which such material may be deposited, and increases the cost of actual dredging very materially.

No instance is known where a radical increase by dredging of the flood-carrying capacity of a river channel has been attempted on any large stream. The low-water channels in streams like the Mississippi oftentimes are dredged to facilitate navigation, but it is believed that the limited application of this method should be apparent.

Auxiliary channels have been suggested, both paralleling long stretches of streams and also to form cut-offs. The cost of providing additional channels for a stream like the Ohio or the Mississippi, of sufficient capacity to carry off the flood waters, is absolutely prohibitive. For the protection of a particular locality short auxiliary channels or cut-offs may be used, but these have the disadvantage that while they may benefit the locality in question by facilitating the run-off past that particular locality they pile the water up more rapidly below, thereby creating more damage at other points, as they necessarily cause steeper slopes, higher velocities, and greater erosion.

The method of prevention of floods have been discussed at some length, and it must be realized that the subject is one of great extent and the problem in the case of large streams very difficult of solution.

We now come to the question of the prevention of damage by floods.

Many towns have grown up on the flood planes of the streams, occupying areas that have been overflowed from the beginning; people have entered the bottom lands and erected their structures with the knowledge that those lands were formed by silt deposited by flood waters; railroads have constructed earthen embankments across these bottoms, leaving only very narrow openings with wholly inadequate capacity for passing floods; city and county officials have built bridges with abutments projecting into the stream, with many piers of insufficient height, thus reducing the discharge area materially; individuals have dumped materials over the banks to increase the area of their property for business purposes. These structures and encroachments have reduced the capacity of the streams, have formed partial dams which raise the water above previous levels and then by the breaking of an embankment or the washing out of a bridge the water held back has rushed downstream under increased head and velocity, destroying everything in its path. Aside from the damage done by the inundation of property, which, while serious, is not destructive, almost all of the damage at the points visited is caused by increased velocities of current due to the backing up of the water, by embankments, bridges, and other structures, the subsequent breaking of these partial dams and the rush of the released waters under increased heads and velocities.

The measures to be taken to prevent such damage are: wherever possible, to remove structures from the flood planes and river bottoms, or to elevate such structures above possible high water; to protect by levees valuable property which it is impossible to remove; to prevent the construction of heavy earthen embankments across flood planes by railroads or counties; to increase the capacity of channels by removing encroachments thereon in the shape of bridges, buildings, etc., and to remove all artificial and natural filling or deposits.

Fire has recently completely destroyed the Oceanic dock at Portland, Ore., and has entailed a damage loss of $150,000. The dock was owned by Balfour, Guthrie and Company. The fire was the third destructive waterfront blaze this spring, all along one section of the Portland waterfront.

SUBURBAN, INTERURBAN AND RURAL ROADS.

SOME valuable suggestions as to the classification of public highways and the proper division of expenditures for their construction and maintenance appears in the 1914 report of the Public Roads and Highways Commission of Ontario. In discussing the subject of supporting areas for cities, the report emphasizes the value to the latter of general rural development brought about by better roads.

Urban centres with good roads are especially benefited by the main roads in their immediate vicinity. It may in a general way be assumed that each city has a special interest in an area immediately surrounding it, sufficient to provide a food supply for the city, and the population within such area.

Attention is called in this report to one or two preliminary points. It is well known that cities are not, even in the matter of home-grown products, supported altogether by their immediate neighborhoods.

It would seem, however, that the most potent influence in preventing such a condition has been the heretofore inadequate means of local transportation in marketing. Improvement in these facilities would induce the abandoning, by nearby farmers, of low-priced crops, which have heretofore carried the bonus of cheap marketing, for high-priced crops upon which marketing charges will decrease as the farmer is brought closer to his market.

Then again, some districts are specially adapted to the production of certain products, such as fruits, and they should, therefore, be properly expected to specialize in the production of these commodities. This factor has its effect in altering any general calculations that may be made for cities and their supporting area as a whole.

Still another point arises with the calculation of a large supporting area. A number of towns of various sizes are found within the area. In this instance, therefore, a special calculation has to be made and the results tabulated. In the case of the smaller cities, however, this difficulty is not incurred.

In all, calculations have been made for the twenty-one largest centres in Ontario. The results appear in the table given on the next page.

The results given are based upon calculations in which both the general items of food entering into the dietary of the average family, and the yield of these items in the various districts respectively, for which estimates are presented, have been taken into account. The "average family" was taken consisting of five members. There was then worked out the acreage required to supply the various food items appearing. The total area required for the support of fifty people for one year was thus found to be 109.14 acres. It is to be noted that this acreage provides only the amounts of each kind of food grown locally and consumed by the unit of fifty people in one year and no account is taken whatever of other foods, such as imported fruits, etc., which are consumed in addition. The 109.14 acres thus represents the area required to provide home-grown products only. It is to be further noted that this acreage represents only the net area required, and this whole area of land would need to be cultivated to provide the required amount of food. In the case of each area for which a calculation was made, therefore, account was taken of the proportion between cultivated or producing land and total acreage.

It will be noted that when the circles designating the supporting areas are placed upon a map, certain of these, if carried through, would intersect; the conclusion being that the supporting areas of various cities are found to