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HYDROLOGY'S PART IN THE WAR EFFORT

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This war caught the United States and the other allied nations in a most deplorable state of unpreparedness--just like the other war did 29 years ago. One generation seems to be a sufficient length of time in which to forget virtually all the lessons learned from one major holocaust. Between catastrophies we assiduously pursue our studies and carry on research about almost everything except how to meet the next one.

When these emergencies arise we are not always prepared to apply the knowledge we have to a solution of many of the problems with which we are faced because such knowledge has never been pointed heretofore in that particular direction.

To illustrate: The necessity for training millions of troops and of building cantonments, ordnance, and industrial plants came upon us like a thunderbolt that shocked us out of the smiling complacency into which we had so easily drifted.

A cantonment large enough to house and train some 50,000 men was hastily decided upon. Of course, there were many other cantonments just as hastily decided upon, but it seemed necessary to build this particular one in the State of Expediency largely because it was urgently demanded by Senator Bring-Home-The-Bacon. The sum of a million dollars was allotted. The ancient firm of "Buildem and Studiem Afterwards" was employed as the Architect-Engineer. The site was picked, farmers were shooed off their land. Barns, houses, corn cribs, granaries, windmills, fences were removed and the land cleared. Guard-fences and guard-houses were erected. Contractors moved in and started building headquarters for themselves, for the Government's staff, and for the staff of the Architect-Engineer.

It had been assumed all along that an abundant water-supply could be had from Deception Creek that flowed near the site. But as the buildings rose the waters fell. Somebody decided to investigate. While a standard gaging-station had never been installed on Deception Creek, there were in published records readily available a goodly number of individual measurements of flow near the site during low seasons. The belated study disclosed the sad fact that each year the flow faded out to practically nothing during the summer and that there were no storage-sites.

The obvious decision was immediately reached to drill a series of wells. Well-drillers began immediately and as the buildings continued to rise the hopes that water could be found also rose. But alas and alack! By the time the cantonment was over 50 per cent completed it was definitely proven that there was no water and moreover that none could be secured within any justifiable time at any cost. What to do? What they did do was to abandon the project in favor of another site 350 miles away where the prudent firm of "Studiem and Then Buildem" was employed as the Architect-Engineers.

Learning hydrology's part in that war effort cost millions of dollars but what was far more important was the billions of dollars' worth of time irrevocably lost. This example is not unique. Small wonder Lloyd George coined the phrase "Too little too late"

Then there's the story of the Great Unbeliever. A peace-time training post adjacent to Fortuitous Ocean, with accommodations for a couple of regiments, was to be expanded into a 40,000-man cantonment in a great hurry. Captain Hipressure was promoted to Major and made the Constructing Quartermaster. It was open season on all the engineers, architects, contractors, material salesmen near and far. All the adjacent brush-studded rolling sand-hills and verdant valleys were purchased. There were no surface-waters of consequence available, so a battery of well-drillers was employed to expand the old Post's two-well system on the valley side into a many-well system on the ocean side. Specifications for drilling and developing the wells took too

much time to prepare, so the orders were "drill 'em over yonder, boys, near the buildings; use your judgment, only get water." They got water--plenty, in plenty of wells.

Then a couple of the best producers went salty. The Great Mogul at Headquarters ordered Hydrology to the rescue, much to the chagrin and disgust of Major Hipressure. Hydrology recommended the abandonment of the ocean-side wells in favor of valley-side wells--longer pipe-lines, higher pumping lifts, of course. The Major'd be darned if he'd abandon perfectly good wells! What if a few did salt up and others fill up with sand? He had plenty anyway. No hydrologic cyclist could tell him how to run his camp. So nothing was done except to add a few reservoirs and put sand-traps in the water-mains.

Those were years of abundant water-supply and the ground-water, high on the valley side, kept the ocean water out of the remaining wells. A lucky break for the Major who by this time had been promoted to Lieutenant-Colonel and transferred with honors.

Soon came a season of scant supply. The valley ground-water dropped too low to form a barrier. One by one the remaining wells began to show symptoms of salt. The new Quartermaster at least had a plan. It was musty and moth-eaten, but was dragged forth. Well-drillers were again called in, handed a set of specifications for drilling and developing. An inspector was employed. Water was found above any likelihood of salt-water encroachment. The Major got away with it largely because no time was lost. The mere \$300,000 squandered did not count in that war effort, but obviously Hydrology should have had the medals instead of the Great Unbeliever.

A more pleasing picture is presented in the great complex of services that Hydrology and its near relative Meteorology are rendering the war effort with most wholesome effects. Water in adequate quantities and of proper quality is indispensable. Domestic supplies must be available at all cost. Hydrology can usually give the answer and avoid wasting precious time and money, and generally does.

Hydrology has become a vital tool in the prosecution of the war. During such an emergency as we are in at present the phases of Hydrology that are most important to the industrial production of war equipment, food, and supplies must be emphasized to the temporary exclusion of the research phases that can be postponed until the more propitious opportunities of the post-war period.

Water-supply for hydroelectric plants, for industrial developments, for domestic water-supplies, in cities, airfields, cantonments, concentration-camps, can be far more effectively used if the science of Hydrology is brought to bear on the programming of those uses.

Industrial power in enormous quantities and at minimum cost is vitally necessary for the innumerable chemical and metallurgical processes as well as for the simpler basic manufacturing requirements that make up such a large part of our war effort. Such power is best supplied from hydroplants. It is a source that is not exhaustible, such as obtains in the case of fuels.

Irrigated agriculture is also an indispensable part of the war effort. In many localities it flourishes alongside of and is interwoven with larger hydroelectric systems. Each thrives or falters on the idiosyncrasies of the same water-sources.

Those sources can be used unwisely, the penalty being a curtailed output. Hydrology supplies the knowledge that makes for the maximum output from available supplies. The quantities available are accurately and quickly made known not only concurrently as the water flows but in mountainous drainage-basins well in advance of the flow. By means of winter snow-surveys the supply in snow-storage is ascertained long before the spring runoff begins. Power-plant operation, irrigation-usage, storage-reservoir regulation, can be wisely planned, to the end that the maximum number of kilowatt-hours and the maximum crop-value may be extracted from the available waters.

Man is prone to build his cities and locate his most important industrial developments in the path of potential floods. He nonchalantly encroaches on waterways with dikes and sea-walls, naively fills the river-channels with multitudinous bridge piers and unheeding narrows its widths with bridge approaches and shipping facilities.

In the scramble to augment production for war, previous warnings are often forgotten and temporal expediency supplies the excuse.

When the rains descend and the floods come he calls loudly on the gods of Meteorology and

Hydrology to save him from disaster. They come lamely to his aid. They give him some inkling of what heights to expect and warn him at least a few hours in advance of the arrival and duration of flood-peaks.

If only man would learn from experiences and profit by them! If only he would ask Hydrology where it is safe to build and then build in the safety zones indicated! If only he could learn some respect for Ole Man River and give him room according to his strength! If only he would not emulate the one of whom Robert Browning wrote:

"Oh he who draws a circle premature,  
Heedless of far gain,  
Greedy for quick returns of profit, sure  
Has made a bad bargain!"

The Grammarian's Funeral

This war will not last long. Rehabilitation of blighted areas, the construction of delayed facilities, and the conversion of industrial plants to peace-time production will demand a greater expansion of the practical aspects of Hydrology than Hydrology was able to give to this war effort: First, because Hydrology is an ever-growing science and, second, the value of its services to mankind is gaining greater recognition. The war taught many a skeptic what of value Hydrology can render if only given the opportunity.

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#### HYDROLOGY'S PART IN THE WAR EFFORT

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War and water on the African Front have been matters of relatively small amounts of the latter, laboriously distributed over great distances, under the difficulties imposed by active combat. War and water on the Home Front relate themselves less spectacularly, but with decided emphasis.

The past decade has witnessed a striking change in the Nation's attitude toward water. Devastation by flood is no longer considered the unavoidable result of an Act of God, and there is now a well-established national policy on flood-control. Much has been accomplished toward the ultimate reduction of flood-damage in those localities where social and economic justification can be made for the investment in flood-control works. Even in cases lacking these qualifications the damage-potential will be substantially reduced through a greater preparation-opportunity as modern flood-forecasting methods are placed in operation. Water-conservation has likewise evolved as a national responsibility, for which active policies and programs have been established.

Water is abundant in our country and we have used it wisely in bringing into production Western valleys which otherwise would never emerge from their desert state. Abundant water and land have meant abundant food in normal times. What of a future in which three-quarters of the Earth's population look hungrily toward our fertile, well-watered fields?

The American hydrologist has a vital part in helping to meet unprecedented demands on our water- and soil-resources. Concentrations of industrial war effort on the flood-plains of our great rivers must be protected from damage and interruption to production, with resort to every available means. Ground-water sources must still further be drawn upon in localities where depletion is already a serious problem. An overburdened system of transportation will insist that food be grown as near as possible to points of consumption or ports of embarkation. This, in some cases, will bring many acres into temporary production which, having no assurance of a continuing water-supply, must be returned to range or unproductiveness before populations are lulled into a false sense of security created by a fortuitous series of years of adequate rainfall or above-normal volumes of water stored in the snow-fields and reservoirs.

Other accomplishments to which hydrologic planning has been the key could be listed. Vast blocks of hydroelectric power, depending upon the hydrologist's assurances of adequate stream-flow, have been made available to industry within planning and construction periods that, four years ago, would have been considered ridiculous. The hydrologist has given valuable aid in the selection of equipment for mountain troops; his knowledge has been important to the designer of