Forest Journal

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The question of Forest Preservation is one which largely interests the Engineer, more particularly one engaged in connection with Water Supply and Conservation. The broad situation has been stated many years ago by Dr. Hough, who stated - "The reciprocal influences that operate between woodlands and climate appear to indicate a close relationship between them. It is observed that certain consequences follow the clearing up of forests, which can scarcely be otherwise regarded than as a direct effect, such as the diminution of flow of rivers and the drying up of rivers and streams. Other effects scarcely less certain are seen in the occurrences of destructive floods, and of unseasonable and prolonged droughts, with other vicissitudes of climate, which it is alleged did not occur when the country was covered with forests. These appear to have been brought about by their removal, and might in a degree be alleviated by the restoration of woodlands to a degree consistent with our best agricultural interests".

Experience has shown that forests afford protection against evaporation, which, in a climate such as is found in Western Australia, is most essential, for it has been observed that on the Western slopes of the Darling Ranges the evaporation is somewhere between 5 to 6 feet on exposed water surfaces. The shade of the trees and their creation and protection of a soil cover makes them natural reservoirs. The leaves, twigs and decaying tree refuse overlaying the soil is the most important factor in retarding evaporation and surface flow. Again a large portion of the rain falling is caught by the leaves of trees and held for a time before reaching the soil. In other words, a well timbered catchment area offers a considerable retarding influence to the storm flows and tends to prevent excessive floods as well as equalising the flow of any stream.

In forest land the increased quantity of water retained in the soil has another advantage, inasmuch as the quantity of water which flows over the crest of any weir is diminished in the rainy season, and the seepage water which finds its way into a reservoir during the summer months is considerably increased; it is largely due to this fact that a quantity of water equal to nearly 2-1/2 times its capacity is annually drawn from Victoria Reservoir

In an article "Forests' effects on streams", Australian Forestry Journal, March 1920, it is stated :- "In case of storms accompanied with heavy rains, the maximum outflow in the wooded valley is from 30 per cent. to 50 per cent. less than that from the other (very meagerly wooded) valley, and there is another beneficial circumstance from the action of the forest, that this maximum flow is produced later in the wooded basin than in the other". With this I agree.

The destruction of a forest removes these influences and settlement further intensifies the evil by reason of stock consolidating the soil by constant traffic. The watercourses run more quickly and generally follow sheep and cattle tracks, forming well defined channels and bringing away large amounts of soil to be deposited in the stream beds or in any artificial reservoir constructed lower down the stream. The necessity of constructing silt-catch drains or diversion channels in front of and around the main dam is a practical recognition of this fact.

Forest preservation is a very important factor in preserving the efficiency of storage reservoirs. The roots of large trees and scrub form a network which binds the soil together. Total destruction of forests on a catchment area will be followed by a loss of efficiency in the reservoir due to silting. This effect has been measured and in two streams in Switzerland the amount of silt in the water from a catchment area in its natural condition was about one-third of that from a catchment area that had been cleared. Cultivation also has a marked effect in this direction. A moment's consideration will show that the soil is cultivated or ploughed when heavy rains are anticipated and therefore the conditions are most favorable for the discharge into a stream of a very large amount of silt. The erosion problem is more serious in Western Australia, as, owing to our long summer (practically 7 months) with a very small rainfall and the light soil found in most of our agricultural areas, the surface soil becomes loose and friable, and with the intense rainfall of about 34" in the vicinity of Perth the run off is considerable, and therefore it may be stated that without forest protection our soils are in such a condition that erosion may readily take place and undoubtedly does.

In Western Australia there is also a further problem in regard to the salinity of the water. This matter has been fully investigated in connection with railway water supplies and results have been ably set out in paper No. 4193 by Robert Bleazby, A.M.Inst.C.E. and published in the Proceedings Vol.CCl11 page 395. A brief synopsis might be given as follows :-

Name of Dam or Weir.	Date constructed.	Salt in water originally.	Date when too salt for boilers.	Salt g. per g.	Methods taken for purification of water.	Result salinity g.p. g.	Remarks.
Cranbrook	1888	Fit for boiler.	1902 1908	53	Diversion of salt bearing streams.	6.5	
Yornaning	1888	"	1909	60	do.	5 to 11	Trees to be allowed to grow on catchment of fresh streams.
West Yuna	1912	g.p.g. 12.3	1914	69.5	Flooding & scouring.	19.5 to 27	Experiment not complete.
Chidlows Well	1898	Fit for boiler.	1909 1915	35 47.5	Diversion of salt streams & scouring.	22.9	Arrangements made to allow catchment to revert to bush.
Burlong	1896	"	Some years later	Too salt for boiler.	Scouring & allowing timber to grow up.	10	

The result of these investigations show that wherever there has been any marked clearing of forests the salinity of the water has been increased. In this respect the attention of the Commission might be drawn to a comparison of the salinity of the water from Mundaring and Victoria Reservoirs. The average salinity of Mundaring being 22 grains per gallon (varying from 6 to 34) as against that of Victoria Reservoir of 13.4 grains per gallon.

In the former case a considerable amount of ring-barking was done, whilst in the catchment area of the latter very little clearing has ~~kkam~~ taken place, and every effort is being made to prevent any additional settlement taking place.

For the purpose of obtaining a satisfactory supply of water for the Metropolis a total area of 531,400 acres, or 830 sq. miles out of 975,920 sq. miles in Western Australia has been reserved as catchment areas, and although this may at first glance appear to be a large amount, experience has shown that every large city has outgrown the reserves set apart for water supply purposes and eventually some of the supply has had to be obtained from contaminated or doubtful sources. Instances have occurred of small villages having to be removed owing to the construction of large impounding reservoirs.

mundaring 569 sq miles

It would, in my opinion, be a wise step to as early as possible set aside any land adjacent to growing towns in Western Australia suitable for catchment areas as reserves, either for water supply or forest preservation purposes. In the end this will be the cheapest for the State, and, after all, the small amount of land so reserved will be an inducement to settlement, as the assurance of a ressonable water supply of good quality is one of the first considerations for close settlement.

Personally I would prefer to see all catchment areas allowed to remain in their natural condition, even although some revenue may apparently be lost. The more settlement or camping on catchment areas, the greater liability there is to fire, and again experience has shown that in two areas in California one was burnt out. The area of the burnt out catchment was only 1/29th of the unburnt, and immediately after the fire a heavy storm occurred and the small area 1/29th of the large area discharged more water than the larger area, showing that the water held in reserve was much less - or that the greater portion of the rainfall was discharged as a flood and not naturally regulated as in the case of a well wooded area.

I would therefore venture the opinion that before any landthat may be suitable for water conservation purposes is alienated or even leased the Water Supply Authorities should be consulted and due consideration given to any recommendation for the complete reservation, as alienation of catchment areas ultimately means costly resumptions, and thus, although it may not at the time be popular, ultimately for the future good of the State too liberal provision cannot be made in this direction. In placing this view before the Commission I do not want it to be thought that anything but aympathetic treatment has been met with, but it is hard to make prospective settlers realise that no good purpose can be served by allowing settlement on any catchment area.

A further provision should be made that in all land alienated a strip of at least 100 feet on either side of every stream or watercourse should be reserved as a water supply or forest reserve, and no timber should be removed from such reserves for any purpose whatsoever. Again as any timber leases or concessions fall in through effusion of, time, the concession should be amended so as to exclude any water reserve or catchment area.