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REMOTE SENSING FOR FOREST FIRE CONTROL

Sponsored by

DIVISION OF FOREST FIRE AND ATMOSPHERIC SCIENCES RESEARCH
USDA FOREST SERVICE

Seminars at: Southern Forest Fire Laboratory
Macon, Georgia - May 4-6, 1971

Western Forest Fire Laboratory
Riverside, California - May 25-27, 1971

Northern Forest Fire Laboratory
Missoula, Montana - June 1-3, 1971

PURPOSE

The scheduling of these seminars is prompted by the rapid advances in developing new remote sensing technology for the detection and mapping of fires and for the sensing of lightning and other weather factors. This technology already has demonstrated a high potential for effective use in fire control operations. Therefore, we want to give it maximum visibility and assist all interested fire control agencies in preparing for effective applications in resource protection and management.

The seminars are designed to acquaint key members of fire control organizations with the state of the art in fire remote sensing. The program is tailored to the needs and interests of State fire control supervisors, regional and national fire staff officers and managers of forest protection units. New remote sensing equipment and techniques will be demonstrated including airborne systems for fire detection and mapping.

The keys to reducing fire suppression and damage costs lie in prevention, early detection, quick initial attack and pre-fire treatment and planning. Recent advances in remote sensing technology offer opportunities for greatly improving our ability to detect fire-causing lightning and fires in their latent stages, to assist initial attack forces in locating fires that are not easily seen visually, and to determine the perimeter, relative intensity, and location of spot fires on large conflagrations when visual methods are ineffective because of smoke or darkness. In this seminar we will attempt to provide you with the physical and theoretical background required to understand these new techniques, to describe their capabilities and limitations, and to suggest when conventional or remote sensing techniques are most applicable.

Although we are not in a position to provide you with definitive answers on when and where to apply each of these techniques, we hope that our experience will be useful to you in establishing guidelines for use in your local problem areas.

CLASS SCHEDULE

- Tuesday: 0830-1000 I. THE SCOPE OF REMOTE SENSING APPLICATIONS TO FOREST FIRE CONTROL
Stanley N. Hirsch, Project Leader
Project Fire Scan
Northern Forest Fire Laboratory
- 1030-1200 II. LIGHTNING SENSING
Project Skyfire Representative
Northern Forest Fire Laboratory
- 1330-1600 III. VISUAL DETECTION SYSTEMS
Robert F. Kruckeberg, Research Forester
Project Fire Scan
Northern Forest Fire Laboratory
- 1600-1730 IV. PROJECT FIRE SCAN
Stanley N. Hirsch
- Wednesday: 0800-1100 V. PHYSICAL PRINCIPLES INVOLVED IN REMOTE SENSING
Ralph A. Wilson, Research Physicist
Project Fire Scan
Northern Forest Fire Laboratory
- 1100-1200 VI. THE FIRE SPOTTER
Robert F. Kruckeberg
- 1330-1430 VII. FIRE SCAN II FIRE SURVEILLANCE EQUIPMENT
Stanley N. Hirsch
- 1500-1700 VIII. FIRE DETECTION EXERCISE
Robert F. Kruckeberg
- 1900-2000 IX. IR FIRE MAPPING
Stanley N. Hirsch
- 2000-2100 X. FIRE MAPPING EXERCISE
Robert F. Kruckeberg
- Thursday: 0830-1030 XI. OPERATIONS RESEARCH METHODS IN FIRE DETECTION
Dr. Peter H. Kourtz, Canadian Forestry Service, Forest Fire Research Institute, Ottawa, Canada
- 1100-1200 XII. PLANNING A COMBINATION DETECTION SYSTEM
Robert F. Kruckeberg
- 1330-1600 XIII. CONTINUATION OF XII
Staff - Group Participation

CONTENTS

- I. THE SCOPE OF REMOTE SENSING APPLICATIONS TO FOREST FIRE CONTROL
 1. "Introduction" by Stanley N. Hirsch
 2. Outline - "The" Fire Detection Problem
 3. List of Project Fire Scan Publications, 1962 to present
 4. Reprint - "Forest Fire Detection Systems" by Stanley N. Hirsch
- II. LIGHTNING SENSING
 1. Reprint - "Lightning Effects on the Forest Complex" by Alan R. Taylor
 2. Reprint - "Weather Modification and Forest Fires" by Donald M. Fuquay
 3. Reprint - "Lightning Suppression" by Donald M. Fuquay
 4. Reprint - "Remote Sensing of Lightning in Forest Fire Research" by R. G. Hawe and D. M. Fuquay
- III. VISUAL DETECTION SYSTEMS
 1. Abstracts of Forest Fire Detection Literature - compiled by Robert F. Kruckeberg
 2. "A Bibliography on Forest Fire Detection, May 1971" - compiled by Robert F. Kruckeberg
- IV. PROJECT FIRE SCAN
 1. Reprint - "Airborne Infrared Forest Fire Detection System: Final Report" by R. A. Wilson, S. N. Hirsch, B. J. Losensky, and F. H. Madden
 2. Excerpt from "The Bispectral Forest Fire Detection System" by S. N. Hirsch, R. F. Kruckeberg, and F. H. Madden. Paper to be presented at Seventh Symp. Remote Sensing Environ., May 1971.
 3. Reprint - "An Operational Test of an Infrared Fire Detection System" by B. John Losensky
 4. Reprint - "Airborne Infrared Line Scanners for Forest Fire Surveillance" by S. N. Hirsch and F. H. Madden
 5. Table - "Summary of Project Fire Scan Program, 1962-1970"

V. PHYSICAL PRINCIPLES INVOLVED IN REMOTE SENSING

1. "Introduction" by Ralph A. Wilson
2. Brochure - "Infrared Systems Highlighting IR Mappers and Real-Time IR Sensors" by Texas Instruments, Incorporated.
3. Reprint - "Some Fundamentals in Non-Contact Electromagnetic Sensing for Geoscience Purposes" by Frank E. Kinsman (from Third Symp. Remote Sensing Environ. Proc. 1964)
4. Reprint - "Interpreting Local Geology From Radar Imagery" by Hubert O. Rydstrom (from Fourth Symp. Remote Sensing Environ. Proc. 1966)
5. Reprint - "Radiophase - A New System of Conductivity Mapping" by A. R. Barringer and J. D. McNeill (from Fifth Symp. Remote Sensing Environ. Proc. 1968)
6. Reprint - "Passive Microwave Sensors for Satellites" by J. W. Sherman, III (from Sixth Symp. Remote Sensing Environ. Proc. 1969)

VI. THE FIRE SPOTTER

1. "Introduction" by Robert F. Kruckeberg
2. "Fire Spotter Instruction Manual" by Barnes Engineering Co.
3. Ground Coverage Table for Fire Spotter

VII. FIRE SCAN II FIRE SURVEILLANCE EQUIPMENT

1. Reprint - "Application of Infrared Scanners to Forest Fire Detection" by Stanley N. Hirsch
2. Chart - Bispectral Equipment Costs

VIII. IR FIRE MAPPING

- ~~1. Reprint - "Project Fire Scan Fire Mapping Final Report" by S. N. Hirsch, R. L. Bjornsen, F. H. Madden, and R. A. Wilson~~
2. Chart - Getting the Data to the Ground
3. Chart - Getting the Information to the Ground

IX. OPERATIONS RESEARCH METHODS IN FIRE DETECTION

1. Reprint - "Analysis of an Infrared Forest Fire Detection System" by Dr. Peter H. Kourtz