Losses from Reservoirs.

The agricultural experiment station of the Colorado Agricultural College has recently completed a series of observations on the losses from lakes and reservoirs from seepage and evaporation. The results of the experiments is of much interest, particularly to those in charge of waterworks systems, and are summarized as follows:

1. The losses from reservoirs are from seepage and evaporation.

2. The seepage losses are dependent on the condition of the reservoir sites, therefore different for different sites.

3. The seepage losses were determined on a series of reservoirs near Fort Collins, in the winters of 1895-6 and 1896-7.

4 The seepage losses may be great. In the lake under measurement, the losses in some cases were less than from evaporation alone.

5. In some cases, lakes may gain from seepage from irrigated lands, and the gain may be more than the combined loss from seepage and evaporation.

6. In the cases where loss from seepage occured, the loss was at the rate of about two feet in depth over the area of the lake, per year.

7. This amount does not necessarily apply to other sites, and other observations are needed before general statements respecting loss from this source can be made.

8. The seepage decreases after the lake is first filled, from the effects of silting, and from having filled the porous ground underneath and connected with site.

9. Even in sand there is a limit to the amount of seepage, and the time during which the loss is large.

10. After sand-beds connected with the reservoir are saturated the losses from seepage will decrease.

10*a*. The loss increases with the depth, probably nearly as the square.

11. The losses may be lessened, though not entirely prevented by silting.

12. The silting process is more efficient with small reservoirs because of the better distribution of the silt.

13. If the loss from seepage is not more than 2 feet per annum the sites may be considered as practically water-tight. In the case of canals the losses often average more than that in twenty-four hours.

EVAPORATION.

14. The losses from evaporation in the cases examined are greater than those from seepage.

15. The evaporation is not necessarily the same from adjacent bodies of water.

16. The amount of evaporation increases with the temperature of the water, with the wind, and diminishes with increased moisture in the air.

17. From the standard evaporation tank at the experiment station the average evaporation for eleven years has been 41 inches.

18. Evaporation proceeds when the water is frozen, but at a diminished rate, averaging about 1 to 1½ inches per month.

19. The evaporation at night is the same as during the day, the difference being loss with the increase of the size of the bodies of water.

20. The loss by evaporation from several lakes exceeded that from the standard tank.

21. The loss from the lakes was about 60 inches per year.

22. The increase is due to higher temperature of the water and to freer exposure to the wind.

23. In some of the summer months the lakes lost twice as much as the standard tank.

24. The lower temperature of water at high elevations and the lower dew points tend to decrease the evaporation.

25. The diminished barometic pressure tends to increase the evaporation, amounting to 14 per cent. at 8,000 feet and to 18 per cent. at 10,000 feet over the evaporation at 5,000 feet.

26. Every mile of wind movement in twenty-four hours increases the evaporation by from 1 to 2 per cent. over the evaporation if calm.

27. The winter period is longer at the high elevations.

28. For the whole year the evaporation in all probability is considerably less at the high elevations than at the low ones.

29. Evaporation is lessened by any influence which diminishes the wind or decreases the temperature of water.

30. Protection of lakes by wind breaks is in many cases practicable and in small lakes sometimes desirable. In the large lakes the benefit is by reducing the wind velocity; in small lakes both from effect on wind and by lessening action of sun.

31. The deeper the lake the cooler the water as a whole, the cooler the surface; consequently, the less evaporation.

32. Assuming a loss of 5 feet in depth per annum, an area of 100 acres would require ¾ cubic foot per second for the whole year to make good the losses from evaporation; one of 500 acres would require 3½ cubic feet per second, considerably more than would be used to irrigate an equal area.

33. The net loss to the reservoir would be the sum of the above losses from seepage and from evaporation, diminished by the rainfall, a combined loss which may be considered as a depth of 6 feet in one year.

34. As irrigation reservoirs are usually full for a few months only, the loss is much less than this for the high water area.

Civic Indebtedness.

The annual reports for 1896-7, of the several departments of the civic government of the city of Halifax, just issued, is, in the main, a statistical account of the receipts, expenditures and public works for the year. Of special interest, however, is the address of the retiring mayor, David McPherson, Esq. In regard to civic indebtedness he said:

"There is a great deal of looseness of thought and looseness of language in discussing this matter of civic debt. The increase of the debt is not necessarily an evil; it certainly does not of itself imply either waste or extravagance. It will be conceded at the outset that no community possessing proper ambition and self respect, can be content to lag behind while the rest of the world is making progress, and it will be further admitted that improvement cannot be made without money. When public opinion becomes clamorous for any civic improvement, the first question to be asked by the mayor and aldermen, the representatives of the people, is whether the proposed work or project is really required, next what it will cost, and finally and chiefly, whether the community can afford the expense. If these questions can be answered satisfactorily there need be no hesitation about the matter. Nor does it effect the argument, as has been frequently shown, that all civic improvements are not of a kind that yield an immediate money return. The advantages to be derived from good streets and pavements, from sewers, fire protection, electric lighting and the like, though real, and indeed in modern days indispensible, are yet in their nature not subjects for commercial valuation."

The report of the city auditor also contains the following with reference to public improvements and civic debt:

"Speaking generally with regard to the increase of our public civic debt, there does not appear to be any way—at least no way has as yet been discovered—by which improvements of any consequence can be effected without increase of civic liability. In the case of works of any magnitude, the benefits of which are expected to be permanent—such works for instance as the opening or widening of streets, water supply, sewage and the like, it would be obviously unreasonable to impose the entire cost of such improvements upon one generation of citizens, and no such rule has been followed anywhere so far as I can learn. It appears to be pretty well established that great public improvements and growth of public debt are convertable terms, we cannot have one without the other."

The good roads movement is not merely a campaign against dust and mud. It is an endeavor to better the condition of every class of the community, the farming element in particular, socially, morally, intellectually, and financially.