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Effects of Floods on Mammal Distribution

SHERMAN A. HOSLETT¹

Abstract. Several species of small mammals are not found in suitable habitats on broad flood-plains of the Mississippi River Valley. In the narrow up-stream flood-plains of the river valley of Northeastern Iowa, some species remain in the flooded area; others migrate out temporarily. Floods, in this case, have only a temporary effect on local populations.

The floods which from time to time cover the flood-plains of northeastern Iowa constitute an important factor in controlling the local distribution of certain species of small mammals. These floods are of two types, dependent upon whether they are sporadic in occurrence or occur at the time of the annual spring break-up of the ice on the large rivers.

The effects of severe floods of the sporadic type in other states have been described by several authors. Grinnell (1939) concludes, from observations made in California valleys, that unusual flood conditions have a lasting effect on the local distribution of small mammals. An unusually severe flood followed by a drought, in eastern Oklahoma has been described by Blair (1939). The effects in this case were extreme, to the extent of practically wiping out the small mammals for a period.

The flood-plains at the mouth of the Upper Iowa River are frequently covered by such sudden, severe floods. Here, the meadow vole (*Microtus pennsylvanicus pennsylvanicus*) is conspicuously absent, in spite of the fact that habitats apparently suitable for this species are present. In the upper reaches of this same valley the meadow vole is common. The striped gopher (*Citellus tridecemlineatus tridecemlineatus*) is also absent from these frequently-flooded bottomlands. No jumping mice (*Zapus hudsonius*) were collected on these same lowlands during the course of this survey. Certain species of small mammals seem, therefore, to be absent on the more extensive flood-plains of the region, and it is believed that their absence is due to the extensive and frequent floods.

The annual spring floods, which at this season of the year cover practically all of the flood-plains of the region, are of shorter duration than the sporadic floods which are ordinarily severe only on the broad-flood-plains near the mouths of valleys. Temporary modifications of populations are caused by the annual spring floods.

The response of small mammals to a spring flood was studied in some detail on the bottomlands west of Decorah. The river

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overflowed its banks during the night of March 22, 1936, and by morning had completely surrounded the adjacent mud flat and willow-maple associations. By noon, the water covered a stubble field and had reached the lower margin of the oak-hickory association on the slope which borders the flood-plain. By mid-afternoon of the following day, the waters had begun to recede, and within a few days the river was again within its banks, leaving behind pools of water and piles of debris on the flood-plain. Observations were made on the mammals which were marooned in the stubble field and on the mammals which inhabited the oak-hickory association. The live-trapping operations which had been carried on this association for several nights preceding the flood period were continued until after the flood was over. No direct observations could be made on the mud flat and willow-maple associations because they were situated in the midst of the deep, swift current of the flood waters.

The meadow vole had previously been trapped on the mud flat and in the open fields of the flood-plain, but under normal conditions was not present in the oak-hickory association on the valley slope. However, on the night that the plain became flooded, and also during the nights thereafter until the flood waters subsided, numerous individual meadow voles were trapped in the oak-hickory association. They were so abundant during the daytime that they were seen scampering about among the leaves on the slope, and several were found under practically every log and stone slab that was turned over. After the flood subsided, meadow voles were neither seen nor trapped again in the oak-hickory association.

During the flood, many meadow voles were seen swimming in the water. Many of them sought cover in the bed of leaves and debris at the lower margin of the oak-hickory association. Sometimes, when they were routed out, they scurried for cover under the leaves, but more frequently they jumped directly into the water. They apparently did not fear the water, for when disturbed they usually swam out from the shore for a few feet and then turned back towards the debris on the shore-line. When attempts were made to catch them in the water, they promptly dove in an expert fashion and swam underwater for several feet in order to escape. Their whole behavior in the water gave the unmistakable impression that meadow voles not only could handle themselves in the aquatic medium, but also that they had no fear or aversion for it.

The prairie deer mouse (*Peromyscus maniculatus bairdii*), on the contrary, did not seem to migrate out of the flooded area.

This species had been common in the weedy mud flat and in

the stubble field previous to the flood period. None were present in the oak-hickory association at any time before, during, or after the flood. The only place they were to be found at the flood time was in the stubble field. Here, rafts of corn stalks and mats of other debris were floating over the field in about eighteen inches or two feet of water. Deermice were crowded on these rafts, as evidenced by the number which frantically swam about when the rafts were submerged. Also, unlike the meadow voles, they apparently had a great fear of the water. They would attempt to hide in the rafts in order to escape capture and would not take to the water until the rafts were sunk beneath them. Their behavior in the water verified their aversion for it as they swam frantically about with labored strokes and with heads high out of the water. They circled about aimlessly, apparently seeking something to clamber upon, and in no instance did they dive below the surface to escape capture.

The white-footed mouse (*Peromyscus leucopus noveboracensis*) did not indicate any marked migration or other response to the flood. This species had been captured in the willow-maple association on the flood plain and in the hillside oak-hickory association previous to the flood period. The numbers present in the latter habitat at the time of the flood did not show an increase. None were present on the corn shock rafts over the flooded stubble field. Because of the semi-arboreal habits of this species, it is very likely that they escaped being drowned by going up into the trees of the flooded willow-maple association.

Exceptionally early spring activity of the pocket gopher (*Geomys bursarius bursarius*) was in evidence at the time of the flood. Ordinarily, signs of activity for this rodent first appear much later in the season. Fresh mounds were noted on March 23, the day of the flood, on a slightly elevated portion of the stubble field about 200 feet from the high-water mark. Three pocket gophers were observed on a muddy, water-saturated spot at the edge of the flooded field. These animals were vigorously digging about corn stubble roots and had evidently been driven from the flooded field where numerous gopher mounds are present during the summer months.

The final observations in connection with this particular spring flood were made during the days following the subsidence of the flood waters. Within a week after the bottomlands were out of the water, all the kinds of small mammals noted prior to the flood period were again present on the mud flats, in the willow maple forest, and in the stubble fields. The small mammal population of the oak-hickory association on the slope also had returned to normal and no meadow voles were present.

It is thus evident that some of the small mammals which inhabit flood-plains escape from a flood by migrating out of the area during the high water period. It was noted that meadow voles in large numbers will even invade an oak-hickory association which they normally avoid. The pocket gopher showed some migratory movement out of the flood-plain, but the extent of its migration out of flooded areas was not determined.

Many of the flood-plain species of small mammals do not migrate during floods. It is very likely that the semi-arboreal white-footed mouse escapes by living in the trees during periods of high water. The house mouse also might escape by climbing into the trees. Numbers of deer mice were observed to have survived on natural rafts of debris, but many of them may have drowned. Nothing was observed in regard to the response of the short-tailed shrew to flood conditions.

Some species of flood-plain mammals must be almost, if not entirely, locally extirpated during flood periods. If the jumping mouse hibernates in these lowlands, it must suffer this fate during early spring floods. Burrowing mammals, such as moles and pocket gophers, also may be trapped by the flood water, at least in large flooded areas. However, the fact that all of these flood-plain species are again found on the same areas within a short time after the flood has subsided indicates a rapid infiltration from neighboring habitats and shows that annual spring floods have only a temporary effect on small mammal populations.

It has been thus demonstrated that small mammals of the flood-plains of northeastern Iowa are affected in two ways by flood conditions. Several species, such as the meadow vole and the striped gopher, are completely absent from the broader flood-plains where the frequent, and occasionally severe, floods prevent them from becoming established. The species which inhabit the narrower flood-plains farther up the valleys are only temporarily affected by floods which ordinarily occur only at the time of the spring break-up. In these localities, some species are able to migrate out of the flooded areas, some species remain within the flooded area and escape by climbing trees or by using natural rafts and other species are unable to escape and are either reduced in numbers or locally extirpated. However, small mammal populations of the smaller valleys regain their normal size soon after the flood has subsided.

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