S-390

FIRE BEHAVIOR

UNIT III

TOPOGRAPHY AND FIRE BEHAVIOR

STUDENT WORKBOOK

for individual study

1981

The NATIONAL WILDFIRE COORDINATING GROUP consists of representatives from: United States Department of Agriculture Forest Service; United States Department of Interior Bureau of Indian Affairs; Bureau of Land Management, Fish and Wildlife Service, and National Park Service; and National Association of State Foresters.

ACKNOWLEDGEMENTS

Contributions to this course were made by numerous individuals within agencies represented in the National Wildfire Coordination Group. Special recognition should be given to individuals within these organizations:

US Forest Service, Region 1, Missoula, MT.

Northern Forest Fire Laboratory, Missoula, MT.

Montana State Division of Forestry, Missoula, MT.

National Weather Service, Boise, ID. & Missoula, MT.

Bureau of Land Management, BIFC, Boise, ID.

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COURSE SCHEDULE

SELF-STUDY UNITS		APPROXIMATE HOURS *
0	Student Guide**	1/2
I	The Fire Environment**	2 1/2
II	Fuels Classification**	3
III	**Topography and Fire Behavior**	**2 ½**
IV	Temperature-Moisture Relationship	2 1/2
V	Fuel Moisture	3
VI	Local and General Winds	2 1/2
VII	Atmospheric Stability and Instability	3
VIII	Keeping Current with the Weather	2 1/2
IX	Extreme Fire Behavior	3
X	Fire Behavior Affects Fireline Tactics	3
XI	Fire Behavior Predictions	4
	Total Review Period for all Units	3
CONTROLLED ACTIVITY		
--	Final Examination	2 1/2

* Includes time for unit tests or evaluations, but not for break periods.

** Prerequisite units to this unit.

INSTRUCTIONS TO STUDENTS

This unit has been designed for self-instruction. In addition to the workbook, you will need an audio cassette tape player and the cassette tape for the unit, or you may use the reference text.

The workbook section contains a series of exercises and note-taking items which help you interact with the materials. You are asked to write down certain information as provided by the narrator on tape. If the tape proceeds too fast for note taking, manually pause it. An audible "beep" will signal when you are to stop the tape and perform an assignment. When you complete an assignment, restart the tape as instructed in the workbook. Follow the workbook sequence. Do not go ahead until instructed.

FOR UNFAMILIAR TERMS USE THE GLOSSARY IN THE STUDENT GUIDE.

START THE TAPE, OR TURN TO THIS UNIT IN THE REFERENCE TEXT

UNIT OBJECTIVES

UPON COMPLETION OF THIS UNIT YOU WILL BE EXPECTED TO:

1. Explain how the factors of topography affect fuels and their availability for combustion.

2. Explain how topography can affect the direction and rate of spread of fires.

3. Describe how changes in fuels and topography can provide barriers or partial barriers to the spread of fires.

4. List five mechanical effects topography can have on weather.

5. Describe how topography induces several local wind conditions including slope and valley winds.

6. Explain the "chimney effect" in canyon topography.

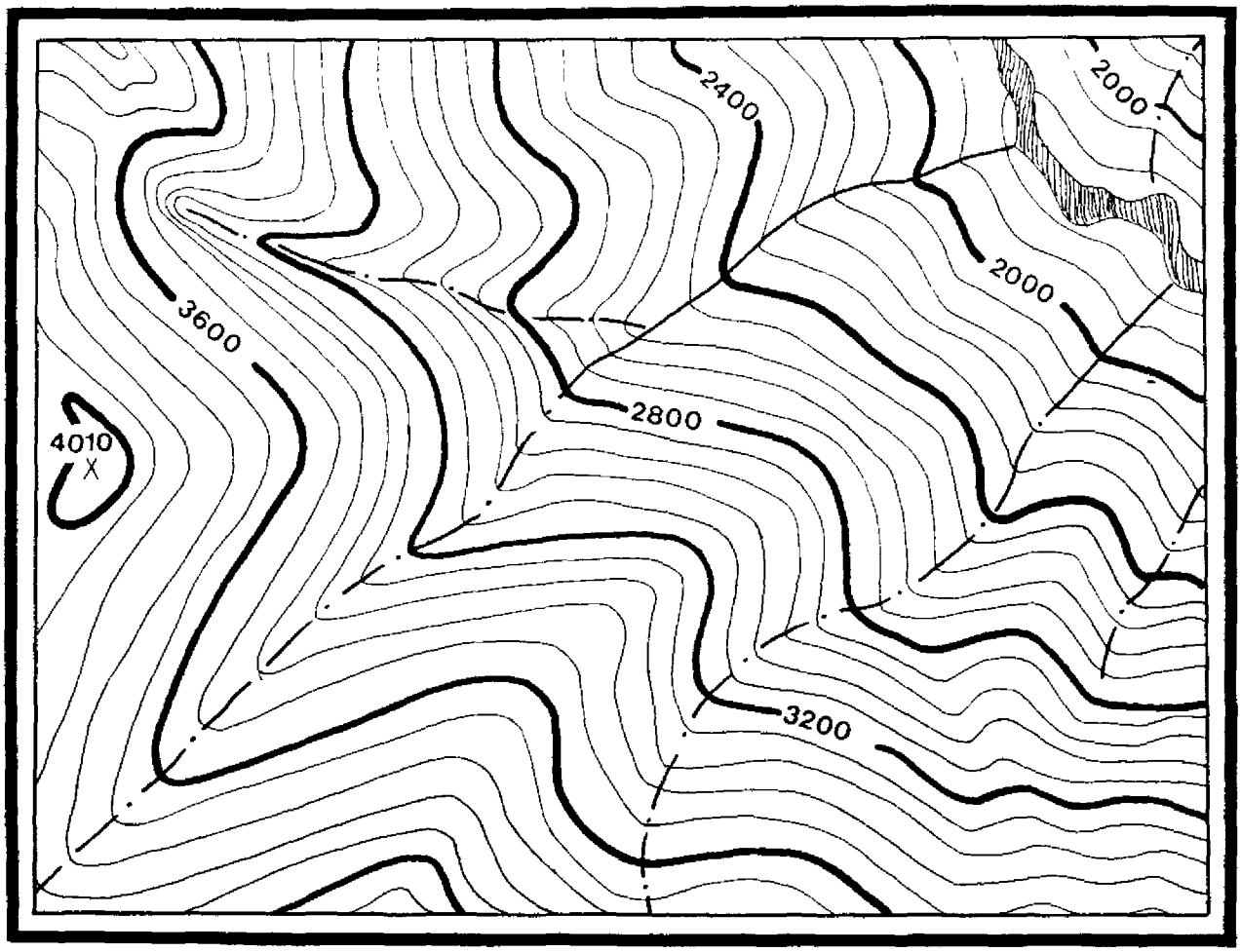
*7. Determine the slope precent from topographic maps, and describe how slope percent is determined or estimated in the field.

* Key skill objective

RESTART THE TAPE

TOPOGRAPHY AND THE FIRE ENVIRONMENT

FIGURE 1 — TOPOGRAPHIC FEATURES



TOPOGRAPHY AFFECTS THE FIRE ENVIRONMENT BY:

- Altering the normal heat transfer processes, and
- Modifying general weather patterns, thus
- Producing localized weather conditions, that
- Influence the type of vegetation (fuels). These, in turn,
- Result in microclimates with localized moisture conditions.

TOPOGRAPHY DIRECTLY OR INDIRECTLY AFFECTS FIRE INTENSITY, AND THE DIRECTION AND RATE OF SPREAD OF A FIRE.

TOPOGRAPHY AFFECTS WEATHER

A. TOPOGRAPHY MODIFIES GENERAL WEATHER (MECHANICAL EFFECTS):

1. _____

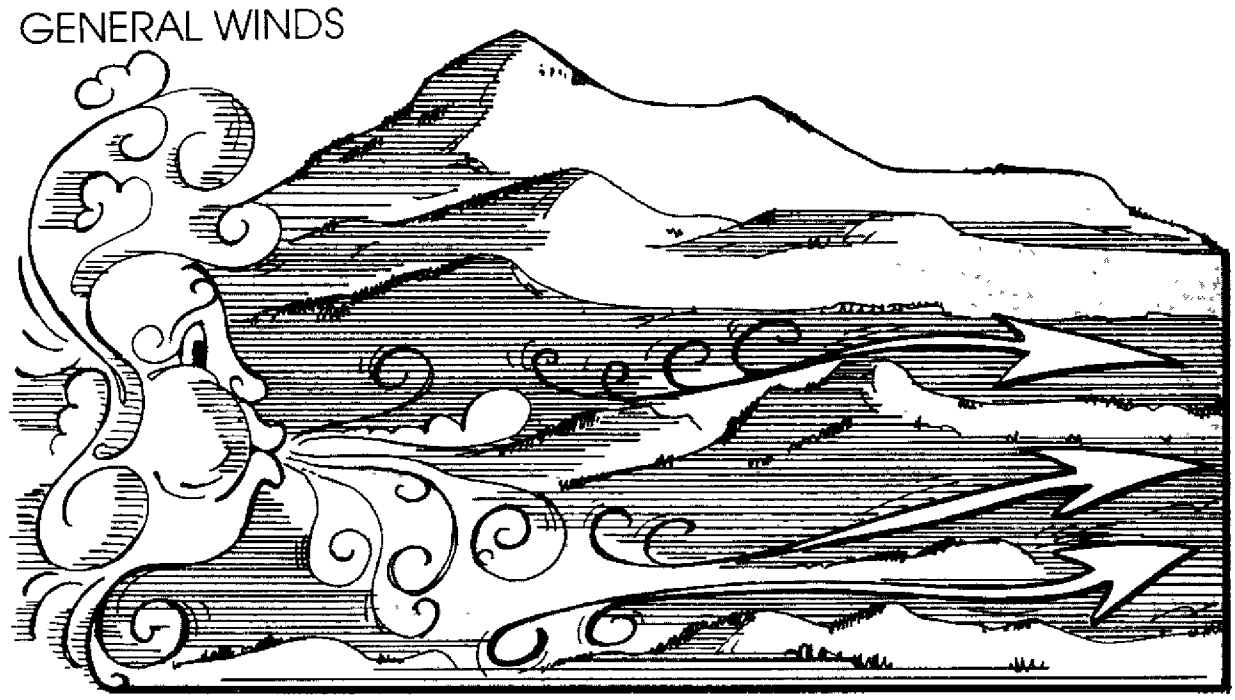
2. _____

3. _____

4. _____

5. _____

FIGURE 2 — FRICTION LAYER EFFECT ON WINDS



B. THE IRREGULAR SURFACE OF THE TERRAIN MODIFIES GENERAL WINDS·

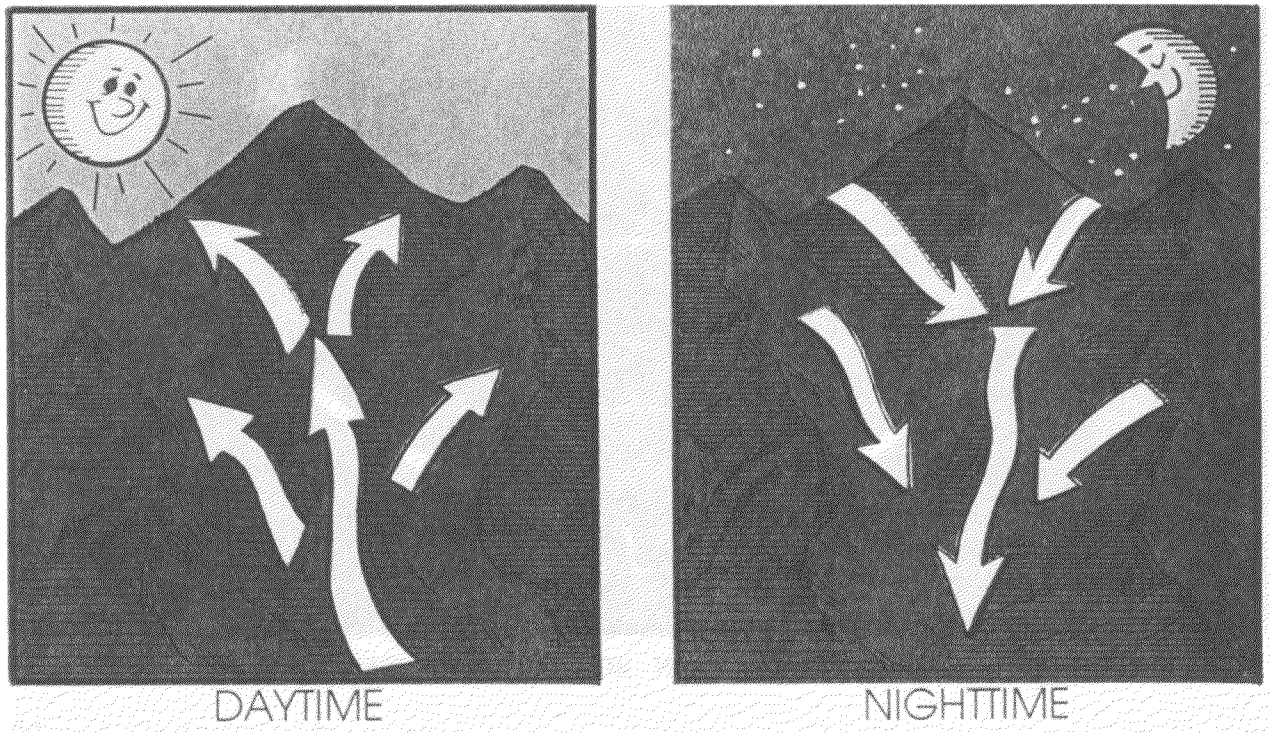
1. _____

2. _____

3. _____

4. _____

FIGURE 3 — SLOPE AND VALLEY WINDS



C. SLOPE AND VALLEY WINDS OCCUR IN MOUNTAINOUS REGIONS.

1. The earth receives radiated energy from the sun, and therefore warms.

2. _____

3. Upslope winds gradually produce up valley winds as the day progresses.

4. At night, the earth and air touching it cools at all elevations.

5. _____

_____

6. Downslope drafts eventually develop into downvalley winds as the night progresses.

7. This process is most prominent on cloudless days nights.