:25,000.

- 277 Bobek, H.  
 [THE EFFECTS OF EROSION AND DENUDATION IN VARIOUS CLIMATES] Die Wirkungen des fliessenden Wassers und der Hangabtragung in verschiedenen Klimaten. Luftbild u. Luftbildmessung, no. 20, 1941: 38-71, photos. TA593.A2L8

A pictorial account of the types and progressive stages of soil erosion and denudation processes is given in a series of aerial photographs. The photographs, ranging in scale from 1:5000 to 1:25,000, illustrate the effects of floods, silt formation, views of sunken meanders, patterns of erosion, etc. The areas photographed include portions of the lower Oder River, the Lyna (Alle) River (Eastern Prussia), the Dulfak Mountain (Elburz Mountains, Northern Iran), the southern margin of the Elburz, and sections of the Iranian Plateau.

Photo interpretation

- 278 Bobek, H.  
[GEOLOGY PLAYS A PART] Die Geologie spricht mit. Luftbild u. Luftbildmessung, no. 20, 1941: 72-103, photos.  
TA593.A2L8

The role of aerial photography in the identification of tectonic, erosional, and sedimentation phenomena is exemplified in a number of photographs, ranging in scale from 1:25,000 to 1:30,000. The following regions are included: the Sudetes, the Elbe River, the Heuscheuer Mts., and parts of southwestern Iran and Saudi Arabia.

- 279 Bobek, H.  
[ICE AND ITS MORPHOLOGY] Das Eis und seine Formenwelt. Luftbild u. Luftbildmessung, no. 20, 1941: 104-148, photos.  
TA593.A2L8

Ice- and glacier landscapes of the Antarctic and the Alps, are shown on vertical and oblique aerial photos of various scales. The effects of glaciation on the topography are illustrated. The photos cover the following regions: the Lyna River (East Prussia), and areas around the towns of Moryn (Mohrin), Bahen (Neumark), Bernau (Brandenburg), Dobre Miasto (Guttstadt, East Prussia), Fiddichow, and Schneidemühl (Pila, Pomerania).

- 280 Bülow, K. von.  
[HOW THE LANDSCAPE ORIGINATED] Wie die Landschaft entstand. Luftbild u. Luftbildmessung, no. 22, 1941: 7-26, photos, incl. map.  
TA593.A2L8

The inspection of the landform as recorded on an aerial photograph may reveal valuable clues concerning various Pleistocene formations present in the area. Basal and marginal moraines and other characteristic surface formations, as well as climatological data deductible from types of vegetation, may be clearly discerned on the pictures. By way of illustration the following areas in Mecklenburg, are shown: areas around the villages of Fresendorf, Klein Pravshagen, Wichmannsdorf, Alt Gaarz, and Klein Spreng, Lübeck Bay, the Recknitz River valley, Niendorfer Lake, Wendelstorfer Lake, and Schwerin Lake. The scale of the aerial photos is 1:13,000.

- 281 Deitz, R. S.  
AERIAL PHOTOGRAPHS IN THE GEOLOGICAL STUDY OF SHORE FEATURES AND PROCESSES. Photogramm. Eng., v. 13 (4), Dec. 1947: 537-545, incl. photos.  
TA593.A2P5

## In physiography

The use of aerial photography in the detection of surface and under-water shore features, sedimentary and erosional shore processes, and shoreline changes is briefly described and illustrated by 10 aerial photographs. [3 refs.]

- 282 Dury, G. H.  
MAP INTERPRETATION. London, Sir Isaac Pitman, 1952, 203 p.,  
incl. maps, diagrs.; plates (photos). GA151.D8

The treatise on map interpretation discusses the topographic features of scarps, folds, glaciated and unglaciated areas, limestone regions, coasts and shorelines, arid regions, and complex terrain based on complex structure. Features of occupancy, as well as morphometric analysis and cartographic appreciation are also treated. Eight aerial photographs are attached to the study.

- 283 Fedorovich, B. A.  
(SOME FUNDAMENTAL CONSIDERATIONS CONCERNING THE ORIGIN AND DEVELOPMENT OF THE SAND RELIEF) Nekotorye osnovnye polozenia o genezise i razvitii rel'efa peskov. [English summary] Izvest. Akad. Nauk SSSR., ser. Geogr. Geofiz., v. 4 (6), 1940: 885-910, AS262.A624  
incl. map, tables; plates.

Ground and aerial studies of sandy areas of Central Asia show that the relief of desert sands results from the action of turbulent air currents and reflects the regime of the wind at any given point. Data obtained during the studies permitted the indication of developmental stages of sand dune formation. Aerial photographs of various sand formations are included. [17 refs.]

- 284 [Gaveman, A. V.] Havemann, A. V.  
ON SOME RELATIONS BETWEEN THE ELEMENTS OF AEROLANDSCAPE. [English text] Compt. rend. Acad. Sci. URSS, n.s., v. 26 (4), 1940: 413-416, incl. tables. G60.A52

A correlation between geological, geomorphological, soil, vegetation, and other elements of the terrain in the southern Urals is discussed. Correlation tables, in which the most probable combinations of the landform elements are classed among different categories, are presented.

## Photo interpretation

- 285 Johnson, W. L.  
COMPARATIVE ACCURACY AND COST OF TOPOGRAPHIC MAPPING BY GROUND  
AND AIR SURVEY METHODS. Brit. Columbia Lumberman, v. 35 (5),  
May 1951: 47-50, 114-116, 118, 120, incl. maps, diagrs., table.  
HD4764.C4B74

Comparative data are presented from a mapping study of a  
1 sq. mile Vancouver University Forest area in British Columbia.  
The study found no practical difference in the accuracy of the  
topographic ground survey and the double-projection air-survey  
method. Comparative results are shown on maps, profiles, and  
in a table. [6 refs.]

- 286 Knechtel, M. M.  
PIMPLED PLAINS OF EASTERN OKLAHOMA. Bull. Geol. Soc. Amer.,  
v. 63, 1952: 689-700, incl. photos, diagrs.  
QE1.G2

Aerial photographs are presented which illustrate soil  
mounds, as well as the fissure patterns found both in playas  
and in tundra and considered to be genetically similar in part.

- 287 Kornrumpf, M.  
[AERIAL PHOTOGRAPHY AND LANDSCAPE EXPLORATION] Luftbild und  
Raumforschung. Luftbild u. Luftbildmessung, no. 12, 1937: 4-13,  
incl. photos. TA593.A2L8

The relation between landscape photographs and geological  
structures is illustrated by a number of aerial and ground  
photographs taken in various parts of Germany.

- 288 Kreutzinger, J.  
[TOPOGRAPHY] Topografja. Warszawa, Ministerstwo Spraw Wojako-  
wych, 1928, 339 p., incl. diagrs., tables; plates, maps.  
UG470.K75

The manual, used as a textbook by the students of the  
Polish War College, presents basic data on the triangulation,  
topography, photogrammetry, cartography, terrain study, and  
the military importance of terrain. Twenty-one aerial photo-  
graphs are appended. [33 refs.]

- 289 Lockey, B.  
THE INTERPRETATION OF ORDNANCE SURVEY MAPS AND GEOGRAPHICAL  
PICTURES. London, Georg Philip, 1937, 31 p., incl. photos,  
maps; maps. NNC-Geology D5268.L79

## In physiography

The interpretation of ground photographs is exemplified on a group of pictures taken on the British Isles. Methods of determining the topography, and identifying vegetation features and man-made objects are shown. The main types of landscape found in Great Britain and analyzed in the study are chalk downland, limestone upland, as well as clay vales and plains.

- 290 Löfström, K.  
 (MAPPING WITH AIR-PHOTOGRAPHS IN FINLAND) Ilmakuvakartoitus Suomessa. [English summary] Terra (Helsingfors), v. 58 (3). 1946: 86-118, incl. photos, diags., tables.  
 G23.G5

The development of aerial photographic mapping in Finland is reviewed. Present aerial mapping methods and techniques, which are making use of photography on a scale of 1:20,000 and includes surveying to fix points and contour lines, are discussed. [12 refs.]

- 291 Lyman, C. K.  
 FORESTERS AS TOPOGRAPHIC MAPPERS IN THE REDWOODS. Jour. Forestry, v. 43, Apr. 1945: 265-268. SDL.S63

The mapping of the coastal area of northern California, performed by the U. S. Forest Service for the War Department, is described.

- 292 OUTSTANDING AERIAL PHOTOGRAPHS IN NORTH AMERICA. Amer. Geol. Inst., Rept. No. 5, 87 p., May 1951.  
 SIPRE files, S-1688

The index of aerial photographs contains examples illustrative of various geomorphic and structural subjects. Included are permafrost features, features associated with glaciation and solifluction. Types of photographs, methods of procurement and a bibliography of literature on aerial photography are discussed.

- 293 Parmuzin, IŪ. P.  
 [AN EXPERIMENTAL APPLICATION OF AEROPHOTOGRAPHIC METHODS IN GEOMORPHOLOGICAL STUDIES OF THE TAIGA BELT IN CENTRAL SIBERIA] Opyt primeneniā aerofotometodov pri geomorfologicheskikh issledovaniĭakh taezhnoi polosy Srednei Sibiri. Voprosy Geogr. (Moskva), v. 21, 1950: 107-120; plates. G23.V6

## Photo interpretation

Experiments with aerial photography applied to geomorphological studies of Central Siberian taiga show that optimum results were obtained by using the following procedures: preliminary photo interpretation and aerial survey of the area studied, and supplementary ground studies along points which cannot be readily defined from interpretation and air survey. Detailed methods for each of the above phases of a geomorphological study are outlined. Eleven aerial photographs, both oblique and vertical, are appended to the study.

- 294 Prouty, W. F.  
CAROLINA BAYS AND THEIR ORIGIN. Bull. Geol. Soc. Amer., v. 63,  
1953: 167-224, incl. photos, maps, diagrs., tables.  
QEL.G2

Photographs were used to map the distribution of the bays along the Atlantic coastal plain area and to make detailed analysis of the forms and patterns of individual occurrences. Photo interpretation was supplemented by magnetometer studies, field observations, and experimentation.

- 295 Rengarten, P. A.  
[USE OF AERIAL PHOTOGRAPHIC MATERIAL IN GEOMORPHOLOGICAL STUDIES UNDER VARIOUS PHYSICAL AND GEOGRAPHICAL CONDITIONS] Ispol'zovanie materialov aerofotos'emki dlia geomorfologicheskikh issledovaniy v razlichnykh fiziko-geograficheskikh usloviakh. Izvest. Vsesoiuz. Geogr. Obshch., v. 71 (6), 1939: 887-896, incl. tables.  
G23.R6

The method of application of aerial photographic survey in geomorphological studies is considered to vary from location to location and depends to a large extent on the layout, size, configuration, internal structure, and the geologic composition of the objective on the ground. The latter two factors are represented on an aerial photo in terms of surface characteristics and tone variations. Examples of utilization of aerial photography in the study of plains, dissected plains, and mountains of the USSR are presented.

- 296 Sadilek, V.  
OUR MOUNTAINS. Liptovsky Svaty Mikulas, Slovotur Publishers  
Ltd., 1950, 120 p., incl. photos. GB542.C9S313

The mountains of Czechoslovakia are depicted in 120 ground photographs. A brief survey of the areas covered by the photographs serves to introduce the pictorial presentation.



## In physiography

- 297 Smith, H. T. U.  
AERIAL PHOTOGRAPHS IN GEOMORPHIC STUDIES. Photogramm. Eng.,  
v. 8, Apr.-June 1942: 129-155, incl. illus., graph, map. Also  
in Amer. Soc. Photogramm. Manual of Photogrammetry, New York,  
Fitzner Publishing Co. 1945, p. 728-748. TA593.A2P5

The present status of aerial photography and cartography is outlined, the pertinent literature reviewed, and the use of aerial photographs in the interpretative study of landforms is discussed. The interpretation of aerial photographs involves the identification of drainage, relief, and cultural features, and a recognition of the significance of these features in terms of bedrock geology and geomorphic history. The principles of interpretation are basically similar to those for topographic maps. The existing differences are primarily caused by the fact that photographs are more qualitative regarding the detail, but are less accurate quantitatively in terms of horizontal and vertical scale. The adequacy of aerial photographs as a direct basis for geomorphic interpretation depends on the type or types of topography to be studied, the scale of the investigation, the importance of accurate vertical control, the nature and scope of the study, the extent of previous field studies on the same problem, and on the reliability of purely morphologic criteria for the given problem.

- 298 Smith, H. T. U.  
PHOTO INTERPRETATION OF TERRAIN. In Comm. on Geophys. and  
Geogr., Res. and Development Board, Washington, D. C., SELECTED  
PAPERS ON PHOTOGEOLOGY AND PHOTO INTERPRETATION. Apr. 1953,  
p. 7-53, incl. photos, maps. (Rept. no. GG 209/1; Unclassified)  
AD 81996 [TID-L475]

The general rationale of photo interpretation as viewed by a geomorphologist is discussed. An example of a terrain study based largely on photo interpretation is presented. Potentialities and limitations of photo interpretation as a means of studying terrain are considered. Two maps and 18 aerial photographs are included in the study. [16 refs.]

- 299 Tator, B. A.  
DRAINAGE ANOMALIES IN COASTAL PLAINS REGIONS. Photogramm.  
Eng., v. 20, June 1954: 412-417, incl. photos, map.  
TA593.A2P5

## Photo interpretation

A report is presented of studies conducted to refine photo interpretation techniques for use as a tool in the determination of geomorphological and geological data in the coastal plains region. [10 refs.]

See also items 24, 163, 222, 225, 231, 235, 262, 308-310, 321.

## 6. Hydrography

- 300 Birdseye, C.  
FLOOD MEASUREMENTS BY AERIAL PHOTOGRAPHY. Canad. Surveyor,  
v. 6 (1), July 1937: 10-11. TA501.C3

A method of determining the flood discharge velocity by means of aerial photographs is briefly described.

- 301 Budel, J.  
[AERIAL PHOTOGRAPHY IN ICE RESEARCH AND ICE INVESTIGATION] Das  
Luftbild im Dienste der Eisforschung und Eiserkundung. Zeitschr.  
Gesell. Erdkunde (Berlin), v. 1943 (7-10), p. 311-345; plates  
G13.G5

Aerial observation and photography facilitate the investigation and cartographical recording of ice formation, distribution, and classification in Arctic and Antarctic seas, including changes in ice floes. The different uses of aerial photography in hydrography are pointed out. Photographs of different types of ice as seen from the air are included. [160 refs.]

- 302 THE DETERMINATION FROM AERIAL PHOTOGRAPHS OF THE RELATIVE SURFACE  
VELOCITIES OF WATER. Canad. Surveyor, v. 5 (11), Jan. 1937: 22.  
TA501.C3

A stereoscopic study method for determining stream velocities is briefly described. A vertical photograph in a direction opposite to the flow of the stream at a scale of approximately 500 ft. to the inch is recommended as most satisfactory.

## In hydrography

- 303 Galkina, E. A., S. S. Gilev, N. P. Golovin, and K. E. Ivanov.  
 [APPLICATION OF AERIAL SURVEY DATA TO HYDROGRAPHICAL STUDIES  
 OF SWAMPS] Primenenie materialov aëros"emki dlia gidrografi-  
 cheskogo izuchenifa bolot. Akad. Nauk SSSR, Otd. Biol. Nauk.,  
 Refer. Nauch.-Issled. rabot [for 1945], 1947, p. 13.  
 QE301.A357

The report presents a brief review of aerial photo-surveying of swamp areas conducted in the northwestern USSR, outlines the basis for interpretation of aerial photographs, and discusses the basic features of the hydrographical network of the investigated regions.

- 304 Gams, H.  
 [AERIAL PHOTOGRAPHY IN THE STUDY OF LAKES AND MARSHES] Das  
 Luftbild in der Seen- und Moorforschung. Zeitschr. Gesell.  
 Erdkunde (Berlin), v. 1943 (7-10), 1943: 345-351.  
 G13.G5

The application of aerial photography to studies of lakes and swamps is briefly discussed and the advances in this field made since the end of World War I are pointed out. The use of color and infrared photography for the identification of bog types and certain plant species is also mentioned. [32 refs.]

- 305 Gaveman, A. V.  
 [APPLICATION OF AERIAL PHOTOGRAPHIC SURVEY TO HYDROGRAPHIC WORK  
 IN THE SOVIET ARCTIC] Primenenie aerofotos"emki dlia gidro-  
 graficheskikh rabot v Sovetskoi Arktike. [English summary]  
 Izvest. Akad. Nauk SSSR, ser. Geogr. Geofiz., v. 4 (1), 1940:  
 133-152, incl. maps, tables. AS262.A6246

Results of the investigation, carried out by the Aero-Survey Commission of the State Geographic Society, are summarized. Methods employed in the aerial photographic survey of the mouth of Olenek River are described. Three different maps of the same area were plotted using either aerial photography alone, aerial photography coupled with ground survey, or ground survey only. Best results were obtained using the combined aerial and ground survey method.

- 306 Karelin, D. B.  
 [ICE RECONNAISSANCE FROM THE AIR] Ledovaiã aviatsionnaia raz-  
 vedka. Moskva-Leningrad, Glavsevmorput', 1946. 152 p., incl.  
 photos, maps, diagrs., tables. GB2593.K3

## Photo interpretation

A brief history of ice reconnaissance and equipment used is presented. Ice reconnaissance from the air was carried out to determine ice conditions. Various factors affecting the ice, the actual organization of flights, methods of reconnaissance, and geographical and seasonal ice conditions are discussed in detail. Visual observation was considered unreliable and the use of photography is recommended. (SIPRE Abstr.)

- 307 Melton, F. A.  
AN EMPIRICAL CLASSIFICATION OF FLOOD-PLAIN STREAMS. Geogr. Rev.  
(New York), v. 26, Oct. 1936: 593-609, incl. photos, diagrs.  
Gl.G35

Eleven aerial photographs of meandering flood-plain streams are presented.

- 308 Parvis, M.  
DEVELOPMENT OF DRAINAGE MAPS FROM AERIAL PHOTOGRAPHS. Proc.  
Nat. Res. Council, Highway Res. Board, v. 26, 1946: 151-163,  
incl. photos, diagrs., table. TEL.N45

The paper reports the development of techniques for compiling drainage maps of fine detail from aerial photographs of the several counties in Indiana.

- 309 Parvis, M.  
DRAINAGE PATTERN SIGNIFICANCE IN AIRPHOTO IDENTIFICATION OF SOILS  
AND BEDROCKS. Photogram. Eng., v. 16, June 1950: 387-409,  
incl. illus., maps. TA593.A2P5

The analyses of drainage patterns for their use in the identification of regional soils and bedrocks by means of airphotos is reported. The relative ease with which stream systems can be observed on aerial photographs facilitates the recognition of drainage patterns. It has been accepted that certain basic drainage patterns such as the dendritic, trellis, radial, parallel, annular, and rectangular are associated with specific land surface materials. Airphoto interpretation revealed several modifications of the basic drainage patterns such as reticular, phantom, and lacunate. Drainage patterns traced from representative airphotos of various physiographic regions throughout the U.S. are presented as illustrations of patterns which develop in the soils and bedrocks typical of the regions. Drainage patterns in regions where the rocks are bare or are covered only with shallow soils are decidedly different from those in regions of deep glacial drift. Drainage

## In hydrography

patterns develop differently in horizontal rocks than in tilted rocks. A conclusion is made that surface drainage patterns can be relied upon in the airphoto identification of soils and bedrocks on a regional basis.

- 310 Parvis, M.  
DRAINAGE PATTERN SIGNIFICANCE IN AIRPHOTO SIGNIFICANCE OF SOILS AND BEDROCKS. Bull. Nat. Res. Council, Highway Res. Board, No. 28, Nov. 1950: 36-62, incl. photos, maps, diagrs.  
TE7.N28

Drainage patterns in various physiographic regions in the United States are analyzed. The drainage patterns are classified according to basic or modified types and are illustrated by photographs. Rock structure is shown to be a major factor in the development of these types. The drainage patterns identified in aerial photographs can be utilized in the airphoto identification of soils and rocks because of the close correlation between the soils and bedrock of an area and its drainage pattern. [26 refs.]

- 311 Predtechenskiĭ, N. P.  
[A SPECIAL PURPOSE HYDROLOGICAL INTERPRETATION] Gidrologicheskoĭ deshifirovaniĭ dlia spetsial'nykh tselei. In Akad. Nauk SSSR. Materialy po deshifirovaniu aerosnimkov. Ed. by A. E. Fersman. [Sbornik. Sverdlovsk?], Izdatel'stvo Akad. Nauk SSSR, 1942, p. 50-71, incl. illus.  
TA593.F4

Methods employed in photo interpretation of streams, rivers, lakes, sea shorelines, river outlets, and other ground features resulting from the presence of water are reviewed. Ten aerial photographs are included in the text, and a discussion of various hydrographic features recognized on aerial photos is presented.

See also items 40, 71, 160, 189, 472, 496.

## 7. Soil classification

- 312 Baldwin, M.  
THE USE OF AERIAL PHOTOGRAPHS IN SOIL MAPPING. Photogram. Eng., v. 13 (4), Dec. 1947: 532-536.  
TA593.A2P5

## Photo interpretation

A review of aerial photographic soil surveying since World War I, and a summary of presently employed processes and techniques are presented. The relationship between the terrain features and vegetation is indicated. [2 refs.]

- 313 Belcher, D. J.  
USE OF AERIAL PHOTOGRAPHS IN WAR-TIME SOILS ENGINEERING. Roads and Streets, v. 85, July 1942: 35-37, incl. illus.  
TEL.R7

Aerial photographs are used by soil engineers to determine the physical features and topography by measurement, and the soil conditions by interpretation. Soils developed under similar conditions are considered to have similar characteristic appearances and engineering properties. Three air photographs are used to illustrate this method of soil identification.

- 314 Belcher, D. J.  
THE DETERMINATION OF ENGINEERING SOIL CHARACTERISTICS BY THE USE OF AERIAL PHOTOGRAPHS. [Lafayette, Ind.] 1943, 122 p., plates, maps, incl. photos, tables. Thesis -- Purdue Univ.  
LP no. 10393

Pedology is used in a soil survey to map soil conditions for engineering purposes. The use of aerial photographs by the engineer to anticipate soil conditions, and to locate sand and gravel deposits is described. [129 refs.]

- 315 Belcher, D. J.  
ENGINEERING APPLICATIONS OF AERIAL RECONNAISSANCE. Bull. Geol. Soc. Amer., v. 57, Aug. 1946: 727-733, incl. diagrs., tables; plates.  
QEL.G2

The application of photo interpretation to engineering work is briefly reviewed. Assembled evidence shows that most soils can be distinguished by characteristic patterns regardless of their geographic distribution. Photographs illustrate the similarity of patterns; test data are presented to permit the evaluation of interpretation.

- 316 Belcher, D. J.  
DETERMINATION OF SOIL CONDITIONS FROM AERIAL PHOTOGRAPHS. Photogramm. Eng., v. 14, Dec. 1948: 482-488, incl. illus.  
TA593.A2P5

In soil classification

Aerial photographs subjected to careful analysis produce evidence of soil texture, soil moisture and ground water conditions, type of rock and its approximate depth below the surface, and the character of the vegetative cover. These data provide the following information for engineering use: (1) Soil properties, including Atterberg limits and compaction requirements for fills; approximate bearing capacity or general road requirements for excavation and embankment in soil or rock; (2) equipment requirements for excavation and embankment in soil or rock; (3) influence of weather on construction; (4) locational problems; (5) drainage requirements; (6) sources of construction material. The identification of the landform is considered as a prerequisite for the evaluation of engineering characteristics.

- 317 Belcher, D. J.  
 TERRAIN INTELLIGENCE AND THE FUTURE OF MINERAL PROSPECTING.  
 In Comm. on Geophys. and Geogr., Res. and Development Board,  
 Washington, D. C., SELECTED PAPERS ON PHOTO GEOLOGY AND PHOTO  
 INTERPRETATION, Apr. 1953, p. 103-107. (Rept. no. CG 209/1;  
 Unclassified) AD 81996 [TID-L475]

Methods and means employed in analysis of aerial photographs for identification of soil textures and rock types are briefly described.

- 318 Davis, M. M.  
 ENGINEERING EVALUATION OF NORTHWESTERN INDIANA MORaine,  
 LACUSTRINE, AND SAND DUNE AIRPHOTO PATTERNS. [Lafayette, Ind.]  
 1949, 91p., incl. photos, maps, diagrs., tables. Thesis --  
 Purdue Univ. LP no. 11489

In a study of the complex soil patterns in the Valparaiso (Indiana) Moraine area, information regarding geology, soils, and drainage was correlated with ground patterns detected on aerial photographs to construct a base map of the area. Significance of the patterns seen on the air photos was established through field study, and used to facilitate differentiation of soil types. A drainage map of Porter County, Indiana, and an engineering soils map of the moraine area were constructed from the assembled data. [65 refs.]

- 319 Dawson, F. K.  
 AIRPHOTO STUDY AND MAPPING OF SOUTHEASTERN INDIANA SANDSTONE-  
 SHALE MATERIALS. [Lafayette, Ind.] 1948, 109 p., incl. photos,  
 maps, diagrs., tables. Thesis -- Purdue Univ.  
 LP no. 11490

### Photo interpretation

A drainage map of Jackson County, Indiana, was prepared and areas containing Mississippian sandstone-shale materials in the state delimited by means of a detailed analysis of aerial photographs. Minor areas of slightly different materials within the sandstone-shale regions were likewise located. Descriptions and illustrations are presented to assist in the identification of airphoto patterns, composite images formed from the following elements: landform, drainage pattern, soil color tone, vegetation, gully shapes and erosion scars, and man-made features. An engineering soils map of the Mississippian sandstone-shale region in southeastern Indiana on a county basis was prepared by identification of airphoto patterns. Soil and rock predictions, made from analysis of the airphoto patterns, were correlated with actual field conditions. The investigation involved a study of airphoto interpretation technique and such background sciences as physiography, geomorphology, geology, and pedology.

- 320 Frost, R. E.  
 AIRPHOTO PATTERNS OF SOUTHERN INDIANA SOILS. [Lafayette, Ind.] 1946, 269 p., incl. photos, maps. Thesis -- Purdue Univ. LP no. 10716

Soil type identification and mapping from aerial photographs is accomplished by utilizing principles of the earth sciences, and an analysis of terrain patterns characteristic of soils derived from the several types of parent material found in southern Indiana. Ground views are given to illustrate such components of the photographic patterns as landform, soil tone, vegetation, drainage pattern, and land occupancy. Aerial photographs are given to show details of the various patterns in stereo vision. [20 refs.]

- 321 Frost, R. E., and J. D. Mollard.  
 NEW GLACIAL FEATURES IDENTIFIED BY AIRPHOTOS IN SOIL MAPPING PROGRAM. Proc. Nat. Res. Council, Highway Res. Board, v. 26, 1946: 562-578, incl. photos, maps. TEL.N45

Regional soil mapping from aerial photographs is discussed. The common bedrock and glacial patterns are described and illustrated. Complex soil patterns and associated glacial features are also described and illustrated by air and ground photographs.



In soil classification

- 322 Frost, R. E., and K. B. Woods.  
AIRPHOTO PATTERNS OF SOILS OF THE WESTERN UNITED STATES [AS  
APPLICABLE TO AIRPORT ENGINEERING]. Washington, U. S. Gov.  
Printing Office, 1948, 76 p. S599.U5F7

The report describes the following airphoto patterns:  
(1) glacial materials of North Dakota and Montana; (2) aeolian  
soils primarily of the Columbia Plateau; (3) sandstone and  
shale materials of Montana and Wyoming; (4) igneous materials  
from many states in the Northwest, in particular the basalts  
of the Columbia Plateau; (5) Great Plains outwash materials;  
and (6) soils of filled valleys including the Willamette and  
the Great Valley of California. Ninety-nine ground and air  
photos are included.

- 323 Hills, G. A.  
THE USE OF AERIAL PHOTOGRAPHY IN MAPPING SOIL SITES. Forestry  
Chronicle, v. 26 (1), Mar. 1950: 4-37, incl. diags., tables;  
table. DA-99.8F7623

A proposed soil site classification scheme suitable for  
use in the mapping of soil sites from aerial photographs is  
presented. Geomorphic features and cover patterns recog-  
nizable in aerial photographs and their use in the interpre-  
tation of the photographs are described. The factors affecting  
the accuracy of the interpretation of soil sites from aerial  
photographs are discussed. [40 refs.]

- 324 Jenkins, D. S., D. J. Belcher, L. E. Gregg, and K. B. Woods.  
THE ORIGIN, DISTRIBUTION, AND AIRPHOTO IDENTIFICATION OF UNITED  
STATES SOILS WITH SPECIAL REFERENCE TO AIRPORT AND HIGHWAY  
ENGINEERING. Washington, U. S. Dept. Commerce, Civil Aeronaut.  
Administration [1946] 2v.; v. 1, 202 p., incl. photos, diags.,  
tables; maps; v. 2, 63 plates. S599.U5J45

Methods of studying soil through application of the prin-  
ciples of pedology are combined with new techniques for  
identifying soils from aerial photographs. The techniques are  
partially based on geology and soil science. The use of aerial  
photo mapping techniques is described.

- 325 Lowdermilk, W.  
USE OF AERIAL MAPPING IN SOIL CONSERVATION. Civil Eng.,  
v. 8 (9), Sept. 1938: 605-607, incl. photos. TAL.C452

## Photo interpretation

The employment of aerial photographs by the U. S. Soil Conservation Service in its soil conservation program is described. The methods and techniques developed in the course of mapping approximately 400,000 sq. mi. of land from the air are discussed. The improvements in soil mapping through photo interpretation, since its first use by the Soil Conservation Service in 1933, are shown.

- 326 McCullough, C. R.  
AIRPHOTO INTERPRETATION OF SOILS AND DRAINAGE OF RUSH COUNTY, INDIANA. [Lafayette, Ind.] 1948, 65 p., incl. photos, maps; maps. Thesis -- Purdue Univ. LP-no. 11071

A study was made of the complex glacial soil patterns in Rush County, Indiana, which contains a variety of morainic patterns and is situated adjacent to the border of the Wisconsin and Illinoian glaciers. Drainage and engineering soils maps (1:62,500) of Rush County were prepared through correlation of data derived from aerial photographs, pertinent literature, and field work. The engineering soils map is considered useful in the regional design of highways to indicate areas having favorable soil characteristics and to locate construction materials. [29 refs.]

- 327 McLerran, J. H.  
AIRPHOTO STUDY AND BOUNDARY DELINEATION OF SOUTHWESTERN INDIANA SHALE-SANDSTONE SOIL MATERIALS. [Lafayette, Ind.] 1952, 100 p., incl. photos, maps, diagrs., tables; maps. Thesis -- Purdue Univ. LP-no. 13110

This portion of Indiana, known locally as the Wabash Lowland, lies mainly in the Aggraded Valley Section of the Interior Low Plateau, a maturely dissected area with alluvial filled valleys. The residual soil mantle, overlying alternating shales and sandstones or massive sandstone of Pennsylvanian age, is predominantly silt and is frequently characterized by poor internal drainage. The study was made through the use of aerial photography combined with field work which was supplemented and facilitated by use of available agricultural and geological reports and maps. A detectable difference was found in the airphoto patterns produced by aeolian silt overlying shale and sandstone, and by the residual soils of the shale and sandstone. The shale-sandstone materials of southwestern Indiana were found to produce a smooth, rounded landform, and to have ragged, V-shaped gullies (appearing white on the photos) and dendritic

## In soil classification

drainage with some structure control; strip-mining scars are apparent. The landform and erosion-gully features are the most significant pattern elements of shale-sandstone topography. Soil textures were found nearly consistent over the entire area mapped as shale-sandstone materials. Hence the same engineering problems, associated with silt soils (pumping, subgrade failure, erosion, landslide, lack of granular construction materials) may be anticipated throughout the area. The text provides a number of illustrations to aid identification of the various airphoto patterns produced by the elements of landform, drainage, erosion, soil tones, and man-made features. Ground views are also included to show landform and structural elements. Maps developed by the study should provide reliable and useful data for engineering projects within the study area. It is concluded that use of airphoto interpretation is a valuable and economical method of mapping soils for engineering purposes. For such purposes in such an area photography on a scale larger than 1/20,000 is considered helpful. A basic knowledge of the fundamentals of physiography, geology, and pedology is considered essential for the photo interpreter. [43 refs.]

- 328 Miles, R. D.  
 PROCEDURES FOR MAKING PRELIMINARY SOILS AND DRAINAGE SURVEYS FROM AERIAL PHOTOGRAPHS. [Lafayette, Ind.] 1951, 65 p.; table, incl. photos, maps, diagrs., tables. Thesis -- Purdue Univ. LP-no. 12803

Methods and procedures are given for preliminary engineering surveys of soils and drainage, conducted by means of interpretation of aerial photography (1:20,000) of proposed highway routes.

- 329 Moessner, K. E.  
 PHOTO CLASSIFICATION OF FOREST SOILS. Proc. Soc. Amer. Foresters, v. 1949: 278-291. SD1.S612

The classification system for soil groups used in this study was developed originally for civil engineers having only a general knowledge of soils. An illustration is given of an airphoto analysis chart which illustrates by means of sketches, the landform, drainage, erosion, and color characteristics of major soils groups found in the U.S.A. Forest site variations are considered as largely caused by basic differences in topography and soils, and photo interpreters can readily classify forest areas into sites based on topographic position and soil groups. Measurements made in the field showed

## Photo interpretation

significant differences in growth and quality on sites thus classified from photos. Since species identification is difficult and subject to change, and site classification relatively easy and more stable, the latter is recommended to forest managers making aerial surveys in hardwood regions. (Forestry Abstr.)

- 330 Mollard, J. D.  
AIRPHOTO INTERPRETATION OF SOILS AND DRAINAGE OF MONTGOMERY COUNTY, INDIANA. [Lafayette, Ind.], 1947, 97 p., incl. photos, maps; maps. Thesis -- Purdue Univ. LP-no. 10778

A description is given of techniques and methods used to compile a drainage and an engineering soils map of Montgomery County, Indiana. The method of mapping drainage was found to be sufficiently accurate and detailed to permit tentative drainage estimates to be made at low cost. Several new air-photo soil patterns were revealed while correlating field investigations of surface materials with their aerial photo characteristics.

- 331 Montano, P.  
THE ENGINEERING SIGNIFICANCE OF THE AIRPHOTO PATTERNS OF NORTHERN INDIANA SOILS. [Lafayette, Ind.] 1946, 160 p., incl. photos, maps, diags., tables. Thesis -- Purdue Univ. LP-no. 10696

A study of the air photo interpretation of the soils of northern Indiana was made to evaluate the engineering properties of these soils in relation to drainage, relative supporting values, use as construction materials, and other characteristics. The study includes an analysis of the air-photo patterns of such glaciological features as till plains, moraines, outwash plains, and lake beds.

- 332 Montano, P.  
ENGINEERING SOILS MAPPING OF INDIANA FROM AIRPHOTOS. Photogramm. Eng., v. 18, Sept. 1952: 719-731, incl. photos, maps, diags. TA593.A2P5

A report is presented concerning the procedures and techniques used, and progress made in soil mapping from airphotos. [7 refs.]

## In soil classification

333 Parvis, M.

AIRPHOTO INTERPRETATION OF SOILS AND DRAINAGE OF PARKE COUNTY, INDIANA. [Lafayette, Ind.] 1946, 108 p., incl. photos, maps; maps. Thesis -- Purdue Univ. LP-no. 10697

A report is made of the research used in developing techniques and methods for compiling a fine-detail drainage map and a general engineering soil map of Parke County, Indiana. [20 refs.]

334 Pollard, W. S., Jr.

AIRPHOTO INTERPRETATION OF SOILS AND DRAINAGE OF HENRY COUNTY, INDIANA. [Lafayette, Ind.] 1948, 65 p., incl. photos, maps, diags.; maps. Thesis -- Purdue Univ. LP-no. 11073

A description is given of procedures followed in the production of an engineering soil map and a detailed drainage map of Henry County, Indiana. Aerial photographs were studied stereoscopically to determine drainage features. Soil areas were differentiated and limited through a study of the soil patterns resulting from such factors as drainage, landform, soil tone, vegetation, and land use. Particular attention was given to discernment of patterns produced by granular and semi-granular morainic deposits, of engineering value due to their gravel content. [40 refs.]

335 Rourke, J. D., and M. E. Austin.

THE USE OF AIR-PHOTOS FOR SOIL CLASSIFICATION AND MAPPING IN THE FIELD. Photogramm. Eng., v. 17, Dec. 1951: 738-747, incl. illus., maps. TA593.A2P5

The use of aerial photos in determining the soil types and in preparation of soil maps, and the use of single-lens vertical aerial photos in field mapping are briefly discussed.

336 Stevens, J. C.

AIRPHOTO INTERPRETATION OF THE ILLINOIAN GLACIAL DRIFT SOILS IN SOUTHEASTERN INDIANA. [Lafayette, Ind.] 1949, 114 p., incl. photos, maps, diags., tables; maps. Thesis -- Purdue Univ. LP-no. 11491

A drainage map of Clark County, Indiana, and a soil map of the Illinoian glacial-drift region of southeastern Indiana were developed by means of photo interpretation of aerial photographs of the area. Soil textures were predicted by interpretation of the composite pattern produced on the aerial

## Photo interpretation

photographs by landform, soil color tone, land use, gully shape and gradient, vegetation, and various man-made features. [87 refs.]

- 337 Van Til, C. J.  
AIRPHOTO INTERPRETATION AND MAPPING OF SOUTH-CENTRAL INDIANA  
LIMESTONE SOILS. [Lafayette, Ind.] 1948, 70 p., incl. photos,  
maps, diagrs., tables; maps. Thesis -- Purdue Univ.  
IP-no. 11358

A study was made of the drainage system and soils in the south-central limestone area of Indiana, during which a drainage map of Monroe County, Indiana, and an engineering soils map were prepared through the use of aerial photography. A background knowledge of geology, physiography, and pedology are considered essential to the interpretation of airphoto patterns which are produced by such factors as landform, soil color tone, gully shape and gradient, vegetation, land use, and man-made features. [111 refs.]

- 338 Woods, K. B., J. E. Hittle, and R. E. Frost.  
USE OF AERIAL PHOTOGRAPHS IN THE CORRELATION BETWEEN PERMAFROST  
AND SOILS. Milit. Engineer, v. 40, Nov. 1949: 497-499, incl.  
photos, map.  
TAL.P85

Data of a study covering the relationship between soil textures, soil position, vegetation, and permafrost as indicated by airphoto patterns of materials from arctic and sub-arctic regions are presented. Results show that aerial photographs can be used to identify permafrost in these regions. The airphoto pattern of the tundra is characterized by polygons, extremely flat topography, numerous elongated lakes and elongated sand ridges. Four aerial photographs of typical permafrost areas are included.

- 339 Yang, S. T.  
AIRPHOTO INTERPRETATION OF DRAINAGE AND SOILS OF FOUNTAIN  
COUNTY, INDIANA. [Lafayette, Ind.] 1947, 77 p., incl. photos,  
maps; maps. Thesis -- Purdue Univ.  
IP-no. 10782

A study was made of the drainage and soils of Fountain County, Indiana, by means of interpretation of aerial photographs. The drainage system and the engineering characteristics of the soil were mapped in the course of study. A description is given of the airphoto pattern of each soil type with its characteristics as observed on the airphoto and in the field.

In soil classification

See also items 11, 18, 71, 219, 252, 254, 257, 271, 284, 309, 310,  
342, 477, 478.

### 8. Forestry

- 340 Boutin, J.  
[GENERAL IDEAS ON THE USE OF AERIAL PHOTOGRAPHS] Notions  
sommaires sur l'emploi des photographies aériennes. Rev.  
Forestière Franç., v. 5 (11), Nov. 1953: 727-734, incl.  
diagr.; plate. DA-99.8R329
- The use and availability of aerial photographs for  
forestry purposes in France and its colonies are discussed.  
Interpretation techniques are described. A new 1:20,000-scale  
aerial map of France is recommended as an aid in photointerpre-  
tation.
- 341 Burwell, R. W.  
THE APPLICATION OF PHOTOGRAMMETRY TO FORESTRY. Photogramm.  
Eng., v. 8, Jan.-Mar. 1942: 18-21. TA593.A2P5
- The uses of aerial maps in forest fire prevention, typing  
of timber stands, planning of roads and trails, and estimating  
of timber volume are briefly reviewed.
- 342 Chabrol, P.  
[SOME USES OF AERIAL PHOTOGRAPHY IN THE RESTORATION OF MOUNTAIN  
LAND] Quelques emplois de la photographie aérienne dans un  
service de restauration des terrains en montagne. Rev.  
Forestière Franç., v. 5 (11), Nov. 1953: 767-773.  
DA-99.8R329
- The use of aerial photography in reforestation projects  
in the Central Pyrenees Mountains is discussed. Aerial pho-  
tography was utilized for the study of erosion, glaciers,  
snowfall, flood prevention, and for agricultural mapping and  
planning.
- 343 Champion, F. W.  
AIR-SURVEY OF FORESTS. Indian Forester, v. 59 (1), Jan. 1933:  
12-21; map, plates. SD1.I3

## Photo interpretation

The results are given of an aerial survey of low lying alluvial forests in Oudh, India, carried out in February 1931 by the Indian Air Survey Company, Ltd. A series of photographs, in which Indian trees of different sizes, shades, and shapes are identified, are included.

- 344 Clason, M.  
[AERIAL PHOTOGRAPHS IN AMERICAN FORESTRY] Flyfotografier 1  
amerikansk skogbruk. Norsk Skogindus., v. 7 (5), May 1953:  
152-161, incl. photos, map, diagr., tables. TS5800.N78

A report is given on a tour of the United States which was made to study the use of aerial photographs in forest research. The use of aerial photographs by the Central States Exper. Sta. in Columbus, Ohio, and the Lake States Exper. Sta. is described. The determination of stand heights, crown diameter and density, and stand volume through stereoscopic study of the photographs is discussed.

- 345 [THE APPLICATION OF AERIAL PHOTOGRAPHY TO FORESTRY. REPORT OF THE COMMITTEE ON FOREST PHOTOGRAMMETRY] Flygbilden i skogsbrukets tjänst. Betänkande avgivet av Kommittén för skoglig fotogrammetri. Stockholm [Kommittén för skoglig fotogrammetri], 1951, 196 p., incl. tables. DA-325.2K83

A review is presented concerning the application of aerial photography in forestry in the U.S., Canada, Germany, and Finland, with a survey of current photogrammetric activity in Sweden. The degree of success attained in the identification of tree species, determination of crown diameter, tree height, stem volume and class, stand density, and stand limits are discussed. The possibilities of extending the use of aerial photography in Swedish forestry are explored.

- 346 [FOREST MAPS FROM THE AIR] Skogskartor från luften. Skogsägaren, v. 25 (8), Aug. 1949: 156-158, incl. photo, map. DA-99.8Sk55

The use of aerial photography for forestry purposes in Canada, New Zealand, and Sweden is briefly reviewed. Details revealed by the use of a stereoscope are discussed.

- 347 Garver, R. D.  
AERIAL PHOTO-INTERPRETATION BY THE FOREST SERVICE. Photogramm. Eng., v. 19, March 1953: 117-120. TA593.A2P5



## In forestry

The use of aerial photographs and maps and the application of photographic interpretation to some of the activities of the Forest Service are briefly discussed.

- 348 Giersig, W.  
[AERIAL PHOTOGRAPHS FROM THE AUSTRIAN FOREST SURVEY] Luftbilder der Usterreichischen Waldstandsaufnahme. Internat. Holzmarkt, No. 5, Mar. 13, 1954: 27-28, incl. map. DA-99.81In82

The methods and procedures employed in the Austrian National Forest Survey are described. Problems encountered in the survey, including weather and terrain, are discussed.

- 349 Griffith, A. L.  
AERIAL RECONNAISSANCE FOR FOREST OFFICERS. Indian Forester, v. 72 (5), 1946: 207-209; plates. SD1.I3

Account of an amateur attempt at air reconnaissance and photography during a fairly extensive tour of the Thar desert of Sind is presented. Illustrations are presented which show the detail, useful to a forester, that can be obtained from oblique photography. (Forestry Abstr. in part)

- 350 Griffith, A. L.  
FURTHER NOTES ON AERIAL RECONNAISSANCE FOR FOREST OFFICERS. Indian Forester, v. 73 (6), 1947: 237-240; plates. SD1.I3

An aerial photographic reconnaissance over the Amb-Chilas-Gilgit Catchment area of the Indus River basin combined with ground inspection of the above areas is briefly described. Notes are given concerning the photographs taken during the flight.

- 351 Guislain, A.  
[AERIAL PHOTOGRAPHY AND AVIATION IN THE SERVICES OF FORESTRY] La photographie aeriennne et l'aviation au service des forestiers. Rev. Eaux Forests, v. 76 (6), June 1938: 485-492; 4 plates, 2 maps. SD1.R4

The merits and limitations of surveys made by aerial photography are discussed; they are considered most useful in mountainous country. Cooperation between forest and other services concerned with aerial photography is suggested, and the uses of aviation in insect and fire control are indicated. Four aerial photographs and 2 maps are appended. (Forestry Abstr. in part)

## Photo interpretation

352 Hansen, V. H.

[THE APPLICATION OF PHOTOGRAMMETRY TO FORESTRY] Fotogrammetrien i Skovbrugets tjeneste. Dansk Skovfor. Tidsskr., v. 20 (4), Apr. 1935: 210-228, incl. photos, map. DA-99.8D23

The uses and techniques of aerial photography in forest management are briefly reviewed. The forestry uses discussed include the determination of forested areas, tree counts, tree heights, crown diameters, canopy height, and of vegetation profiles. [9 refs.]

353 Howlett, L. E., and P. D. Carman.

PHOTOGRAPHY FOR FORESTRY PURPOSES. Nat. Res. Council Canad., Phys. Div. (Ottawa), Mar. 1949, 5 p. (N.R.C. No. 1907) TR810.H57

Information considered as being not readily available in ordinary photographic texts is summarized. Data are presented on resolution, shutters, scale, filters, haze, stray light, mounting, winter photography, negative processing, and prints.

354 Johansson, F.

[THE TECHNIQUE OF AERIAL PHOTOGRAPHY IN FORESTRY] Flygbildsteknik i skogsbruket. Skogsägaren, v. 28 (3), Mar. 1952: 60-62, incl. photo. DA-99.8Sk55

The formation of a "Committee for Forest Photogrammetry" supported by the Fund for Forest Research in Sweden is reported. The Committee is conducting a research program to obtain the best available photographs for forestry purposes. Besides instruments and other aids the following research topics are noted: identification of tree species and tree stands, ground slope, soil fertility, tree height, tree crown diameter, and stem volume.

355 Kehutanan, P.

(AERIAL PHOTO INTERPRETATION FOR THE EXPLOITATION OF FORESTS ON THE ISLANDS OUTSIDE JAVA) Pemakaian potret udara untuk membuka hutan didaerah Luar Djawa. [English summary] Rimba Indonesia, v. 2 (3), Mar. 1953: 87-98; plate. DA-99.8R46

The photo interpretation methods and techniques employed by the Indonesian Forest Service are described. Scale, identification of tree species, measurement of crown density, and correlation between crown diameter and the length and diameter of the trunk are discussed.

## In forestry

- 356 Kretzschmar, H.  
 [FOREST PHOTOGRAMMETRY] Forstliche Photogrammetrie. In Neudammer  
 forstliches Lehrbuch. Neudamm, J. Neumann, 1942, v. 2, p. 41-65,  
 incl. photos, maps, diagrs.; plate (photo). SD371.N4

The following topics are briefly discussed: general principles of photogrammetry, use of aerial photographs in forestry, aerial maps, construction of special forestry and topographic maps, determination of such silvicultural elements as basal area, tree height and crown diameter, calculation of timber volume, and the use of terrestrial photogrammetry in stand measurements. [9 refs.]

- 357 Jaer, W. von.  
 [THE ACCURACY OF THE PHOTOGRAMMETRIC BASIC FOREST MAP] Die  
 Genauigkeit der photogrammetrisch hergestellten Forstgrundkarte.  
 Forstarch., v. 23 (9-10), Nov. 15, 1952: 195-197. DA-99.8F7723

A comparative study is presented showing that reasonably accurate base maps for forestry purposes can be prepared from aerial photographs. Comparative measurements of area and of distance in 8 German forest districts with varying terrain were used as the basis of the study.

- 358 Lee, H. C.  
 AERIAL PHOTOGRAPHY, A METHOD FOR FUEL TYPE MAPPING. Jour.  
 Forestry, v. 39, June 1941: 531-533, incl. illus. SD1.863

Aerial photographs, used as a basis for locating and classifying fuel types, are supplemented by field surveys which are conducted to determine fuel-type ratings, factors affecting the development of crown fires, special hazardous conditions, and to gain a first-hand knowledge of the country. Steps to be taken to extend this method of survey to obtain more detailed information are noted.

- 359 Lindeberg, E.  
 [PHOTO MAPS FOR FORESTRY] Fotokartor för skogsbruket. [German  
 summary] Svenska skogsvårdsför. Tidskr., v. 36 (1), 1938:  
 29-52, incl. photos. DA-99.8Sk5

## Photo interpretation

The use of aerial photographs for forestry purposes and in the production of an economic map of Sweden are discussed. Photographs show differences between coniferous and hardwood tree stands as well as other details which can be used in studying forest resources.

- 360 Löffström, K. G.  
 USE OF ATR PHOTOGRAPHS IN FINNISH FORESTRY. [English summary]  
 Proc. World Forestry Congr., 56, (Helsinki, 1949), v. 3, 1950:  
 147-152, incl. photos, diags., tables. DA-99.9C76912A

The use of aerial photographs for forestry purposes is briefly reviewed. Special methods of horizon and statoscope measurement practically without use of ground control, have been used since 1928. The main species of trees in Finland, pine, spruce, and birch, can be distinguished and the heights of individual trees can be measured to an accuracy of approximately 1 m. on photographs of a 1:20,000 scale. Also, the number of trees in required samples can be counted, the crown width measured, and the crown density of stands estimated with reasonable accuracy. Volume estimation from air photographs is still in an experimental stage in Finland; figures presented from an investigation to determine the accuracy of air estimation are not regarded as conclusive.

- 361 Marcelo, H. B.  
 NOTES ON AERIAL PHOTOGRAPHY. Forestry Leaves, v. 5 (1),  
 Sept. 1951: 14-15, 52. DA-99.8P532

The application of aerial photography in forest inventory and land-use survey in the Philippines is discussed. The problem of identification of species in a rain forest is briefly noted. [3 refs.]

- 362 Meyer, J.  
 [THE FIRST FORESTRY STUDY-FLIGHT OVER THE FORESTS OF GREATER GERMANY] Der erste forstliche Studienflug über die Wälder Grossdeutschlands. Forstarch., v. 15 (15-16), Aug. 1, 1939:  
 315-319. DA-99.8F7723

A study-flight over the forests of Greater Germany by 40 German professional foresters is described. Characteristic features of forest stands and of individual species are discussed.

## In forestry

- 363 Miguet, J. M.  
[APPLICATIONS OF AERIAL PHOTOGRAPHY TO FORESTRY AT REUNION]  
Applications forestières des photographies aériennes à la  
Réunion. Rev. Forestière Franç., v. 5 (11), Nov. 1953:  
764-766; plate. DA-99.8R329
- 364 Moessner, K. E.  
PRINCIPAL USES OF AIR PHOTOS BY THE FOREST SERVICE. Photogramm.  
Eng., v. 16, June 1950: 301-304. TA593.A2P5

An aerial survey of Reunion Island in 1949 and 1950 is described. Tropical forests of Tamarindu and Acacia were distinguished. An aerial photograph considered representative of a part of the area is included.

Air photographs are used for the preparation of maps, as map substitutes in the field and office, and in photo interpretation often supplemented by stereo-photogrammetry. Black and white photographs taken with a vertical camera on panchromatic film are used in general evaluation. Modified infra-red film is occasionally used for timber surveys because of its greater tone range in coniferous stands. Various techniques of photo interpretation and stereo examination that assist forest fire prevention and better fire control are discussed. The use of stereo pairs permits a comparison of topography, vegetation, soil, site, and enables the selection and classification of samples by their photo characteristics. A rough segregation of timber stands into volume classes can be best accomplished by three simple photo measurements.

- 365 Olenius, L.  
(AERIAL PHOTOGRAPHS IN THE FORESTRY OF NORTH FINLAND) Ilmakuvat  
Pohjois-Suomen metsätaloudessa. [English summary] Metsätalou-  
dellinen aikakauslehti, 1951 (1): 25-26, incl. map, table.  
DA-99.9F49

The use of aerial photographs for forestry purposes in North Finland is reviewed and the possible applications for volume estimation, for forest inventories, and for forest administration are discussed.

- 366 Pikalkin, V. M.  
[THE USE OF A DIRIGIBLE IN FOREST INDUSTRY] Primenie  
dirizhablia v lesnoi promyshlennosti. Les Promyshl., v. 5,  
Oct.-Dec. 1945: 5-8, incl. illus., tables. SD1.L387

The advantages of use of a dirigible over an airplane for taxonomic work are reviewed.

## Photo interpretation

- 367 Reid, E. H., and G. D. Pickford.  
AN APPRAISAL OF RANGE SURVEY METHODS. Jour. Forestry, v. 42,  
July 1944: 471-479, incl. illus., maps, table.  
SD1.863

Results of 20 separate surveys of a range area in eastern Oregon, during which the square-foot-density and reconnaissance methods were used, are reviewed. Comparisons of dependability of forage estimates and of relative costs, as well as a discussion of grid and aerial photograph mapping procedures, are presented.

- 368 Rey, P.  
[AERIAL PHOTOGRAPHY AND FOREST PROBLEMS] Photographie aérienne et problèmes forestiers. Rev. Forestière Franç., v. 5 (11),  
Nov. 1953: 735-745; plates. DA-99.8R329

The organized mapping of vegetation, including photo interpretation, in France is discussed. The system of photo interpretation employed is described under the following topics: principles of elementary identification, elementary identification classes, and complex identification. The potentialities and limitations of forest photo interpretation are stated.

- 369 Rogers, E. J.  
AERIAL PHOTOGRAPHS IN TIMBER ESTIMATING. Jour. Forestry, v. 40,  
May 1942: 430-432. SD1.863

A proposal to establish in the United States a central clearing office for all information pertaining to the use of aerial photographs in forestry enterprises is discussed.

- 370 Salverda, Z.  
[EXPLORATION FROM THE AIR. (REPORT BASED ON PRACTICAL EXPERIENCE IN NEW GUINEA)] Exploratie van uit de lucht. (Rapport naar aanleiding van praktijkervaringen op Nieuw-Guinea). Tectona (Bogor), v. 32, 1939: 772-786. DA-99.8B65

A general review of the usefulness and limitations of aerial reconnaissance and photographic surveys for forestry purposes in the tropics is presented. Simple reconnaissance, especially if supplemented by photographs taken with an ordinary hand camera, can be extremely useful in simplifying and speeding up the exploration of unknown territory. While systematic mapping by aerial photography is too costly and technical a procedure for ordinary purposes, such photography

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can be used to advantage if available. Aerial reconnaissance greatly reduces the amount of work necessary by facilitating, although not entirely replacing ground surveys. An annotated series of aerial photographs taken with an ordinary camera is included. (Forestry Abstr. in part)

- 371 Seely, H. E.  
[SYMBOLS FOR DESCRIPTION OF GROWING STOCK ON MAPS OR AIR PHOTOS].  
Forestry Chronicle, v. 25 (1), 1949: 62-65.  
DA-99.8F7623

The Committee of Surveys Research of the Canadian Society of Forest Engineers, has recommended the use of the following symbols. Type to be represented by the letters H for hardwood, S for softwood, and M for mixed. Arabic numerals for height classes, starting with 1 for 0.5 ft., 2 for 6-15 ft. and then by 10-ft. intervals. If 5-ft. classes are required, the use of subscripts is advocated. Density to be shown by capital letters, A = 6-15%, B = 16-25%, and so on to J = 86-100%; age classes by roman numerals I = 0-15 yrs., II = 16-25 yrs., etc. For site, symbols as follows: U = ridge top, V = upper slope, W = lower slope, X = moist flat, Y = dry flat, and Z = wet flat. (Forestry Abstr.)

- 372 Seely, H. E.  
TECHNICAL DEVELOPMENTS IN AIR SURVEYS AND INTERPRETATION OF FORESTRY DATA. Brit. Columbia Lumberman, v. 33 (11), Nov. 1949: 59-60, 108-111.  
HD4764.C4B74

The application of aerial photography to forestry is discussed. Special forest air photography methods are described. The accuracy and cost of air photograph and of ground estimates of timber quantities are compared. Special problems discussed include species identification, site classification, height in relation to age, composition of the tree stand, defects, and related conditions. [6 refs.]

- 373 Seely, H. E.  
AIR PHOTOGRAPHY AND ITS APPLICATION TO FORESTRY. Photogramm. Eng., v. 15, Dec. 1949: 548-554.  
TA593.A2P5

The application of aerial photography to forestry is discussed in relation to types of air photography, mapping methods, photographic detail, seasonal conditions, and photographic operations. The construction of a base map from the air photographs is briefly reviewed. Some aspects of tri-camera use in forest

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photography is described. Quantitative estimates of timber stands together with the qualitative information regarding the species, site, height in relation to age, composition of the stand, and defects are discussed.

- 374 Skappel, V.  
[THE USE OF AERIAL MAPPING IN FORESTRY] Luftkartleggingen i skogsbrukets tjeneste. Tidsskr. Skogbruk, v. 54 (9), Sept. 1946: 277-293, incl. photos. DA-99.8T432

The uses and techniques of aerial photography for forestry purposes in Denmark are briefly reviewed. The use of the stereoscope in bringing out details of special interest to forestry is discussed. These details include identification of tree species, distribution of species in mixed stands, determination of tree heights, and identification of new tree growth.

- 375 Spurr, S. H.  
DEVELOPMENTS IN AERIAL PHOTOGRAPHY AS RELATED TO FORESTRY EDUCATION. Proc. Soc. Amer. Foresters, v. 1947: 38-42. SD1.8612

The position and subject content of aerial photography in the forestry curriculum is discussed.

- 376 USES OF AERIAL PHOTOGRAPHS IN FOREST PROTECTION. Jour. Forestry, v. 49, Sept. 1951: 630-633. SD1.863

A list of abstracts of papers delivered during the panel discussion of the American Society of Photogrammetry meeting held in San Francisco on Dec. 5, 1950 includes: Uses of Aerial Photographs in Control of Forest Diseases, by T. H. Harris; Uses of Aerial Photographs in Control of Forest Fires, by K. Arnold; Uses of Aerial Photographs in Control of Forest Insects, by J. F. Wear and J. W. Bongberg.

- 377 Waldo, C. E.  
APPLICATION OF COLOR PHOTOGRAPHY. Photogramm. Eng., v. 16, June 1950: 327-328. TA593.A2P5

The use of vertical, as well as low and high angle oblique color photography by the Forest Service for the location of timber damaged by the tussock moth is evaluated. Practically every damaged tree could be detected in the vertical photos; the oblique photos clearly showed the



## In forestry

widespread areas affected. A continuation of the experiments using color photography is recommended.

- 378 Wan, Han Lioe, and K. Paijmans.  
 [THE AERIAL PHOTOGRAPHY SECTION OF THE INDONESIAN FOREST SERVICE]  
 De afdeling "Luchtfotobewerking" van de Dienst van het Boswezen.  
 [English summary] Tectona (Bogor), v. 39 (3), 1949: 237-251.  
 DA-99.8B65

Methods, instruments, personnel training for aerial photo interpretation by the Indonesian Forest Service are described. One of the principal functions of the Section is the interpretation of photographs of the forests of Borneo. Vertical photography is used in the operations; oblique photographs present too many difficulties in mapping and interpretation. [10 refs.]

- 379 Welander, E.  
 [THE USE OF PHOTOGRAMMETRY IN FORESTRY] Fotogrammetriens användning i skogsbruket. Svenska Skogsvårdsför. Tidskr., v. 45 (3), 1947: 155-178, incl. photos. DA-99.8Sk5

The methods and techniques of aerial photography developed in conjunction with the mapping of Sweden are reviewed. Photo interpretation and the differentiation of tree species are discussed. Effects of shadow, seasonal variations, and the photographic scale are analyzed.

See also items 2, 5, 38, 40, 43, 45, 46, 62, 67, 180, 197, 291, 323, 329.

## 8a. Forest surveys

- 380 AERIAL SURVEY. Empire Forestry Rev., v. 28 (3), 1949: 212-214.  
 SD1.E573

A progress report on aerial surveys carried out in the British Empire is given. The report was issued at a meeting of the Technical Committee on Aerial Survey of Forests, set up on the recommendation of the Empire Forestry Conference of 1947. (Forestry Abstr.)

## Photo interpretation

- 381 [AVIATION EMPLOYED IN THE RECONNAISSANCE OF COLONIAL FORESTS].  
Rev. internat. produits coloniaux (Paris), v. 13, 1938:  
224-226. SDL.F66

Aerial reconnaissance of forests in French Equatorial Africa, French West Africa, and Madagascar has proved useful, especially for preliminary surveys. In French West Africa, where surveys were carried out by the military air establishment, the cost was only 250 fr. per flying hour. (Forestry Abstr.)

- 382 Bakken, A.  
[AERIAL PHOTOGRAPHING OF FORESTS] Luftfotografering av skog.  
Skogbrukeren, v. 26 (3), Feb. 1, 1951: 17-20, incl. diagr.  
DA-99.8Sk54

The use of aerial photography in a survey of forests in the Trysil parish in Norway is described. Details in aerial photographs are discussed. The use of personnel familiar with the terrain is recommended for best results in the interpretation of photographs.

- 383 Boon, D. A., and M. van Bottenburg.  
FOREST SURVEY IN INDONESIA. Proc. World Forestry Congr., 3d,  
(Helsinki, 1949), v. 2, 1950: 173-175. DA-99.9C76912A

The methods employed by the Forest Survey Division in the interpretation of aerial photographs and in plotting survey maps are described.

- 384 Craig, R. D.  
FOREST SURVEYS IN CANADA. Forestry Chronicle, v. 11 (3), Sept.  
1935: 26-32. DA-99.8F7623

Canadian use of aerial forest surveys is reviewed. Vertical, oblique, and winter photography are discussed. The factors of height and crown size are discussed in relation to stand estimates.

- 385 Crow, A. B.  
A METHOD OF DETERMINING FOREST AREAS FROM AERIAL PHOTOGRAPH  
INDEX SHEETS. Jour. Forestry, v. 43, Nov. 1945: 812-813.  
SDL.S63

## In forest surveys

A short-cut method of using aerial photographs to determine forest areas is described. The percent of area covered by tree stands is estimated by observing the proportion of mechanically-spaced points which fall within forested areas on aerial photographs.

- 386 Fairbairn, W. A.  
SOME NOTES ON AERIAL SURVEY. *Farm and Forest*, v. 6 (3), 1945:  
158-159. SD1.F66

Conditions for aerial photography in West Africa are considered to be perfect before and after rains. The periods of poor visibility during the Harmattan in the North, and clouded conditions in the south, should be avoided. Photographic flights should be made in the early morning (8-10 A.M.) to obtain satisfactory relief. A list of practical points based on the experience gained in recent aerial surveys is presented. (Forestry Abstr.)

- 387 Grigor'ev, K., L. Mattison, and S. Rumiantsev.  
[AIRPLANE IN FORESTRY] *Samolet v lesnom khoziaistve. Les Khoz. i Lesoeksploat.*, Apr. 1935: 10-15, incl. tables.  
SD1.L4

Summary data on the 1934 achievements in photographing and mapping of forests in the USSR are presented. Visual survey was conducted from the air over an area of about 22.5 million hectares; 727,000 hectares of selected forest areas were photo-mapped, and 4.14 million hectares of river beds were photographed. Ground survey covered an area of 608,000 hectares.

- 388 Hagberg, N.  
[THE AERIAL PHOTOGRAPH AS A FOREST MAP] *Flygbilden som skogskarta. Skogen*, v. 39 (3), Mar. 1-15, 1952: 70-72, incl. photos, map. DA-99.8Sk51

The use of aerial photography in forestry is discussed as a basis and framework for forest maps prepared indoors or in the field, and as a forest map following minor revision.

- 389 Heske, F.  
[IDEAS AND PROPOSALS FOR THE UTILIZATION OF AERIAL PHOTOGRAPHY AS AN AID TO THE PLANNING AND STUDY OF FORESTS OVER LARGE AREAS] *Gedanken und Vorschläge zum Einsatz des Luftbildes als Hilfsmittel forstlicher Grossraumforschung und Planung. Zeitschr. Gesell. Erdkunde (Berlin)*, v. 1943 (7-10), 1943: 351-374; plates G13.G5

## Photo interpretation

The value of aerial photography to forest surveys and classification is discussed. An aerial survey alone is considered insufficient to provide adequate information regarding the ground conditions. The aerial photographic survey, when supplemented by ground control, appears to be the most rapid and most economic method of stocktaking and evaluation of forest resources. Five aerial photographs of German forest areas are included in the text. [65 refs.]

- 390 Kondrat'ev, A. I.  
 [JOINT UTILIZATION OF THE AERIAL PHOTOGRAPHIC SURVEY AND SELECTIVE-ENUMERATIVE EVALUATION DURING INVENTORIES OF FOREST RESOURCES] Sovmestnoe ispol'zovanie ae'rofotos'emki i vyborochno-perechislitel'noi taksatsii pri inventarizatsii lesnogo i lesosechnogo fonda. Les. Indus., Nov. 1935: 40-46, incl. tables. HD9765.R88L4

Experimental studies conducted in the vicinity of Petrozavodsk showed that an aerial photographic survey, which used a Zeiss 2 x KMKC/I camera, was sufficiently adequate to evaluate the vegetation. The average error, as ascertained by a subsequent ground survey, was less than 10%.

- 391 Loomis, R. D.  
 FOREST SURVEYING AND WORKING PLANS. Forestry Chronicle, v. 25 (3), 1949: 130-135. DA-99.8F7623

The relative roles and integration of photographic and ground survey methods in the preparation of working plans are discussed. (Forestry Abstr.)

- 392 Losee, S. T. B.  
 AIR PHOTOGRAPHS AND FOREST SITES. I. MAPPING METHODS ILLUSTRATED ON AN AREA OF THE PETAWAWA FOREST EXPERIMENT STATION. II. APPLICATION OF AERIAL SITE MAPPING METHODS TO AREAS IN SASKATCHEWAN AND QUEBEC. Forestry Chronicle, v. 18 (2), 1942: 129-144, 169-181. DA 99.8F7623

Aerial photographs can be used to study topography and vegetation after the topographic and vegetational characteristics noted in aerial photography are correlated with ground conditions determined by a survey of test sites. This method which permits classification and mapping of extensive forest areas by absolute site qualities can also be used in areas containing agricultural sites. Mapping accuracy is

## In forest surveys

dependent on ecological conditions, type of photography, amount of field work possible, and degree of site classification desired. The greater the complexity of ecological factors and the higher the degree of classification, the more detailed must be the field and photographic information. (Forestry Abstr.)

- 393 Losee, S. T. B.  
AIR SURVEY OF FOREST LANDS. Pulp Paper Mag. Canad., v. 49 (6),  
May 1948: 98-100. TS1080.P85

The required quality of photography, scale of maps, interpretation of photographs, and subsequent field work employed in forest surveys are discussed. (Forestry Abstr.)

- 394 Mason, B., Jr., and K. B. Wood.  
A FOREST SURVEY IN GUATEMALA. Photogramm. Eng., v. 18, March  
1952: 140-143. TA593.A2P5

Aerial photographic studies of Guatemala forests are briefly described.

- 395 Mottishaw, J. S.  
AERIAL FOREST SURVEYS IN BRITISH COLUMBIA. Washington Univ.  
Forest Club Quart., v. 15 (3), Spring 1941-1942: 18-21.  
DA-99.9W275Q

The use of aerial photography by the British Columbia Forest Service is discussed. The methods and techniques employed in the preparation of a forest type map are described.

- 396 Paijmans, K.  
(INTERPRETATION OF AERIAL PHOTOGRAPHS IN A VIRGIN FOREST COMPLEX:  
MALILI, CELEBES) Een voorbeeld van interpretatie van lucht-  
foto's van oerwoud; het Malili-complex op Celebes. [English  
summary] Tectona (Bogor), v. 41 (2), Oct. 1951: 111-136, incl.  
diagr., tables. DA-99.8B65

A comparative study of aerial photographs of 5 sample virgin forest areas in Borneo is presented. The sample areas included upland forests of good and of poor quality, a lowland forest, and a transition area between hills and lowland. Anthocephalus macrophyllus in the lowlands and Camposperma in the hills were the only tree species considered to be easily identifiable. Quality classes were roughly differentiated on the basis of crown density.

## Photo interpretation

- 397 Parsons, H. H.  
 MAPPING AND IDENTIFYING TIMBER STANDS BY AERIAL OBSERVATION.  
 Canad. Lumberman, v. 65 (12), June 15, 1945: 16-18, incl.  
 photos. DA-99.8C16

The determination of age class of pulpwood stands in eastern Canada and species identification are discussed. Height and crown shape are the principal bases for differentiating mature, second growth, or immature types. Species identification is based mainly upon different intensities or shadings of foliage, and upon crown shapes.

- 398 Samoïlovich, G. G.  
 [AERIAL PHOTOGRAPHIC SURVEY IN THE FORESTRY OF THE KUZNETSK  
 BASIN COAL DISTRICT] Aerofotos"emka v leanom khoziaistve  
 Kuzbassugliã. Trudy Lesotekh. Akad. (Leningrad), v. 43, 1935:  
 263-300, incl. photos, maps, tables. SDL.L35

An aerial photographic survey was conducted in Gornaya Shoriya area between 52°30' and 53°45' N. Lat., and between 87°00' and 89°00' E. Long., covering an area of 1,212,276 hectares. Results of the survey show that fir stands predominate, either as pure stands or mixed with spruce and juniper. Pine stands were noted along rocky banks of rivers and streams. One ground and 12 aerial photographs of forest formations are included.

- 399 Samoïlovich, G. G.  
 [AERIAL INVESTIGATION OF FORESTS LOCATED IN BASINS OF MIDDLE  
 AND UPPER TRIBUTARIES OF THE ENISEI RIVER] Vozdushnoe obsledo-  
 vanie lesov basseinov srednikh i niznikh pritokov reki  
 Eniseia. Izvest. Geogr. obshch. SSSR. (Moscow-Leningrad),  
 v. 71 (5), 1939: 730-739. G23.R6

A report is made of flights over the tributaries of the Yenisei River, conducted at heights of 200-800 m., and at speeds of 120-190 km/hr, to determine the extent of forest cover as well as the percentage of cover of each species. In the Elogui basin 682,720 hectares were surveyed, of which 73.5% were forests, 26.5% swamps and alluvial deposits. The forests were composed of pine (34.9%), spruce and fir (32.8%), larch (0.6%), birch (16.4%), juniper (5%), and mixed forest (10.3%). In the upper Taz basin and the Taz-Elogui watershed 55% of the 1,348,075 hectares surveyed were forests, 45% swamps. The forests were composed of pine (50.1%), juniper (14.4%), larch (8.7%), spruce and fir (7%), birch (18.2%), and floodplain

## In forest surveys

forests (1.6%). Swamps occupied 6.3% of the 396,003 hectares surveyed in the lower reaches of the Nizhnaia Tunguska, Nizhnaia Letnaia, and Severnaia Rivers; inundated areas 4.3%, and forests 89.4%. These were composed of larch (29.2%), fir (19.7%), and birch (21.8%). The survey of the Turukhan basin covered 398,880 hectares, of which swamps and inundated areas occupied 35.6%, the forests 64.4%. Here the forest composition was larch (15.8%), spruce and fir (10.2%), birch (36.2%), and floodplain forests (27.7%). In the Kureika basin 549,040 hectares were surveyed, of which 53.1% were forests, 33.1% swamps, and 13.8% inundated areas. The forests were composed of larch (36.7%), juniper (21.8%), spruce and fir (11.6%), birch (9.2%), and floodplain forests (20.7%). About 1.35 million hectares of the Enisei basin from the mouth of the Podkamennaia Tunguska to the mouth of the Kureika were surveyed. Forests occupied 80%, swamps about 12%, inundated areas about 8%. The forest was composed of larch (25%), juniper (15%), spruce and fir (12%), and birch (48%).

## 400 Seely, H. E.

DIFFERENT SURVEY METHODS OF LARGE AREAS: AERIAL PHOTOGRAPHY. [French summary] Proc. World Forestry Congr., 3d, (Helsinki, 1949), v. 1, 1950: 53-60. DA-99.9C76912A

A general discussion of the use of aerial photographs for forest survey purposes is presented. Forest maps and special forest photographic mapping methods are described. Sections are devoted to photographic detail, seasonal conditions, and the qualitative information which the air photograph shows in regard to species, site, height in relation to age, composition of the stand, and related conditions.

## 401. Shillinglow, A. W.

THE MILITARY SURVEY OF THE FOREST RESOURCES OF THE COMMONWEALTH TERRITORIES. Austral. Timber Jour., v. 11 (12), 1946: 613-619. SD430.A8

An account of the forest survey conducted by the army in New Guinea is presented. From a study of aerial photographs, areas are classified into distinct vegetation types and the boundaries of each type transferred to a 1-in. map. Aerial photographs were used in tropical areas principally for rapid elimination of those areas which are unimportant for timber. (Forestry Abstr. in part)

## Photo interpretation

402 Shul'ts, V. E.

[EXPERIMENTAL CALCULATION OF FOREST RESOURCES USING A COMBINATION OF METHODS] Opyt ucheta lesnogo fonda kombinirovannykh metodom. Les. Indus., July 1937: 52-59, incl. tables.

HD9765.R88L4

Ground taxonomic survey combined with an aerial photographic survey of the White Sea-Baltic Canal (Belomorsko-Baltiyskiy Kanal) area of 386,000 hectares showed: pine forests to occupy 161,500 hectares; spruce, 49,700 hectares; birch, 1300 hectares; agricultural areas, 1000 hectares; water bodies, 14,600 hectares; marshes, 154,600 hectares; and others, 3300 hectares.

403 Spurr, S.

AERIAL PHOTOGRAPHY. Unasylva, v. 2, July-Aug. 1948: 183-194, incl. photos.

SD1.U5

The use of aerial photography in the field of forestry, particularly in making vegetation and land-use surveys and forest inventories, is described and evaluated. The significance of such factors as date or season, time of day, focal length of camera, film and filter combination used, and scale are discussed. Vertical photographs of recent date, taken during the period of normal coloration of the foliage by the modified infrared technique, are recommended. A scale of 1:12,000 and 1:18,000 is judged desirable. Representative area photographs from the Harvard Forest are included.

404 West-Nielsen, G.

[MAPPING FROM THE AIR] Kortlægning fra luften. Dansk Skovfor. Tidsskr., v. 35 (5), May 1950: 271-280, incl. photos, tables. Also in Hedeselskabets Tidsskr., v. 71, 1950: 16-23.

DA-99.8223

Details are given on the photographic survey of 3 Danish plantation areas with varying terrain and forest coverage. Survey accuracy was found to decrease in accordance with the ruggedness of the terrain. Three photographs show stands of Sitka spruce, Austrian fir, Scotch pine, and white pine.

405 Wilson, R. C.

PRELIMINARY INSTRUCTIONS FOR VEGETATION TYPE MAP AND CULTIVATED LAND CLASSIFICATION IN CALIFORNIA FOREST SURVEY. In Proc. of Seminar of Aerial Photography in Flood Control Survey, December 6-8, 1939. Washington, U. S. Dept. of Agric., Flood Control Advisory Comm. [1939], Appendix B (6 p.) DA-1.915F2P94



In forest surveys

Office and field procedures and techniques are presented for the guidance of personnel participating in the California forest survey. The instructions are applicable to the interpretation of contact print aerial photographs on a 1:20,000 scale. The instructions cover the preparation prior to the type interpretation, type interpretation procedures, and the steps in the mapping of broad types from photographs.

See also items 47, 54, 59, 66, 71, 72, 96, 122, 127, 145, 146, 150, 156, 157, 175, 201, 202, 329.

8b. Forest inventory

406 Clason, M.

[AERIAL PHOTOGRAPHS IN CANADIAN FORESTRY] Flyfotografier i kanadisk skogbruk. [English summary] Norsk Skogindus., v. 7 (9), Sept. 1953: 295-301, incl. photos, diagrs., table. TS5800.N78

The aerial photo interpretation and field inventory measurement methods of the Abitibi Power and Paper Company, Ltd., and of the Air Survey Section, Department of Mines and Resources, Forestry Branch, are described. The identification of cover types, of density classes, and of tree height classes is discussed. The effects of film quality, light conditions, stability and speed of the airplane, and reproduction techniques on the quality of the photograph are shown. [17 refs.]

407 Cromer, D. A. N., and J. D. Aitken.

AN AERIAL INVENTORY OF NORFOLK ISLAND PINE. Austral. Forestry, v. 12 (2), 1948: 82-87. DA-99.8Au74

The resources of Norfolk Island in *Araucaria excelsa* were evaluated from air photographs taken at an altitude of 9000 ft. with an 8.25-in. lens, giving an approximate photo scale of 1:13,000. Since the open-grown, isolated trees were inconstant in crown-diameter ratio, a graph was constructed from ground measurement of crown widths and stem diameters. Results were correlated with photo images of known trees. [4 refs.]

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## 8b. Forest inventory

- 406 Clason, M.  
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## Photo interpretation

- 408 Cromer, D. A. N.  
AERIAL SURVEY AND PHOTO INTERPRETATION IN AUSTRALIAN FORESTRY.  
[English summary] Proc. World Forestry Congr., 3d, (Helsinki,  
1949), v. 3, 1950: 143-146. DA-99.9C76912A

The difficulties of detailed photo interpretation of the 1:19,000- and 1:34,000-scale photographs available in Australia are discussed. A new design for a photo interpreter's stereoscope is briefly described. Problems in identification of forest types and species in surveys undertaken in Western Australia, Tasmania, New South Wales, and Norfolk Island are reported. The rain forest is considered the most difficult vegetative type to interpret in Australia. [6 refs.]

- 409 Dimbleby, G. W.  
AIR PHOTOGRAPHS AND FORESTRY. Wood, v. 14 (11/12), 1949: 332-  
334, 370-372. DA-99.82W855

The articles present data on mapping, mensuration, and interpretation of forests.

- 410 Ferguson, J. H. A.  
(FOREST SURVEY AND AERIAL PHOTOGRAPHS) Boschinventarisatie en  
luchtfoto's. [English summary] Tectona (Bogor), v. 37 (5-6),  
May-June 1947: 133-141, incl. table. DA-99.8B65

The combination of aerial photographic interpretation and field work for forest inventory purposes is discussed. Through photo interpretation, the species or species group and the broad site class may be determined, the crown closures estimated, and the tree heights and crown diameters calculated. [7 refs.]

- 411 A FORESTRY SURVEY BY AIR ... PHOTOGRAPHY AND PHOTOGRAMMETRY.  
Timber Canad., v. 9 (9), May 1949: 33-37, chiefly photos and maps.  
SD1.T57

A pictorial account of the steps involved in a typical forest survey conducted by the Photographic Survey Company, Ltd. of Canada is presented. A representative photo analysis data table is included.

- 412 Garver, R. D.  
AERIAL PHOTOGRAPHS IN FOREST SURVEYS. Jour. Forestry, v. 46,  
Feb. 1948: 104-106. SD1.S63

## In forest inventory

The author discusses the status of current activities and new developments in the use of aerial photography in forestry. While aerial photographic methods have produced a great change in forest inventory techniques, ground survey methods will not be completely eliminated. Ground surveys are expected to serve as a check and supplement to aerial photo interpretation to produce complete and accurate forest surveys. Aerial photography at a scale of 1:15,000 appears to be most suitable for this work. While panchromatic film is most widely used, other types such as infrared combined with a minus-blue filter are considered to have possibilities in forestry.

- 413 Grumbine, A. A.  
AERIAL PHOTO TIMBER CRUISING. Southern Lumberman, v. 1946,  
Dec. 15, 1946: 220-222, incl. photos, maps. TS800.S7

An account of methods and equipment is presented in general terms, illustrated by 2 sets of stereo pairs. Sketch maps and classification by forest type, form, size and density classes derived from analysis of the photographs are given.

- 414 Hennibal, L. W.  
AERIAL FOREST PHOTO INTERPRETATION IN INDONESIA. Rimba  
Indonesia, v. 2 (4), Apr. 1953: 139-163; maps, plate. DA-99.8R46

Photo interpretation methods employed in an inventory of tropical mixed hardwood stands in Celebes are described. Identification of species in mangrove forests, marshland forests, and dryland forests is discussed. [16 refs.]

- 415 Hemmings, W. D.  
THE USE OF AERIAL PHOTOGRAPHS IN FORESTRY IN TASMANIA. Austral.  
Timber Jour., v. 15 (4), 1949: 256-259, 261, 263, 265. SD430.A8

The successful use of aerial photographic methods employed by the Tasmanian Forestry Department in surveying the Tasmanian forests are described. Identification of species has been successful within limits. An average error of  $\pm 12$  ft. was incurred in measuring tree heights on 1:16,000-scale photographs. Density classes were determined by tree counts under the stereoscope. The methods used in preparing planimetric and topographic maps from airphotos are described.

Photo interpretation

- 416 Hodge, W. C.  
AIR PHOTO METHODS FOR TIMBER SURVEYS IN THE NORTHERN ROCKY MOUNTAINS. Northwest Sci., v. 26 (3), Aug. 1952: 111-117, DA-470.Si  
incl. table.

The possibilities and limitations of aerial photography in forest survey work in the Northern Rocky Mountain region are discussed. A photo interpretation guide for stand-size classes and species types in the Northern Rocky Mountain region is presented in a table.

- 417 Husch, B.  
A COMPARISON BETWEEN A GROUND AND AN AERIAL PHOTOGRAMMETRIC METHOD OF TIMBER SURVEYING. Thesis, New York State Coll. Forestry, Syracuse, N. Y. [Abstract in Jour. Forestry, v. 45, July 1947: 491]. SDI.S63

A timber survey from vertical aerial photographs was compared with conventional ground timber survey of a typical Adirondack northern hardwood stand. A topographic and type map and a timber estimate were first prepared by field methods. Similar maps were prepared from aerial photographs by means of a radial plot, the Abrams Contour-Finder, and the Saltzman reflecting projector. In the second series of maps the aerial timber estimate was based on the photographic measurement of visible crown diameters of individual trees. Aerial photographic volume tables were prepared using variable, visible crown diameter. The effects of scale and topographic relief displacement on the photographic measurements were recognized. Comparisons were then drawn between the results of the 2 surveys. Required times for all phases of the 2 surveys were noted. The method of aerial photographic timber surveying proved entirely feasible. Modifications to increase the accuracy are suggested.

- 418 Jenkins, J. T.  
AN AERIAL SURVEY IN LABRADOR. Canad. Surveyor, v. 7 (8), April 1942: 2-15, incl. photos, map. TA501.C3

An account is given of an aerial forest survey of a 1500-sq. mi. area in Labrador undertaken to determine the volume of available pulpwood.

- 419 Kelley, J. G.  
A TIMBER SURVEY CONTROLLED BY AERIAL PHOTOGRAPHS. Photogramm. Eng., v. 3, Oct.-Dec. 1937: 4-6, incl. illus. TA593.A2P5

## In forest inventory

Compass (strip) lines are run parallel at regular intervals and sample plots are taken at specified points along the strip lines. The timber volume and the species presence are measured accurately in these sample plots and factors such as drainage, condition of the soil, and presence of fungi and insects are noted. From a compilation of the sample plots, an accurate picture of the area may be drawn and future prospects anticipated.

- 420 Kondrat'ev, A. I.  
 (JOINT USE OF AERIAL PHOTOGRAPHING AND SELECTIVE COUNT TIMBER ESTIMATING METHOD IN MAKING AN INVENTORY OF THE STAND AND TIMBER FUNDS) Sovmestnoe ispol'zovanie aérofotos"emki i vyborochno-perechislitel'noi taksatsii pri inventarizatsii lesnogo i lesosechnogo fondov. [English summary] Trudy Moskov, Nauch.-Issled. Inst. Les. Khoz. Narkomlesa SSSR, v. 1, 1936: 5-49, incl. tables. SD1.K84

The study presents an attempt to combine aerial photographic surveys with a ground tree count in order to obtain more accurate estimates of the timber resources.

- 421 Kramer, P. R., and E. E. Sturgeon.  
 TRANSECT METHOD OF ESTIMATING FOREST AREA FROM AERIAL PHOTOGRAPH INDEX SHEETS. Jour. Forestry, v. 40, Sept. 1942: 693-696, incl. tables. SD1.S63

A method of transecting is reported for estimating the extent of various land-use areas from aerial photograph index sheets. Linear measurements are made along uniformly spaced transect lines superimposed on the photographs by use of a celluloid guide. These measurements are then totalled and converted to figures for ground area. Tests showed that the transect method is at least equal to planimetry in accuracy and about 3.5 times as rapid.

- 422 Krueger, T.  
 USE OF AERIAL PHOTOS FOR TIMBER SURVEYS IN THE ROCKY MOUNTAIN REGION. Jour. Forestry, v. 39, Nov. 1941: 922-925, incl. illus. SD1.S63

The survey method, which incorporates use of aerial photography, is considered especially adapted to regions where forest types are distinct and where mature timber, pole stands, open parks, etc. can be distinguished on photos by the survey.

## Photo interpretation

crew. The mapper observes type boundaries from vantage points in the field, checking these by stereoscopic examination of the photos, and draws the type lines on the photos, also locating all survey corners found in the field.

## 423 Loetsch, F.

(THE USE OF AERIAL PHOTOGRAPHS AS THE BASIS OF STAND INVENTORIES IN THE U.S.A.) Die Anwendung des Luftbildes als Grundlage von Vorratsinventuren in den USA. [English summary] Forstarch., v. 24 (1/3), Mar. 15, 1953: 75-85, incl. diagr. DA-99.8F7723

A review is presented of the use of aerial photography in conjunction with mathematical statistical methods in the field of forest inventory, forest management, and forest aerial surveys. The study includes a discussion of the statistical principles involved in sampling, the classification of forests according to characteristic features, or indicators appearing on aerial photos, the technique of photo interpretation, as well as inventories of timber stock and increments based on photo interpretation with ground control. A bibliography of 50 items is included.

## 424 Losee, S. T. B.

SOME ASPECTS OF INVENTORY SURVEYS FROM AERIAL PHOTOGRAPHS. Forestry Chronicle, v. 25 (4), 1949: 250-256. DA-99.8F7623

A method of combining field and photographic data in use at Abitibi is described. The basic data for volume estimates and for species and diameter groups is obtained from ground work. Data from aerial photographs provide type boundaries, species composition by groups, height of stand, and density of stocking. (Forestry Abstr.)

## 425 Moessner, K. E.

PHOTO INTERPRETATION IN FOREST INVENTORIES. Photogramm. Eng., v. 19, June 1953: 496-507, incl. photos, table. TA593.A2P5

The history of the use of photo interpretation in forest inventories is briefly reviewed. Interpretation techniques used in forest inventories such as classification into relatively homogeneous areas, measurement of these areas, and determination of per-acre volume are discussed. Six aerial photographs are included in the study. [14 refs.]

## In forest inventory

- 426 THE PLACE OF AIR SURVEY IN FORESTRY. Empire Forestry Rev., v. 26  
(1), 1947: 24-29; plates. SD1.E573

The use of aerial photography for forestry purposes by Hunting Aerosurveys, Ltd. is discussed. The methods of survey are described: (1) combination of forest and topographical survey, (2) stock-mapping on existing maps from air photographs, (3) sketching and stock-mapping by visual reconnaissance without maps. Color and granulation are discussed as aids in recognition of tree species.

- 427 Robinson, J. M.  
TRI-CAMERA WINTER PHOTOGRAPHY CUTS FOREST INVENTORY COSTS .  
Jour. Forestry, v. 46, Sept. 1948: 643-645, incl. illus. SD1.S63

The economy in time and cost resulting from the use of three cameras, one mounted vertically and the other two tilted, in aerial mapping are discussed. The advantages of winter oblique photographs, in which the profile outline of the tree provides a major aid in the interpretation of its species, are outlined.

- 428 Rothery, J. E.  
THE USE OF VERTICAL AERIAL PHOTOGRAPHS IN FOREST MAPPING AND  
TIMBER ESTIMATING. Jour. Forestry, v. 33, June 1935: 587-589.  
SD1.S63

New developments in the use of vertical aerial photographs in forest mapping and timber estimating are briefly outlined.

- 429 Samoilovich, G. G.  
[ON THE DETERMINATION OF THE NUMBER OF TREES FROM AERIAL PHOTO-  
GRAPHS] Ob opredelenii chisla derev'ev po aërosnimkam. Les.  
Khoz. (Moskva), Mar. 1940: 25-30, incl. tables. SD1.L395

A review of tree-count studies on aerial photographs conducted by Krutzev (1925), Weisker (1937), Zieger (1928), Neumann (1935), Jacobs (1932), and Eugershoff and Heyde (1924) is presented.



## Photo interpretation

- 430 Samoilovich, G. G.  
 [INTERPRETATION OF AERIAL PHOTOGRAPHS OF FORESTS] Deshifirovanie po aerosnimkam lesov. In Akad. Nauk SSSR. Materialy po deshifirovaniu aerosnimkov. Ed. by A. E. Fersman. [Sbornik. Sverdlovsk?], Izdatel'stvo Akad. Nauk SSSR, 1942: 28-49, incl. illus., tables, diags. TA593.F4

Studies revealed that optimum photo interpretation was obtained from 1:15,000 and 1:25,000 aerial photographs. The height of individual trees and of timber stands was obtained either by measurement of the shadow length, by visual estimate using a stereoscope, or by employing the parallax method. Measurements of crown width and length and estimates of the number of trees per unit area are described. The identification of conifer and deciduous forests on vertical and oblique aerial photographs of varying scale is discussed. Certain characteristic features of each type of the forest vegetation, as it appears on aerial photographs, are outlined. Methods of identifying forest fellings, turned out areas, and wind falls are presented.

- 431 Sarvas, R.  
 [THE IMPORTANCE OF PHOTOGRAMMETRY IN OUR FOREST ECONOMY] Ilmavalokuvauksen merkityksestä metsätaloudessamme. [German summary] Silva fennica, No. 48, 1938: 1-45, incl. photos, diags. SDL.S5

An account of the development of air survey for forestry purposes in Finland is presented. Photos on a scale of 1:10,000 were found best suited to surveys in Southern Finland and photos on a scale of 1:20,000 in Northern Finland. Satisfactory results are reported in the determination of proportional distribution of tree species, tree count, dominant height, mean height, density, and volume count. [32 refs.]

- 432 Seely, H. E.  
 AIR PHOTOGRAPHS AS USED BY THE DOMINION FOREST SERVICE. Jour. Forestry, v. 36, Oct. 1938: 1035-1038. SDL.S63

Analyses of the detail available in aerial photography was extensively applied in mapping and estimating forests. Vertical air photographs taken during winter flights provide an accurate height of the stand when the tree shadows are measured in mixed stands on level ground. The measurement of the tree's displacement, which often supplants the shadow method in softwood stands is basically twice as strong as the method of stereoscopic

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parallax. Procedures employed in volumetric estimates, forest inventory requirements, and the application of the double-vision projector are discussed.

- 433 Seely, H. E.  
TECHNICAL DEVELOPMENT IN AIR SURVEYS AND INTERPRETATION OF FORESTRY DATA THEREFROM. Proc. United Nations Sci. Conf. Conservation and Utilization of Resources (Lake Success, 1949), v. 5, 1951: 20-25. DA-279.9Un32P

A review of the use of aerial photography in the investigation of timber resources is presented. Special forest photography and mapping methods are described. Qualitative information derivable from aerial photographs, particularly species identification, is discussed. [6 refs.]

- 434 Skappel, H.  
[AERIAL PHOTOGRAPHY AS AN AID TO MEASURING AND APPRAISING THE FOREST] Luftfotografiet og fotogrammetrien som hjelpemiddel ved skogmåling og skogtaksasjon. Tidsskr. Skogbruk, v. 44 (11), Jan. 1936: 4-8, incl. photos. SDL.T55

The value of aerial photography in relation to forest surveys is discussed. The procedures and techniques used are briefly described. The importance of training and experience in photo interpretation is emphasized.

- 435 Spurr, S. H., and C. T. Brown, Jr.  
TREE HEIGHT MEASUREMENTS FROM AERIAL PHOTOGRAPHS. Jour. Forestry, v. 44, Oct. 1946: 716-721. SD1.S63

Tree heights may be measured on high quality aerial photographs by either the shadow or parallax method. The former method is considered to be more easily mastered, while the latter method is more accurate and can be used in a wider variety of conditions. The accuracy of tree height measurements on aerial photographs depends upon (1) film emulsion used, (2) scale of photography, (3) focal length of lens, (4) time of day of photography, (5) method of measurement, (6) skill of the observer, (7) shape of the tree being measured, and (8) character of the forest being studied. The average observer should be able to classify forest stands accurately (into 10-ft. height classes when using 1:16,000 scale photographs, into 5-ft. height classes when using 1:12,000 scale photographs) by making use of high-grade modern photographs of the modified infrared type taken with a lens having a focal length of 8.25 in. (Author's Summary)

## Photo interpretation

- 436 Spurr, S. H.  
 UNITED STATES EXPERIENCE IN THE USE OF AIR SURVEYS IN FOREST INVENTORY. Proc. United Nations Sci. Conf. Conservation and Utilization of Resources (Lake Success, 1949), v. 5, 1951: 24-27. DA-279.9Un32P
- A short summary of current U. S. practices in aerial photography for forestry purposes is presented. Studies and tests of photo interpretation techniques and devices are reviewed. The ecological basis of photo interpretation is discussed. [7 refs.]
- 437 Standish, M.  
 THE USE OF AERIAL PHOTOGRAPHS IN FORESTRY. Jour. Forestry, v. 43, Apr. 1945: 252-257, incl. diagr. SD1.S63
- A brief review of the use of aerial photographs with reference to type and scale of photographs, stereoscopy, and the influence of seasonal variations is presented. A detailed discussion of the application of aerial photographs in determining timber volume is included.
- 438 Thomson, A. P.  
 TECHNICAL DEVELOPMENTS IN AIR SURVEY AND THE INTERPRETATION OF FORESTRY DATA THEREFROM -- NEW ZEALAND EXPERIENCE. New Zealand Jour. Forestry, v. 6 (1), 1949: 39-44. DA-99.8C162
- The contribution and use of aerial photography in New Zealand's National Forest Survey are described. The limitations of aerial photographs for making accurate measurements of either total height or crown diameter are indicated. The sub-tropical rain forests of New Zealand are so dense that ground level cannot be seen on the photographs. [5 refs.]
- 439 Thomson, A. P.  
 TECHNICAL DEVELOPMENTS IN AIR SURVEY AND THE INTERPRETATION OF FORESTRY DATA THEREFROM -- NEW ZEALAND EXPERIENCE. Proc. United Nations Sci. Conf. Conservation of Resources (Lake Success, 1949) v. 5, 1951: 27-29. DA-279.9Un32P
- An account of the use of aerial photography for forest survey work in New Zealand is presented. The combination of an extensive ecological survey with forest inventory in New Zealand is discussed. [5 refs.]

## In forest inventory

- 440 Trobitz, H. K.  
 USE OF AERIAL PHOTOGRAPHS IN THE INVENTORY PHASE OF THE FOREST  
 MANAGEMENT JOB. Photogramm. Eng., v. 16, June 1950: 321-324.  
 TA593.A2P5

Studies were conducted to determine the usefulness of a controlled mosaic in evaluating the timber stands around Shelton. The equipment included a Multiscope, stereocomparagraph, and binocular stereoscopes. The greatest single aid furnished by aerial photos was their use as a basis for stratifying forest stands of similar characteristics. Forest stands were segregated on a basis of age, stocking, tree size, volume, and species. The stratification permitted a preparation of a map showing the location of stands of various characteristics. Factors as crown density, crown color, picture-tone, crown-size, relative stand-height, and slope and exposure were used to name the individual stands. The accuracy of photo interpretation was checked wherever possible by known field classification from old typing surveys. A good correlation exists between aerial photo and ground classification methods.

- 441 Wiesehuegel, E. G.  
 AN ECONOMICAL FOREST INVENTORY METHOD. Jour. Forestry, v. 39,  
 Aug. 1941: 672-676, incl. photo, map, table.  
 SD1.863

A method is described for use in areas where planimetric maps or aerial mosaics are available, and where a complete system of secondary roads exists. In the forest inventory of the Tennessee Valley area described, a standard field crew of 2 men with a car was used in traversing the roads and noting type boundaries and gross mensurational data in code on planimetric maps of a scale of about 1:24,000. One-fifth-acre plots were established in representative stands as a check on estimates and to obtain stand-table, growth, and mortality data. An average of 31,000 acres was covered per crew day. Cull studies were made separately by special crews. The field code used makes possible analysis of field data by means of Hollerith punch cards. The cost of this method of survey compares favorably with that of other methods.  
 (Forestry Abstr. in part)

- 442 Wilson, R. W.  
 CONTROLLED FOREST INVENTORY BY AERIAL PHOTOGRAPHY. Timberman  
 (Portland, Ore.), v. 51 (4), Feb. 1950: 42-43, 98, incl. photo,  
 map, table.  
 HD9750.1T65

## Photo interpretation

The usefulness of aerial photography in a survey of an area in Douglas County, Oregon is discussed. A map made by the projection of forest type data from interpreted aerial photographs to a planimetric base is included.

- 443 Wodera, H.  
[DETERMINATION OF TIMBER VOLUME FROM AERIAL PHOTOGRAPHS] Die Holzmassenermittlung nach Luftbildern. Allgem. Forst. Holzwirt. Zeitung, v. 59 (13/14; 15/16), 1948: 109-112; 123-126. DA-99.8AL53

The history of photogrammetry in Austria and Germany is reviewed; the methods used to determine stand volume from aerial photographs are explained.

- 444 Young, H. E.  
TREE COUNTS ON AIR PHOTOS IN MAINE. Photogram. Eng., v. 19, March 1953: 111-116, incl. diagrs., table. TA593.A2P5

The report explores the limits to the interpretation of photos of different scales. Different film filter combinations were used in order to evaluate the mensurational information on airphotos of the spruce-fir region of the northeast.

See also items 36, 144, 157, 440, 441, 469.

## 8c. Forest management

- 445 Braithwaite, J. D.  
CANADIAN AERIAL PHOTOGRAPHY FOR BURMA. Indian Forest Rec. [n.s.]. Silviculture (Delhi), v. 4, 1940: 1-96. DA-99.8In22S

A report on the development of aerial photography in Canada and, in particular, on its use in forest mapping is presented. The author discusses the equipment, methods, and technique used in aerial photography, methods of mapping from vertical and oblique photographs, the use of photographs in mapping and thinning plantations and in stock mapping, the transfer of detail from photograph to map, and the analysis of

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forest conditions as shown by the photograph. Suggestions are made for the use of aerial photography in forest management in Burma. (Forestry Abstr.)

446 Campbell, R. M.  
USE OF AERIAL PHOTOGRAPHS ON LARGE FOREST OWNERSHIP. Jour. Forestry, v. 48, Dec. 1950: 889-890. SD1.863

Aerial photograph utilization by the Scotch Lumber Co. in studying large forest properties in a comparatively short time is described.

447 Choate, G. A.  
AERIAL PHOTOGRAPHS - AN EFFICIENT TOOL IN MANAGEMENT PLAN SURVEYS. Jour. Forestry, v. 47, Dec. 1949: 961-965, incl. diagr. SD1.863

The background and methods of an inventory survey developed to meet the present and probable future forest management requirements are outlined.

448 Clason, M. S.  
[AIR PHOTOGRAPHS INSTEAD OF SKETCHMAPS IN FORESTRY] Flyfoto-grafier istedenfor krokikarter i skogbruket. [English summary] Norsk Skogindus., v. 4 (1), 1950: 17-21, incl. photos. TS800.N78

The methods of a Norwegian firm using air photographs in forestry are described. [5 refs.]

449 Coleman, C. C.  
THE AERIAL PHOTOGRAPHIC MAP - AS AN AID TO THE LOGGER. Loggers Handbook, v. 4, 1944: 75-79, incl. photos. DA-99.76P112La

The use of aerial photography in logging operations at Kinzua, Oregon, is described. The use of aerial photographic maps in the location of main hauling roads and in the planning of a logging transport system is discussed. The advantages derived from the use of aerial photographs are briefly summarized.

450 Dimbleby, G. W.  
AIR PHOTOGRAPHS AND FORESTRY. IDENTIFICATION, PLANNING AND COSTS. Wood, v. 15 (1), Jan. 1950: 11-13, incl. photos. LA-99.82W855

## Photo interpretation

The problems of photo interpretation encountered in the tropical rain-forests of the Gold Coast are discussed and illustrated with photographs. Eighty-eight per cent of the individual trees were identified in a British deciduous forest in a test involving over 500 trees of more than a dozen species. [2 refs.]

- 451 Ehrhart, E. O.  
 THE USE OF AERIAL PHOTOGRAPHY IN FOREST MANAGEMENT. Pennsylvania Dept. Forests Waters Service Letter, v. 10 (3), Apr.-May 1939: 35-39, incl. photo, map. DA-99.9P385

A survey of timberland owned by the Armstrong Forest Company on the Allegheny Plateau is described. Large and small evergreens were distinguished, old growth and second growth hardwoods were recognized, but accurate data on species in mixed hardwood stands were not obtained.

- 452 Gieruszyński, T.  
 [THE APPLICATION OF PHOTOGRAMMETRY IN FOREST MANAGEMENT]  
 Zastosowanie fotogrametrii przy urządzaniu gospodarstw leśnych. Wydawnictwa Pomocnicze i Technicznogospodarcze. Inst. Badawczy Lasów Państwowych. Warszawa, No. 16, 1948, 50 p. SD1.F66

The author describes the application of aerial photography to forest surveying and stock-taking. While ground and aerial surveys should be looked upon as complementary as regards stock-taking, the writer rejects Tischendorf's opinion that the volume of stands estimated by aerial photogrammetry cannot be considered accurate. [50 refs.] (Forestry Abstr.)

- 453 Hagberg, N.  
 [THE AIRPLANE IN FOREST MANAGEMENT] Flygplan vid skogsindelning. Skogen, v. 40 (6-7), June 15, 1953: 76, incl. photos. DA-99.8Gk51

Photographic flights were conducted at altitudes of 50 to 300 m., with most flights at 100 m., at speeds between 60 to 80 m.p.h. Photographs were taken with several cameras, using combinations of filters and films, including infrared and color. Results are summarized.

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- 454 Hallert, B.  
[SOME GENERAL OBSERVATIONS ON PHOTOGRAMMETRY AND ITS USE IN FORESTRY] Några allmänna synpunkter på fotogrammetrien och dess användning inom skogsbruket. Skogen, v. 36 (22), Nov. 15, 1949: 302-303, incl. photo. DA-99.8Sk51

The uses of aerial photography in forest management in Sweden are discussed. Recommended techniques are described.

- 455 Hudson, D. W.  
APPLICATION OF AERIAL PHOTOGRAPHY TO LOGGING OPERATIONS. Forestry Chronicle, v. 20 (3), 1944: 262-269. DA-99.8F7623

An evaluation is made of aerial photographs, used in connection with a stereoscope, to supply specific information to timber operators, to aid preparation of operating plans, and to locate motor, portage and hauling roads, timber cuts, dams, streams and stream improvements. (Forestry Abstr. in part)

- 456 Hyde, R. S.  
USE OF AERIAL PHOTOGRAPHS IN FOREST MANAGEMENT. Pennsylvania Forests Waters, v. 2 (5), Sept.-Oct. 1950: 106-107, 118, incl. photos. DA-99.8P38

The use of aerial photography by the Research Division of the Pennsylvania Bureau of Forests in conducting forest inventories is discussed. Information considered essential to the preparation of working plans for the State Forests includes data on areas, volumes, types, sites, stand conditions, growth, and reproduction.

- 457 Losee, S. T. B.  
THE APPLICATIONS OF PHOTOGRAMMETRY TO FORESTRY IN CANADA. Photogramm. Eng., v. 18, Sept. 1952: 742-753, incl. photos, maps. TA593.A2P5

The application of photogrammetry and photographic interpretation to forestry is discussed concerning such operations as surveys to determine wood volume, reforestation surveys, cut-over surveys, damage surveys, road location surveys, logging plans, and water delivery systems.



## Photo interpretation

458 Luzu, G.

[THE UTILIZATION OF AERIAL PHOTOGRAPHY BY THE FOREST MANAGEMENT SERVICE] Utilisation de la photographie aérienne par le service forestier de gestion. Rev. Forestière Franç., v. 5 (11), Nov. 1953: 755-763. DA-99.8R329

Aerial photography is used by the Forest Management Service of Coblenz to provide data concerning general orientation; description of stands including site, density, and identification of individual species; measurement of distances and area coverage; wood mensuration; and up-to-date working knowledge of the forests.

459 Mattison, L.

[FLOATING OF LUMBER AND THE ROLE OF AVIATION] Lesosplav i aviatsiia. Les. Indus., July 1937: 45-48, incl. photos, tables. HD9765.R88L4

Advantages of using aerial observations and photographic survey to discover the most suitable waterways for the movement of lumber from the forest to processing plants are discussed. Aerial work in the regions of Omega Lake, city of Pudozh, and the White Sea is briefly described. Three aerial photos of unidentified rivers and lakes are included.

460 Moessner, K. E.

THE VALUE OF AERIAL PHOTOGRAPHS TO THE FOREST MANAGER. Proc. Soc. Amer. Foresters, v. 1947, 1947: 377-384, incl. photo, tables. SD1.S612

Various aspects of the usefulness of aerial photographs to the forester are enumerated and discussed. An annotated photo map is included. [4 refs.]

461 Moir, S.

AIR SURVEYS IN LOGGING AND FORESTRY. Loggers Handbook, v. 5, 1945: 189-199, incl. photos, map. DA-99.76P112La

Three methods of conducting aerial forest surveys are described: by sketching, by use of oblique photographs, and by use of vertical photographs. Other topics discussed include scale of photographs, overlap, stereoscope, ground control, timber cruising, seasonal factors, and road location. Representative photographs of timber stands and a forest cover and vegetation type map are included.

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- 462 Spurr, S. H.  
AERIAL PHOTOGRAPHIC TECHNIQUES IN FORESTRY. Photogramm. Eng.,  
v. 14, Dec. 1948: 535-537. TA593.A2P5

The use of photographs in forest mapping, in inventory, and in other phases of forest management is discussed. Photo interpretation techniques using panchromatic and infra-red films are reviewed. The possible use of large-scale continuous-strip photography and low-altitude obliques taken when the deciduous trees are leafless is suggested.

- 463 Stanley, G. W.  
USE OF AERIAL PHOTOS IN MANAGEMENT PLANS. Jour. Forestry, v. 48,  
Sept. 1950: 442-443. SDL.S63

Advantages obtained through the use of photographic data on logging conditions, mill capacities, and present condition of timberlands for proper forest management and planning are briefly outlined.

- 464 Treorey, L. G.  
AERIAL SURVEY IN FOREST MANAGEMENT IN THE PACIFIC COAST FOREST  
REGION. Empire Forestry Rev., v. 31 (2), June 1952: 99-102;  
plate. SDL.E573

The practices and procedures of Photographic Surveys (Western) Ltd. in British Columbia are outlined. A 12-in. camera, either a Williamson-Ross Eagle IX or Fairchild, and the use of a 4 in. to 1 mi. scale, are recommended for best photo interpretation results. Stereoscopic forest interpretation photographs are included which show identification of broad and detailed types, as well as the timber line defined in major valleys and tributaries.

- 465 Van Asch, H. P. D., and H. C. Wickett.  
DISCUSSION ON AERIAL SURVEYING IN ITS RELATION TO FOREST  
RECONNAISSANCE. New Zealand Jour. Forestry, v. 4 (3), 1958:  
141-147. DA-99.8C162

An aerial survey of a timber area in National Park conducted by the N. Z. Aerial Mapping, Ltd. is discussed. The interpretation of aerial photographs for the determination of quantity and quality of species is described. Millable and nonmillable species were distinguished. It was possible to identify tree species only occasionally; it was not possible

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to tell the quality of trees in the bush country. The selection of road routes and mill sites was facilitated through stereoscopic study of the aerial photographs.

## 466 Wilcox, F. R.

THE USE OF AERIAL PHOTOGRAPHS AND AIRCRAFT IN WOODS OPERATIONS. Jour. Forestry, v. 36, Oct. 1938: 1038-1044, incl. table. Also in Photogramm. Eng., v. 6, July-Sept. 1940: 138-143, incl. tables. SD1.S63; TA593.A2P5

The uses of aircraft and aerial photography in map making, timber estimating, forest protection, forest improvements, logging cost estimating, and transportation are briefly discussed. It is considered possible, with the aid of an accurate planimetric map of an area, to make a timber type interpretation from aerial photographs taken at any season other than midsummer.

## 467 Wilcox, F. R.

POSSIBILITIES OF STRATOSPHERE AND SUBSTRATOSPHERE PHOTOGRAPHY IN THE ADMINISTRATION OF FOREST LANDS. Jour. Forestry, v. 37, June 1939: 441-444, incl. illus. Also in Photogramm. Eng., v. 6, Oct.-Dec. 1940: 156-159. SD1.S63; TA593.A2P5

A proposal is made to use high altitude photography applicable to forest administration. The lack of turbulent air currents has a favorable effect on high altitude photography through the reduction of tipping and tilting of the aircraft. Timber typing can be executed satisfactorily for inventory purposes provided the photography is carried out during either spring or fall when contrasting foliage colors exist in the forest crown. Infrared photography should be used in midsummer.

## 468 Wood, K. B.

PRACTICAL AERIAL LOGGING ENGINEERING; REVIEW OF AERIAL MAPPING IN THE LOGGING INDUSTRY. Loggers Handbook, v. 10, 1950: 55-64, incl. photos, map. DA-99.76P112La

The development and use of aerial mapping in the operations of the Pacific Northwest logging industry is discussed. The mapping methods and interpretation equipment employed by several operating companies in conducting timber surveys are described. The accuracy and limitations of aerial topographic maps for timber estimating are reviewed.

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- 469 Wood, K. B.  
 PHOTO INTERPRETATION IN FORESTRY. Photogramm. Eng., v. 19,  
 June 1953: 477-481. TA593.A2P5

Photo interpretation techniques as applied to forest land measurement, measurement of timber, and special survey problems are briefly outlined.

See also items 58, 61, 97, 105, 148, 468.

#### 9. Engineering

(Includes references to permafrost)

- 470 Benninghoff, W. S.  
 USE OF AERIAL PHOTOGRAPHS FOR TERRAIN INTERPRETATION BASED ON  
 FIELD MAPPING. Photogramm. Eng., v. 19, June 1953: 487-490,  
 incl. photos. TA593.A2P5

The use of aerial photographs during field studies of permafrost in Alaska is discussed.

- 471 Black, R. F.  
 POLYGONAL PATTERNS AND GROUND CONDITIONS FROM AERIAL PHOTOGRAPHS.  
 Photogramm. Eng., v. 18, March 1952: 123-134, incl. photos.  
 TA593.A2P5

The significance of polygonal patterns in the photo interpretation of ground conditions is appraised. A bibliography of recent literature on polygonal soils and 10 aerial photographs of such soils are included in the study. [56 refs.]

- 472 Fedorovich, B. A.  
 [THE SIGNIFICANCE OF A GEOGRAPHICAL ANALYSIS OF AN AERIAL PHOTO  
 FOR MILITARY OPERATIONS IN DESERTS] Znachenie geograficheskogo  
 analiza aerosninki dlia boevykh deistvii v pustyniakh. In Akad.  
 Nauk SSR. Materialy po deshifirovaniu aerosnimkov. Ed. by  
 A. E. Persman. [Sbornik. Sverdlovsk], Izdatel'stvo Akad. Nauk  
 SSSR, 1952, p. 72-85, incl. illus., diag. TA593.F4

The use of aerial photography in determining the water supply and general hydrological conditions, the trafficability, the forage and fuel conditions, the availability of air strips,

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feasibility of engineering construction, the camouflage and cover in relation to landscape configuration, and aerological conditions of the desert are discussed. Application of 1:17,000-scale aerial photos is considered satisfactory for military purposes.

- 473 Frost, R. E.  
IDENTIFICATION OF GRANULAR DEPOSITS BY AERIAL PHOTOGRAPHY.  
Proc. Nat. Res. Council, Highway Res. Board, v. 25, 1945:  
116-129, incl. photos. TEL.N45

Techniques used to locate sand and gravel deposits by use of photographs are briefly discussed.

- 474 Frost, R. E., and O. W. Mintzer.  
INFLUENCE OF TOPOGRAPHIC POSITION IN AIRPHOTO IDENTIFICATION  
OF PERMAFROST. Bull. Nat. Res. Council, Highway Res. Board,  
No. 28, 1950: 100-121, incl. photos, diagrs. TE7.N28

The use of aerial photographs to determine the presence or absence of detrimental permafrost is discussed. Permafrost and the factors affecting its existence are discussed in relation to climate and topographic position. The types of topography discussed include uplands, transition zones and valley fill, terraces, and flood plains. The principal criteria for the photo interpretation of permafrost are given. It is concluded that the influence of topographic position is the most important factor in identification of permafrost in subarctic regions. [31 refs.]

- 475 Fulton, W.  
THE USE OF AERIAL PHOTOGRAPHY IN HIGHWAY SURVEYING. Canad.  
Surveyor, v. 8 (4), Apr. 1944: 13-17. TA501.C3

The application of aerial photography to highway planning in northern Ontario is discussed. Highway location engineers were trained to interpret their own photos. A study of vegetation and soil characteristics indicated that certain types of soil are peculiar to definite types of vegetation. Poplar growth was reported to indicate dry, well-drained soil; Jack pine indicates sand and gravel formation, also well-drained; dense growths of small size spruce and tamarack usually indicate muskeg; large spruce indicates fair terrain conditions, and alder and willow may be interpreted as indicating wet ground.

In engineering

- 476 Hittle, J. E.  
THE APPLICATION OF AERIAL STRIP PHOTOGRAPHY OF HIGHWAY AND  
AIRPORT ENGINEERING. Proc. Nat. Res. Council, Highway Res.  
Board, v. 26, 1946: 226-235, incl. photos. TEL.N45

The study presents a method of gathering pavement performance data by the use of aerial strip photography.

- 477 Hittle, J. E.  
AIRPHOTO INTERPRETATION OF ENGINEERING SITES AND MATERIALS.  
Photogramm. Eng., v. 15, Dec. 1949: 589-603, incl. illus.,  
tables. TA593.A2P5

The interpretation of aerial photographs is considered to be a progressive translation whose diagnostic features include terrain, position, topography, drainage, and erosion features, color tones, and vegetation-climate effects. These features have significance when considered in terms of landforms and pedologic concepts. The relation of soil and rock materials to landforms and pedology permits the interpretation to be completed in terms of anticipated engineering problems. A brief description of the photo interpretation method and technique is presented, the limits of application are cited, and some significant applications and advantages are discussed.

- 478 Miller, S.  
HIGHWAY LOCATIONS BY AERIAL PHOTOGRAPHY IN NEW JERSEY. Photo-  
gramm. Eng., v. 13 (2), June 1947: 231-233. TA593.A2P5

The use of aerial photographs in highway engineering operations is briefly outlined and illustrated with examples drawn from various highway projects in New Jersey. Aerial photo interpretation facilitates the study of alternative alignments as well as the selection of a preliminary alignment of a new route previous to the extensive surveys and necessary plotting of topography; the study of secondary stages of design work (need of underpasses, overpasses, etc.); the adaptation of roadways to the terrain and scenery (parkways); the preparation of highway maps; and the preparation of soils data.

- 479 Pryor, W. T.  
AERIAL SURVEYING ON THE ALASKA HIGHWAY, 1942. Public Roads,  
v. 24, Jan.-Mar. 1947: 275-290, incl. illus., tables, maps.  
TE23.P86

## Photo interpretation

The location of the Alaska Highway could not be established by ground survey because of harsh climate, difficult topography, and limited time. Aerial methods of surveying eliminated the difficulties of ground operations and enabled engineers to examine unexplored territory quickly. During the fall of 1941 the Army Air Corps took many aerial oblique photographs at an average elevation of 20,000 ft. with a camera having a 6-in. focal length lens; generally the photos were high-oblique. The development of trimetrogon photography make it possible to take three photographs simultaneously producing a left and a right high-oblique with a vertical between them. Detailed studies were made with vertical photographs taken with a 6-in. lens camera from 10,000 ft. altitude at a scale of about 4 in. per mile. Slides and drainage channels could be seen clearly. By stereoscopic study of aerial photographs it was possible to make topographic features fit into their proper elevational position. The stereoscopic studies also served to identify soils and drainage conditions from their relation to vegetation and topography.

- 480 Raup, H. M., and C. S. Denny.  
 PHOTOINTERPRETATION OF THE TERRAIN ALONG THE SOUTHERN PART OF  
 THE ALASKA HIGHWAY. Bull. U. S. Geol. Survey, 963-D, 1950:  
 95-135, incl. photos, maps, diagrs., tables.  
 DGS-GS14-290

The combined data and methods of geology and botany were applied to the terrain interpretation in British Columbia and southeastern Yukon, both representative of the northern regions. The uses and limitations of tree species and associated shrubs as indicators of such ground characteristics as soil texture, drainage, presence or absence of permafrost, stability of slopes, and trafficability are described. A key for the identification of the vegetation seen on aerial photographs is given. [8 refs.]

- 481 Sager, R. C.  
 AERIAL ANALYSIS OF PERMANENTLY FROZEN GROUND. Photogramm.  
 Eng., v. 17, Sept. 1951: 551-571, incl. illus., map.  
 TA593.A2P5

Closely associated geomorphological, pedological, ecological, and cultural factors affecting the interpretability of permanently frozen ground are briefly reviewed. The polygons and related terrain features which serve as a valuable aid in aerial photographic interpretation are described and illustrated.

## In engineering

- 482 Simonson, W.  
NEW ROLE OF AERIAL PHOTOGRAPHY. Civil Eng., v. 15 (5), May  
1945: 223-226, incl. photos, maps, tables. TAL.C452

Aerial photographs are shown to be useful and economical in the surveying for, and design of highways. The advantages of large-scale aerial photographs used in combination with ground surveys are cited. The study includes a table giving map scales for highway design use, and an analysis of map scales for aerial photographs and photogrammetric maps.

- 483 Tham, P.  
[THE PROJECTED ATLANTIC AIRPORT, LAKE HALM, MAPPED PHOTOGRAM-  
METRICALLY] Planerade Atlantflygfältet "Halmjön" fotogram-  
metriskt kartlagt. Globen, v. 25 (3), 1946: 34-37, incl.  
photo, map. GA101.G6

The use of aerial photographs in the planning of the Swedish international airport at Lake Halm is described. The saving in time and money by this method is stressed, and the special problems encountered are discussed.

- 484 Witenstein, M. M.  
PRINCIPLES OF APPLICATION OF PHOTO-INTERPRETATION TO ENGINEER  
INTELLIGENCE. Photogramm. Eng., v. 17, June 1951: 349-355,  
incl. maps. TA593.A2P5

Reference standards or criteria are established for aspects of engineer intelligence which can be identified easily on aerial photographs. Based upon these criteria a system of photo study, comparative analysis, is developed. An example of photo interpretation criteria for highways is presented.

See also items 169, 182, 190, 204, 237, 313-319, 322, 324,  
326-328, 330-334, 336-339.

## 10. Military science

- 485 [AN AERIAL-GEOGRAPHIC DESCRIPTION OF THE BALKAN COUNTRIES. VOLUME 1:  
THE EASTERN BALKAN PENINSULA] Luftgeographische Beschreibung  
der Balkanländer. 1 Band: ost-Balkan. Berlin, [Deutsche Luft-  
waffe], 1 v., incl. photos, maps, diags., tables.  
DR10.G43



## Photo interpretation

The study presents a selection of about 210 annotated aerial and ground photographs, and approximately 70 maps of the most important geographic and military features of southern Rumania, Bulgaria, and European Turkey. Data are included on the more important landforms, the vegetation cover, the climatic conditions, and the location of airfields.

- 486 [AN AERIAL-GEOGRAPHIC DESCRIPTION OF THE BALKAN COUNTRY. VOLUME 2: THE SOUTHERN BALKAN PENINSULA] Luftgeographische Beschreibung der Balkanländer. 2 Band: Süd-Balkan. Berlin, [Deutsche Luftwaffe], incl. photos, maps, diagrs., tables. DR10.G43

The study presents a selection of about 300 annotated aerial and ground photographs and about 90 maps depicting the most important geographic and military features of Albania, the southern part of Yugoslavia, the western part of Bulgaria, and Greece. Data are also included on the more important landforms, vegetation cover, climatic conditions, and location of airfields.

- 487 AIR PHOTOGRAPHY; ORGANISATION AND TRAINING. London, Air Ministry (Gt. Brit.), H. M. Stationery Office, 1940, [108 p.], incl. illus., maps, tables, plates. TR810.G8

The manual discusses the purpose and value of aerial photography, general and unit organization, methods of photographic flying including flying for air survey purposes, for the Army and the Navy, training of personnel, and interpretation of aerial photographs.

- 488 Clark, W., and R. R. Arnold. MILITARY USES OF PHOTOGRAPHY FROM THE AIR. Milit. Engineer, v. 33, Sept. 1941: 357-362, incl. photos. TA1.P85

Various aspects of aerial photography, such as mapping and intelligence, are briefly reviewed. Four aerial photographs are included.

- 489 Coleman, C. G. NAVAL PHOTOGRAPHIC INTERPRETATION. Photogramm. Eng., v. 18, June 1952: 486-489. TA593.A2P5

The structure and scope of naval photographic interpretation are briefly reviewed.

## In military science

- 490 Colwell, R. N.  
 AERIAL PHOTOGRAPHIC INTERPRETATION OF VEGETATION FOR MILITARY PURPOSES. Photogramm. Eng., v. 14, Dec. 1948: 472-481, incl. illus. TA593.A2P5

The recognition of vegetation types on aerial photos is based on the interpretation of such characteristics as size, shape, tone, texture, shadow, and topographic location. All the characteristics of any given vegetation element are not of equal value in its photo identification. Confirmatory characteristics must be used; there are usually 1 or 2 salient features of greatest diagnostic value in the identification of any given vegetation element. Aerial photography employing panchromatic film at scales smaller than 1:10,000 seldom permits adequate identification of individual species of vegetation. An increase in scale to greater than 1:10,000 permits the use of a tree's branching characteristics and accentuates textural differences in foliage. Optimum results were obtained from black and white photography which accentuates tonal contrasts between species by capitalizing on differences in their foliage reflectance spectra.

- 491 Conklin, G. N.  
 INTERPRETING THE MILITARY AERIAL PHOTOGRAPH FOR TACTICAL USE. Photogramm. Eng., v. 20, June 1954: 549-550. TA593.A2P5

Although background training in earth sciences and the use of photographic keys and complex instruments are of great value to photointerpreters, these are of secondary importance in tactical photo interpretation. The military value of the photo interpreter is based upon his facility to transmit in the minimum of time the immediately pertinent and required tactical information derived from a large volume of photographs. The technique necessary to perform this function is gained through constant training and practice. [2 refs.]

- 492 [DATA ON PHOTOGRAPHIC TOPOGRAPHY] Svedeniia iz fototopografii. In Russia (1923-USSR) Armia. General'nyi Shtab. Otdel topograficheskoi sluzhby. Voennaia topografiia. Moskva, Voenizdat, 1939, p. 159-180, incl. diagrs.; 18 plates (23 aerial photographs) UG470.R95

The manual outlines the importance of photographic study of topography in military operations, the concept of central projection, the classification and scale of aerial photographs.

## Photo interpretation

The treatment of interpretation of aerial photographs includes a discussion of general principles and of topographic and tactical interpretation. Methods of orientation and mounting of aerial photographs, the use of such photographs in visual observation, the transfer of data from photographs to maps, and panoramic photography are also discussed.

- 493 Fischer, E.  
[AERIAL PHOTOGRAPHY] Das Luftbildwesen. (Der Dienst in der Luftwaffe, Bd. 2)., verb. Aufl. Berlin, Bernard and Graefe, [1938], 267 p., incl. illus., maps, diagr., tables.  
TR810.F5

The manual includes a discussion of aerial photography and its possible uses, the organization, responsibilities, and duties of a military photo reconnaissance section; preparation and execution of photo reconnaissance flights; photographic equipment, materials, and techniques; details of photo interpretation mechanics; cameras, their maintenance and mounting; administrative methods, records and record handling.

- 494 Frank, A. F. W.  
MAP AND AERIAL PHOTOGRAPH READING, COMPLETE. Harrisburg, Military Service Publishing Co., 1951, 165 p., incl. photos, map, diagrs., tables.  
UG470.M32

The manual covers descriptions of various map projections, an introduction to map reading, location, distance, scale and time, elevation and relief, direction, map reading in the field, ground navigation by dead reckoning, and foreign military maps. The discussion on aerial photograph reading includes an introduction to this subject, aerial photograph identification, stereovision, and restitution of aerial photographs.

- 495 Fuller, T. A.  
INTERPRETATION OF AERIAL PHOTOGRAPHS BY COMPANY OFFICERS. Milit. Engineer, v. 34, Jan. 1942: 26-29, incl. photos, diagr.  
TA1.P85

The value of aerial photographs as map substitutes, and uses of photo interpretation in advance reconnaissance for general military engineering, as well as for special tactical engineering missions, and in counter-intelligence measures are discussed. Four aerial photographs are included.

## In military science

- 496 Galkina, E. A.  
 [METHODOLOGY EMPLOYED IN INTERPRETATION OF AERIAL PHOTOGRAPHS  
 OF MARSHLANDS USING THE FOREST ZONE OF THE USSR AS AN EXAMPLE]  
 Metodika deshifirovaniia aerofotosnirkov s bolotnykh massivov  
 na primere lesnoi zony SSSR. Akad. Nauk SSSR. Otd. Biol. Nauk,  
 Nauch.-Issled. rabot [for 1941-1945], 1945: 44-46.  
 QH301.A357

Information from a military manual on photo interpretation  
 of aerial photographs of marshes is summarized.

- 497 Hack, J. T.  
 PHOTO-INTERPRETATION IN MILITARY GEOLOGY. Photogramm. Eng.,  
 v. 14, Dec. 1948: 488-496. TA593.A2P5

Aerial photographs can furnish the following information  
 relative to military geology: the presence of geological  
 deposits (dunes, spits, beaches, moraines, etc.), the topog-  
 raphy, the pattern and completeness of drainage, the vegetation  
 and its patterns, and the adjustment of cultural patterns to  
 the terrain. Natural and cultivated vegetation commonly  
 reflects ground conditions. Certain plants and plant associa-  
 tions, recognized and delineated on aerial photographs, are  
 useful as indicators of drainage conditions and of underlying  
 rock types. Relationships between rock formations and kinds  
 of vegetation are reviewed.

- 498 Hunt, C. B.  
 MILITARY GEOLOGY. In Geol. Soc. Amer. Application of Geology  
 to Engineering Practice; Berkeley Volume. [New York], 1950,  
 p. 295-327, incl. maps, tables; maps. QE33.G36

Techniques and uses of geology applicable to the solution  
 of military problems are considered. Map interpretation,  
 especially of geologic and topographic maps, and interpreta-  
 tion of aerial photographs are briefly discussed. [14 refs.]

- 499 Niederheitmann, A.  
 [ELEMENTARY COURSE IN AERIAL PHOTOGRAPHY] Curso elemental de  
 fotografia aérea. Guatemala, Cuerpo de Aeronautica Militar,  
 1943, 222 p., incl. photos, diagrs. TR810.N5

An elementary and general treatise on aerial photography,  
 designed primarily for use of the military, is presented.  
 Aspects of photo interpretation are discussed.

## Photo interpretation

- 500 Niederheitmann, A.  
[ARMY MANUAL OF AERIAL PHOTOGRAPHY] Manual Militar de  
fotografía aérea. Guatemala, Fuerza Aérea, 1949, 485 p., incl.  
photos, diags., tables. TR810.N52

Equipment and processes of aerial photography are de-  
scribed briefly, and its application in map-making and in  
military intelligence is outlined. Topographic interpretation  
is discussed on p. 287-314.

- 501 Quackenbush, R. S.  
TERRE DIMENSIONAL VECTOGRAPHY. In Amer. Soc. Photogramm.  
Manual of Photogrammetry. New York, Pitman Publishing Co.,  
1945, p. 321-326, incl. photos. TA593.A63

The basic principle of vectography, the processing of  
stereograms, and some military applications of vectography are  
briefly outlined.

- 502 Stepanov, N. N.  
[PRINCIPLES OF AERIAL PHOTOGRAPHIC SURVEY] Osnovy aérofotos"emki.  
In his Inzhenernaya geodeziya, Moskva-Leningrad, Izdat. Narkom-  
khoza RSFSR, 1943: 282-308, incl. photos, diags., tables;  
photos. TA545.S65

A discussion is presented concerning the importance of  
aerial photographic reconnaissance to military operations, the  
materials required for such photographic work, general charac-  
teristics of the aerial photograph, and aerial surveying  
operations and planning. The survey includes such topics as  
general principles of photo interpretation, topographic and  
tactical interpretation, perspective, and other aspects of the  
mechanics of interpretation and mission handling. Six aerial  
photos are appended.

- 503 Stroh, R.  
"READING" AERIAL PHOTOS. Popular Photography, v. 11 (6), Dec.  
1942: 22-23, 200-202, incl. photos. TR1.P8845

The use of aerial photographs in military intelligence and  
the work of the photo interpreter are described.

- 504 TACTICAL INTERPRETATION OF AIR PHOTOS. Washington, D. C., Dept.  
of the Army, Tech. Manual No. 30-246, Feb. 9, 1954, 71 p.;  
plates. Unclassified

## In military science

This manual covers the interpretation of major items of military activity normally encountered by Army photo interpreters in the field. It consists of 1043 photographs and figures arranged in a series of photo interpretation keys on specific subjects. A bibliography of 161 titles is included in the manual.

- 505 Talley, B. B.  
MAPPING BY THE USE OF AERIAL PHOTOGRAPHS. Milit. Engineer,  
v. 27, Sept.-Oct. 1935: 357-360, incl. photos, diagr.  
-TAL.P85-

Various phases of mapping with the aid of aerial photography are discussed.

- 506 Thomas, H. H.  
RECENT DEVELOPMENTS IN AIR PHOTOGRAPHY. Nature (London),  
v. 156, Oct. 6, 1945: 409-411. Q1.N2

The article presents a general review of the use of aerial photography for intelligence work during the war; some account is given of technical developments. Various subjects investigated by aerial photography are mentioned, and the interpretation of prints is described. [2 refs.]

- 507 Trorey, L. G.  
HANDBOOK OF AERIAL MAPPING AND PHOTOGRAMMETRY. Cambridge  
[Eng.] Univ. Press, 1952, 178 p., incl. photos, maps, diagrs.,  
tables; plates. TA593.T7

The manual describes aerial mapping techniques found practical during the World War II. Standard mapping procedures of the Royal Canadian Engineers are briefly outlined. [19 refs.]

- 508 Truesdell, P. E.  
RESEARCH ASPECTS OF MILITARY PHOTO INTERPRETATION. In Comm.  
on Geophys. and Geogr., Res. and Development Board, Washington,  
D. C., SELECTED PAPERS ON PHOTO GEOLOGY AND PHOTO INTERPRETATION.  
Apr. 1953, p. 215-218. (Rept. no. GG 209/1; Unclassified)  
AD 81996 [TID-L475]

The role of the Research and Analysis Division of the Naval Photographic Interpretation Center in investigating and developing photo interpretation techniques is briefly discussed.

Photo interpretation

- 509 Whitmore, F. C., Jr.  
THE DILEMMA OF MILITARY PHOTO INTERPRETATION. Photogramm. Eng.,  
v. 19, June 1953: 425-427. TA593.A2P5

Major obstacles to the maximum utilization of photo interpretation in the solution of military problems are briefly discussed.

- 510 Wilson, H.  
THE INTERPRETATION OF AIR PHOTOGRAPHS. Aeronaut., v. 3, Dec.  
1940: 26-31, incl. photos, maps. TL501.A5512

The use and interpretation of aerial photographs for military intelligence is discussed. The account is based largely on aerial photo interpretation work as set forth in German Air Ministry regulations. Shadow effects, landmarks, water courses, scale effect, and other aids to interpretation are described. Examples of vertical and oblique photographs are included.

See also items 19, 25, 28, 29, 32, 35, 131, 160, 229, 271, 288,  
472.

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