Making Climate an Ally

WELDON F. HEALD

A NEIGHBOR of ours, a white-haired, retired colonel, asked my wife early in the war, "What is your husband doing in the army?"

"He's in the Climatology Section of the Quartermaster Corps," she said.

"Climatology!" exclaimed the colonel. "What's the Quartermaster got to do with climate?"

"Why," my wife explained, "their job is to find the exact climatic conditions throughout the year on all world fronts so that the physiological stresses and strains on our troops may be minimized by proper equipment and amounts of clothing. They call it environmental protection." Maybe she didn't say it just like that, but it was what she meant.

The old colonel shook his head. "I don't understand this newfangled way of fighting wars," he said. "When I was in Cuba and the Philippines in '98 we'd find out where the enemy was, go there and engage him. That's how we won."

The colonel wasn't any more old-fashioned than most of us back in 1942. We thought of war in terms of guns, bombs, planes, men, blood and sweat. Few realized that in past wars climate and disease have been our deadliest enemies—or if they did, it was one of those things which couldn't be helped.

But World War II was global. Our troops fought in steamy tropics, burning deserts and arctic snows. To be efficient fighting machines they had to become adjusted to their environment and protected from unfamiliar climatic conditions. So, soon after Pearl Harbor, the Quartermaster General called in explorers, mountain climbers, desert rats, outdoorsmen from all over the country, gave them desks, and told them to go to work. This group became a part of the Research and Development Branch of the Quartermaster General's office. They designed all QM clothing and personal equipment for our troops in World War II.

However, no matter how efficient clothing, sleeping bags or tents may be under certain climatic conditions, they cannot be issued intelligently to troops unless we know exactly where and

when these conditions occur. For instance, the Arctic sleeping bag is a beautiful piece of environmental protection in central Alaska in January, but would produce Indian sweathouse conditions on an average winter night in Tennessee. Just where should the line be drawn south of which the Arctic bag becomes inefficient due to increased temperatures? How does that line vary from season to season? Answering these questions, and hundreds like them, involving temperatures, winds, rainfall, snow conditions, humidity, mud and dust, was the principal job of the Climatology Section. In other words, we tried to evaluate clothing and equipment needs throughout the year in terms of the actual climates found in all parts of the world.

First we had to find out what a man needs to function efficiently under various conditions of environment. Basically, this meant a thorough study of human bodily reactions to heat, cold and other climatic factors. Only by testing men under actual conditions can you discover how much protective insulation is necessary to insure restful sleep at −50° or how many kilogram calories per hour of energy a human being can safely expend in combat under a desert sun.

A scale of clothing insulation values was adopted using "clo" or "layer" units, with each unit equal to about a quarter inch thickness of standard material. Then all clothing and equipment designed by the Research and Development Branch was tested in the field and in the fifteen laboratories associated with QM during the war. Hundreds of these tests simulating actual conditions of heat, cold, wet and wind were performed with living subjects at the Lawrence Climatic Research, Harvard Fatigue and other laboratories, while field tests were held under varying climatic conditions from Florida to Alaska. So little by little a knowledge was acquired of the "layer" value of each item as well as how many "layers" were required to keep men comfortable, or at least efficient, under all types of weather.

The second job of the Climatology Section was to assemble climatic data from all available sources. From world-wide figures for temperature, rainfall, winds, snow and humidity we were able to estimate pretty closely what conditions would be encountered by our troops in all parts of the world at any season of the year. Knowing the environmental factors and under what climatic conditions each item performed most efficiently, a system of geographical

distribution zones based upon climate could be set up for properly clothing and equipping the entire army.

This seemingly logical system, with its mathematical overtones, appears in retrospect to be a dispassionate, straightforward process. However, I have no desire to be misleading. In true Washington fashion our progress was halting and hesitant; it was punctuated by ignorance, prejudice, complications, endless discussions, trial, error and downright mistakes. Clothing and equipping the United States Army based upon actual climatic needs was new, an untried experiment, and it won friends with exasperating slowness.

Early in the work we realized that climatic maps indicated world conditions more graphically than any other method. However, the existing maps, such as Koppen's and Thornthwaite's, were unsuitable for our purposes. They divided the world into permanent year-round regional zones while we had to show how climate varied throughout the twelve months.

The climate maps evolved by the Climatology Section were, therefore, based on a new principle. They were plotted and drawn for each separate month so that there are twelve maps for every area chosen. By this method it is possible, without training in climatology or elaborate interpretation, to tell immediately the climatic conditions of any locality within the region covered by the maps. The thirteen colored zones, based on differences in average temperature, precipitation, snowfall, humidity, etc., are not stationary, but slide north and south across the face of the earth month by month. Wherever located, every zone retains its same climatic characteristics each month of the year whether found on a January or July map. For example, the *Mild Humid Zone,* which covers Florida in January, travels northward during the spring and is found over northern New England and eastern Canada in July. That it is a pleasant resort climate is attested by the fact that people seek it in Florida in winter and the north during the summer months. I might add for the benefit of the Los Angeles Chamber of Commerce that a piece of this zone spends the winter in southern California also.

The maps provide for those lacking in technical training a simple means of comparing average temperatures and precipitation between familiar and unfamiliar regions. The colored zone system allows comparison between any locality on another continent with familiar areas in the United States having the same color. The *Warm Humid Zone* in which Tokyo is located in July also covers

Washington during that month, so presumably the climates would be similar enough to require the same clothing and equipment. This is not strictly true, however, as identical averages may result from widely different variables. Therefore a table of temperature and rainfall variations showing the seasonal extremes which may be encountered in each area accompanies each map.

With these Climate Zone maps, the key showing the average climatic conditions of each zone, and the table of variations, the QM was able to draw up a fairly accurate estimate of clothing requirements throughout the world. In fact, the Climatology Section drew numerous clothing zone maps which showed directly the number of insulating layers needed in each area during the year. With these maps, laboratory tests and the field experience of the outdoor experts of Research and Development Branch—nicknamed "The Iron Men"—a new Quartermaster Table of Equipment was evolved. For the first time in the army's history an attempt had been made to base distribution zones upon actual climatic conditions!

The Section's hundreds of Climate Zone maps and graphs proved useful during the war to all branches of the army, navy and marines. Climate is an important factor in all military planning. And they should prove of value to peacetime travellers and explorers as well as to clothing manufacturers and those planning large scale development projects.

Of particular interest to mountain climbers, however, is a mapping project recently set up in the Climatology Section. It is planned to map the mountain ranges of the world on the Climate Zone system. Although designed for army use, these maps will furnish accurate, non-technical information on mountain climate to climbers, explorers, skiers and campers. A detailed text will accompany the maps, enabling one to correlate correct clothing and equipment throughout the year with the zones shown on the maps. Other environmental factors, such as vegetation and insects, will be included as well as seasonal snow and storm conditions. Such maps, if accurate data can be secured, should go a long way towards taking the guesswork out of mountain climbing expeditions.

Both at peace and in war climate can prove an upsetting element in planning—from the shower which spoils the picnic to the storm that wrecked the Spanish Armada. We cannot change the climate—we wouldn't if we could—but at long last negotiations have been started for a unilateral treaty of alliance with the elements.