



# FOREST RESEARCH NOTES

EDITOR'S

*Issued by the* FILE COPY**PACIFIC NORTHWEST FOREST EXPERIMENT STATION**

No. 19

Portland, Oregon.

April 3, 1936

GLARE-REDUCING GOGGLES FOR LOOKOUTSBy Richard E. McArdle<sup>1/</sup>

Summarized by William G. Morris

FOREWORD

Detection of forest fires while they are still small is so important in forest protection that studies of the visibility of forest fire smokes from lookout points has been one of the principal phases of the fire studies program of the Pacific Northwest Forest Experiment Station. One phase of fire detection is the personal efficiency of the lookout. The Station has studied methods of testing the eyesight of lookouts and the effectiveness of colored and smoked glasses in lessening eyestrain. The study of glasses, made by Richard E. McArdle, E. J. Workman, and George M. Byram, led to selection of a specific type of glare-reducing goggles. Such goggles are now being used by several hundred lookouts in Region Six. At the fire-control conference held in Spokane in February, 1936, these goggles were adopted by the Forest Service as standard equipment for all parts of the country.

The procedure in this study and the reasons for deciding upon this certain type of goggles are of sufficient general interest that this digest of the full report on the subject is being presented in this form for distribution not only to the agencies using these glasses but to others.

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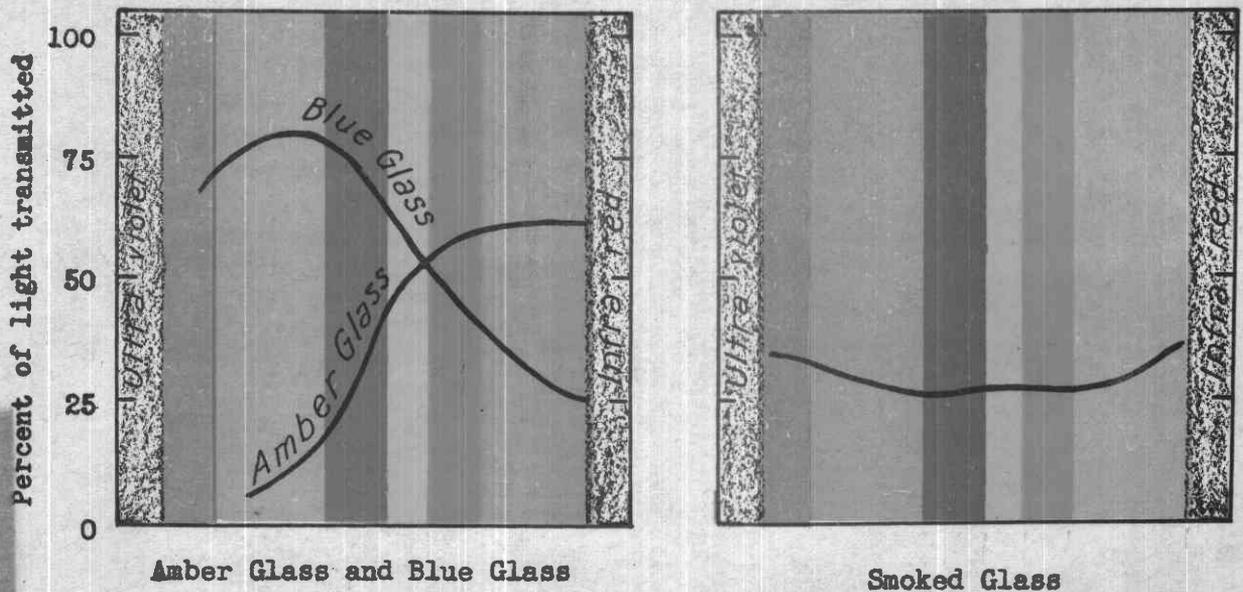


Figure 1.—Curves showing the percentage of light transmitted by colored glass and smoked glass when placed in different parts of the sun's spectrum. Amber glass transmits the red and yellow light but absorbs much of the blue light. Blue glass produces the opposite effect by letting through light from the blue end and stopping light from the red end of the spectrum. (Intermediate colors of glass would produce intermediate effects.) Smoked glass is somewhat similar to window glass: it transmits the different parts of the spectrum in approximately equal amounts.

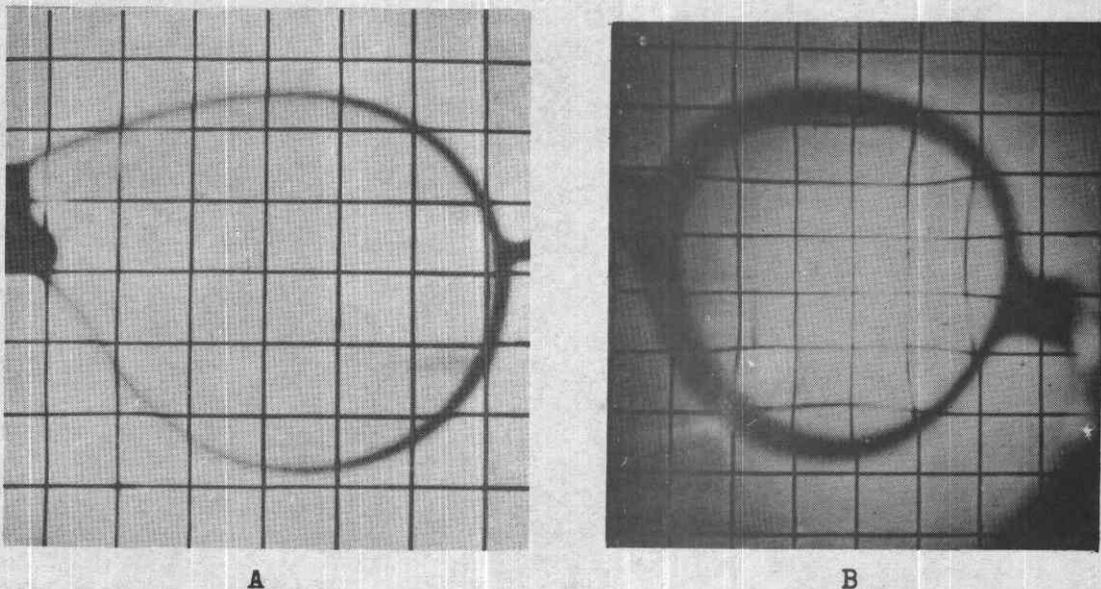


Figure 2.—(A) Grid photographed through the "lookout special" goggles which have lenses of optical glass, ground and polished. (B) The same grid photographed through a lens pressed from ordinary glass.

end of the spectrum and transmitting light from the red end. The objective was to find a color which would react in much the same way as window glass, letting through light from the different parts of the spectrum in about equal amounts but letting through much less light than is transmitted by window glass. As can be seen in Figure 1, smoked glass does this. Smoked glass, therefore, is the best color for this particular use because it reduces the amount of light reaching the eye but does not appreciably change the colors of objects.

Before deciding definitely on smoked glass, however, field tests were made from several lookouts and small columns of bluish white smoke were viewed through many shades of glasses in addition to the two shown in Figure 1. These tests confirmed the results obtained in the laboratory and showed that smoked glass was the best shade to use.

Some people may have been led by certain advertising to believe that a special type of glass is necessary to protect the eyes from harmful effects of ultra-violet light. As a matter of fact, ordinary glass transmits only a small proportion of ultra-violet light and smoked glass reduces that amount still further. Eye specialists have advised that the eyes need protection from ultra-violet light only when there is an excess of this type of radiation as in oxyacetyline welding.

#### Density

The best density of smoked glasses for lookout use was determined by actual field tests from lookout stations and by the recommendations of lookouts who tried smoked glasses of different densities. It was desired to recommend a glass dense enough to really protect the eyes and yet not so dense as to decrease visibility of smoke from fires or to be uncomfortable to the lookout. Glasses worn inside a lookout house can be less dense than those for use on open towers. Shutter awnings on lookout houses greatly decrease light intensity except in very early morning and late afternoon, and in houses so equipped the lookout needs glasses less dense than he would require in a house not equipped with awnings. For a number of reasons which need not be enumerated here, it was finally decided to provide all lookouts with smoked glasses of approximately the same density, namely a glass which transmits about 26 percent of the visible radiation (light). Such a glass is fairly well adapted to the majority of lookouts for use inside lookout houses equipped with shutter awnings. For lookouts occupying exposed towers, glasses transmitting from 15 to 20 percent of the visible radiation are desirable.

The question has been asked whether or not the person wearing dark glasses of the kind described would injure his eyes by suddenly removing the glasses in bright sunlight. Eye specialists state that there would be no more danger of this than might occur by moving from

For those lookouts who must wear glasses to correct their vision the smoked goggles should be given extra support to prevent their slipping down. One method is to fasten each bow of the goggles to each bow of the other glasses with a piece of string or adhesive tape at a point near the hinge. A clip-on type to be attached to the rims of vision-correcting glasses is available through optical supply houses, but these lenses will not shut off overhead and side light. The issuing of this type would be difficult because it must be ordered according to the size of the vision-correcting lens over which it is to be worn. An acetylene welder's type of goggles with side shields and with head band support is designed especially so that it may be worn either with or without vision-correcting glasses. This type may be purchased on special order equipped with the same kind of smoked glass lenses as those in the "lookout special" and at about the same price.

#### Cost and Availability

The Forest Service in Region Six purchased in 1934 about 500 pairs of the sport type "lookout special" goggles meeting the above requirements at a bid price of \$2.17 each. The Forest Service supply depot at Oakland will stock this type of goggles during 1936.