Distribution and Control of Rats in Five Rocky Mountain States

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COMPREHENSIVE investigations on the distribution and control of domestic Norway rats (*Rattus norvegicus*) were conducted from 1947 to 1955 in the Rocky Mountain area comprised by Colorado, Idaho, Montana, Utah, and Wyoming. These investigations sought data essential to the organization and operation of effective programs of rodent control at State and local levels.

The objectives were (*a*) determination of the distribution and relative population densities of domestic rats, (*b*) evaluation of the factors influencing their distribution, rate of spread, and degree of infestation, and (*c*) appraisal of the results of past and present control activities.

Representatives of the Communicable Disease Center, Public Health Service, who were assigned to the State departments of health, and Public Health Service Region VIII, Denver, Colo., conducted the investigations in cooperation with personnel from the State and local departments of health. In numerous instances, representatives of the U.S. Fish and Wildlife Service assisted in making the surveys and also contributed valuable information regarding the history of rat infestations and the attempts that have been made to control these rodents. Information of great value to the studies was also provided by agricultural extension officials, public agencies, and private individuals.

All the known areas of infestation in the five States were visited. No survey was made of remote communities and farming districts situated at considerable distances from main highways or railroads, or those isolated by desert or mountain barriers from known rat-infested localities. Visits were made to garbage and refuse dumps, packing houses, feed mills and elevators, dairies, livestock yards, hog and poultry farms, and other likely harborages and breeding places of rats in urban and rural localities. Canals and natural watercourses were also inspected, since it became apparent early in the studies that indiscriminate dumping of garbage and refuse along and into streams is a factor which contributes to the spread and maintenance of rat populations.

In this report, the term "rat" refers only to the Norway rat, since the survey revealed the presence of the roof rat (*Rattus rattus*) only in Salt Lake City, Utah. No reference is made to any of the various native rodents, such as *Neotoma*, which sometimes occur in or around human habitations.

Distribution of the Norway rat in Colorado, Idaho, Montana, Utah, and Wyoming, as ascertained by the studies from 1947 to 1955, is indicated on the map.

Colorado

According to Silver (*1*) rats were reported in Denver in 1886, and by 1907, they were entrenched in most of the larger towns of the State. Our studies in Colorado showed that most of the towns and farming areas in the eastern half of the State are infested with rats. No evidence of rats was found at any locality within the San Luis Valley, which lies east of

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the Continental Divide, and, with the exception of Salida, no evidence of rats was found in towns above 7,000 feet elevation along the eastern slope of the Rocky Mountains. Also, no evidence of rats was found in any locality in Colorado west of the Continental Divide. It appears that the dry, sparsely populated areas along much of the eastern slope of the Rocky Mountains have served as effective barriers to the migration of rats in Colorado.

Idaho

Three widely separated areas of infestation were found in Idaho during the surveys conducted in 42 of the 44 counties of the State. No survey was made in Blaine or Camas Counties, both of which were authoritatively reported by personnel of the Idaho Department of Health to be free of domestic rat infestation.

The largest area of infestation in Idaho covers all or portions of nine northwestern counties. This area extends southward along the Idaho-Washington border from the south-central part of Bonner County through much of Kootenai, Benewah, Latah, Nez Perce, and Lewis Counties, east into Clearwater County, and thence south through an extensive portion of northwestern Idaho County. The infestation also extends eastward from Kootenai County through the rural and urban areas along U.S. Highway 10 in Shoshone County to within a few miles of the Montana line.

The exact date of the initial infestation of these northern counties is not known, but local residents reported that rats have been troublesome in certain localities of Kootenai, Latah, and Nez Perce Counties since the early 1920's. Reports indicated that the early infestations in these counties spread from the west to the southeast, implying that the initial infestations probably occurred when rats migrated into northern Idaho from heavily infested adjoining localities in the State of Washington.

Franklin, Bannock, and Oneida Counties in southeastern Idaho have been invaded by rats within the past 20 years. According to C. P. Maughan, district sanitarian, Idaho Department of Health, rats were first observed in Franklin County about 1940, when they apparently migrated northward from adjacent Cache County, Utah, where severe infestations had developed during the 1930's. The spread of rats in Franklin County progressed at a rapid rate, probably because they were migrating from an abundant base population in Cache County, Utah. By 1954, rats were established in most of the towns and farming areas of Franklin County and had reached the Oxford and Swan Lake areas of southern Bannock County.

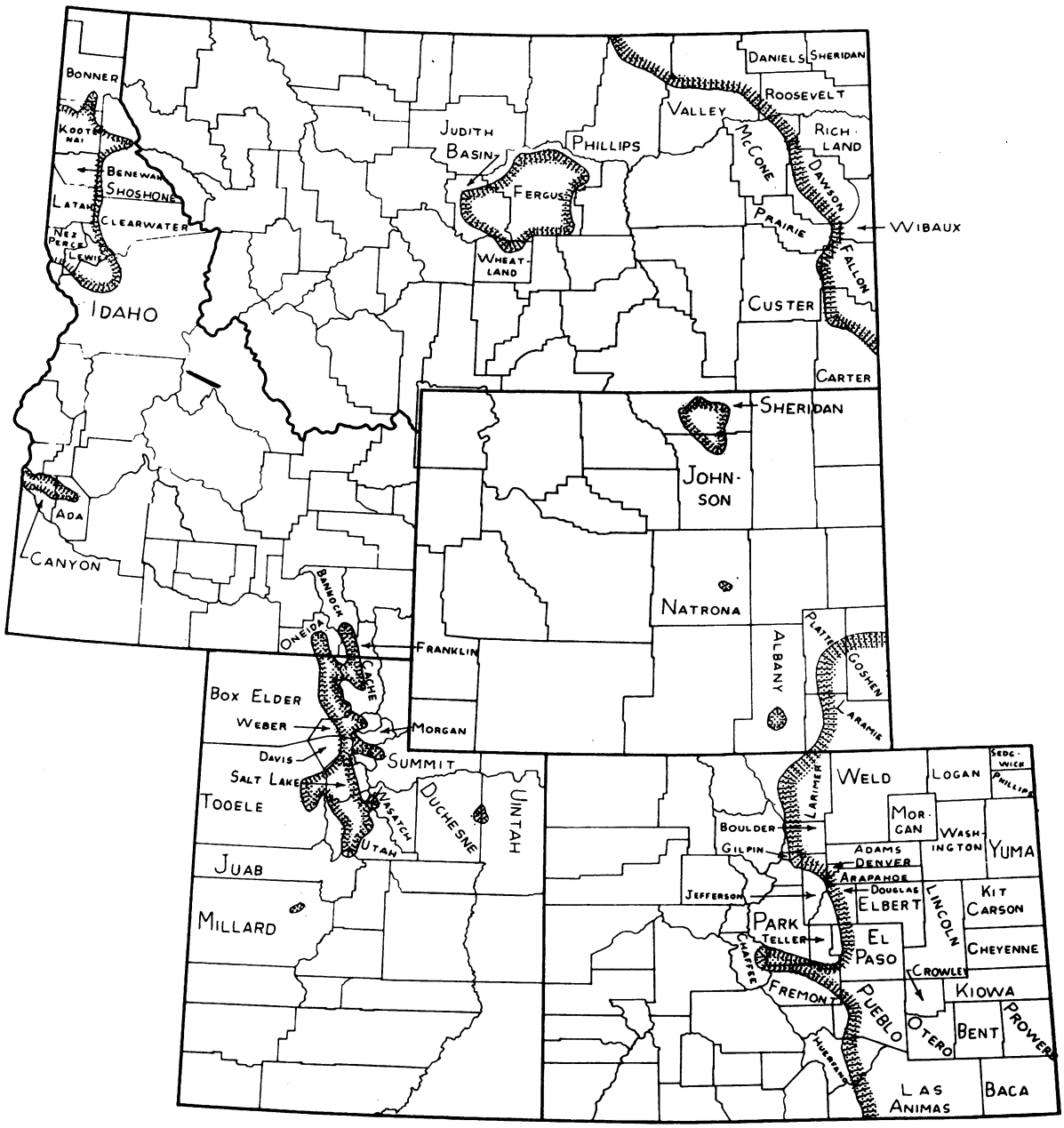
It appears almost certain that only a short time will elapse, in the absence of adequate control measures, before rats cross the divide between the Bear River and Snake River watersheds, and they will then have a favorable route of migration along Marsh Creek to the more heavily populated rural and urban areas in Bannock County. Rat infestation of this area would pose a serious problem, since it would open the way for rats to invade the entire upper Snake River Valley, which in 1955 was entirely free of rats.

Rat infestation of Oneida County, according to Maughan, was first reported in the spring of 1947, when a few rats were trapped at Woodruff, about 2 miles north of the Utah line. By 1950, rats were being reported in the vicinity of Malad. Surveys in the spring of 1954 showed a heavy infestation at Malad, but no evidence of rats at any of the ranches along U.S. highway 191 north of Malad and south of the Bannock County line.

In southwestern Idaho, portions of Ada and Canyon Counties have become infested in recent years. The first reported infestation of Ada County was in 1946, when a few rats were trapped in Boise. A survey of southwestern Idaho in 1949 revealed that rats had begun to migrate westward from Boise along the Boise River.

As a result of the survey in 1949, which indicated that rat populations in Boise and vicinity were increasing rapidly, a program of rodent control was initiated by the Boise City-Ada County Health Unit in conjunction with the Idaho Department of Public Health. Despite this control program, which included the use of poisons and elimination of open dumps along the Boise River, rats continued to spread westward, and in the spring of 1953, they were first reported in the vicinity of Caldwell and Nampa

Distribution of the Norway rat (Rattus norvegicus) in Colorado, Idaho, Montana, Utah, and Wyoming in 1955



in Canyon County. The infestations in Ada and Canyon Counties have thus spread through a fairly heavily populated area, approximately 40 miles in length and 15 miles in width, during a period of about 10 years. The rate of migration in Ada and Canyon Counties was much faster than in Franklin and Oneida Counties, probably because of the relatively few people in the latter two counties. The spread of rats in these four counties illustrates the cumulative effect of short, local wanderings which enable rats to spread over extensive areas in a short time.

Montana

Silver (*1*) indicates that Montana was the last State permanently invaded by the domestic

rat. He states that a few rats were found in Lewistown, Fergus County, during the summer of 1926, and that investigations indicated that the initial infestation occurred about 1923. He also states that rats were introduced into the Fort Benton area of Chouteau County during the early days before railroads, when freight for mining camps was transported up the Missouri River by river packet. For a time, rats were reported to be quite numerous in the Fort Benton area, but later they disappeared. Silver further states that rats gained a foothold in Helena in the early days, but since have entirely disappeared.

Tryon (*2*) refers to the first permanent establishment of rats in Montana as occurring in Lewistown at some time between 1920 and 1925. This infestation is stated to have spread over most of Fergus County by 1936, and westward through much of Judith Basin County by 1947. According to Tryon, rats also entered the eastern part of the State near Sidney in Richland County about 1936, and within a few years had spread through most or part of the nine counties of Daniels, Sheridan, Valley, Roosevelt, Richland, Dawson, Wibaux, Fallon, and Carter. The infestation in eastern Montana spread rapidly during the decade 1936–1946 as a result of migrations from abundant base populations in adjoining areas of North Dakota and the Province of Saskatchewan in Canada.

During 1950 and 1951, studies relating to the problem of rodent control in Montana were conducted in 46 of the 56 counties in the State. The surveys did not include all counties lying west of the Continental Divide, inasmuch as this area was reported to be free of rats. The studies showed that much of Fergus and Judith Basin Counties was infested with rats. However, no evidence of rats was found in the Fort Benton area or in Helena. The area of infestation in eastern Montana was found to include most of the communities and farming districts bordering the Province of Saskatchewan, Canada, on the north, and North Dakota on the east. This area included all or portions of 12 counties extending from the northeastern part of Phillips County which adjoins the Canadian border, to the northern part of Carter County in the southeastern section of the State.

From available information, it appears that the rat infestation of Fergus, Judith Basin, and Wheatland Counties in central Montana was originally established by common carrier at Lewistown. The invasion of counties in eastern Montana was accomplished by the migration of rats overland, apparently without the aid of commercial vehicle or other manmade transport. All the migrations followed streams or highways and roads, and moved relatively faster in the more thickly populated areas. In the thinly settled ranching districts of the State, the rate of migration was slower, indicating that the scarcity of settlers is a factor inhibiting the rapid migration of rats. The rat invasion of eastern Montana has demonstrated that by reason of their high biotic potential and their adaptability to different environmental conditions, rats are capable of spreading across extensive areas in which the situations are marginal for them.

Utah

The rat-infested area of Utah was found to include most of the central valley of the State from the Idaho border south to the northeastern part of Juab County, bordered on the east by the Wasatch Mountains and on the west by the Great Salt Lake and Utah Lake. Isolated infestations were also found at Park City in Summit County, Delta in Millard County, and near Roosevelt in Duchesne and Uintah Counties.

During the early period of settlement, Silver states that rats were not present in Utah in 1888, but in that year they were reported to be abundant in Albuquerque, N. Mex., and were known to be present in Arizona. Allen (*3*) reported that there was no evidence of the house rat in the Salt Lake Valley, Utah, in 1874 but that the house mouse had been introduced into that area and was common in homes and fields.

The earliest authenticated record of the presence of rats in Utah was provided by the late N. W. Pickett, former senior sanitarian, Utah State Department of Health. According to Pickett (personal communication, 1948), rats were first observed in Salt Lake City about 1900, but for several years afterward they were apparently low in numbers and were observed only in the western portion of the city in the

immediate vicinity of the railroads. This would suggest that the domestic rat was imported into Utah by railway cars. By 1914, rats were reported to be causing considerable damage in grocery stores in the downtown area of Salt Lake City, and were present in large numbers at the Utah State fairgrounds in the western part of the city.

From available information (personal communication from DeLore Nichols, former agricultural agent, Davis County), rats first appeared in Davis County between 1916 and 1918 at which time they were most numerous in the southern portion of the county, particularly in the Bountiful area. By 1920, the infestation had spread northward to the vicinity of Centerville and by the autumn of 1927, nearly all portions of the county were infested. The infestation of Davis County apparently resulted when rats migrated from the base population in adjacent Salt Lake County.

S. R. Cunningham, former chief sanitarian, Ogden City Health Department, informed the senior author that the presence of rats in Ogden, Weber County, first came to his attention in 1903 when he investigated rat infestation at a bakery located in the west portion of town. Since this bakery was located in the vicinity of the railroads, it appears likely that the original infestation at Ogden, like that at Salt Lake City, resulted when rats were transported into the area by railway.

According to R. A. Madsen, former city sanitarian, Brigham City Health Department, the first instance of damage resulting from rats in Brigham City, Box Elder County, occurred in 1922 when poultry producers reported serious damage to stored feeds and loss of chicks and eggs. Residents in other areas of Box Elder County stated that rats were first observed in the vicinity of Willard about 1920, but they were not observed in the Corinne, Plymouth, and Collinston areas until about 1935, and not until about 1940 at Portage. The migration of rats in Box Elder County apparently progressed in a northerly direction and required about 20 years to cover the area from the Weber County line to the Utah-Idaho boundary.

The first authenticated record of rats in Cache County in the north-central part of the State, is supplied by Dr. E. G. Titus, former head of the department of zoology, Utah State University. Dr. Titus informed the senior author that an infestation of rats at Cache Junction was called to his attention in the spring of 1911, and this was his first experience with domestic rats in Utah. The presence of rats in Cache Junction in 1911 and the fact that this community was then an important center for the shipping of grain suggest that rats were brought into Cache Valley by the railroad. Moreover, there were no known infestations at that time in the adjacent counties of Utah or Idaho from which the rats may have migrated into Cache County.

The presence of rats east of the Wasatch Range in Utah was first reported to the senior author during the autumn of 1949 by P. H. Kiser, sanitarian, milk division, Salt Lake City Health Department, who had just returned from Duchesne County where he found a dead Norway rat in a metal watering trough at a dairy located one mile south of Roosevelt. Subsequently, a survey in the fall of 1949 showed rats to be present at this dairy and several were trapped at an adjacent hog farm and the nearby community garbage dump. Exhaustive surveys during 1950 and 1951 disclosed no evidence of rats elsewhere in the Uintah Basin, or in any other locality in Utah east of the Wasatch Mountains. In the fall of 1955, rats were observed at farms situated along Cottonwood Creek several miles east of the Roosevelt community refuse dump. This constituted the first record of rats in Uintah County. Information obtained from surveys conducted during 1949 to 1955 indicated that the rat population in Duchesne and Uintah Counties was low in numbers and confined to the vicinity of Roosevelt. This suggests that rats were introduced into this area at a relatively recent date, and sufficient time had not elapsed for them to become widespread.

Wyoming

With respect to the early history of rat infestations in Wyoming, Silver (*1*) wrote as follows: "With exception of Montana, Wyoming has been the last State invaded, the first rats apparently crossing the border from Nebraska about 7 years ago (1919), while at the present

time they are reported as having worked their way up the Platte River Valley as far as Fort Laramie and as being common along much of the Nebraska line. They are also firmly established at Sheridan, not far from the Montana line."

During the rodent surveys from 1947 to 1955, all of the counties of Wyoming were visited, and four widely separated areas of infestation covering portions of seven counties were found within the State. Of these infested areas, the most extensive is located in the southeastern corner of the State and includes a large portion of Laramie County and parts of Goshen and Platte Counties. At present, most of the towns and ranches along U.S. Highways 85, 87, and 26, from Guernsey, Fort Laramie, and Wheatland in the north to the Colorado line in the south, are infested. In all probability, these infestations developed during the past 40 years as a result of the rats advancing westward from base populations in adjoining areas of Nebraska.

More recently, rats have been introduced into Albany County. In 1947, intensive surveys disclosed no evidence of rats at Laramie and vicinity. However, when the area was again surveyed in 1949, a few rats were observed at an animal byproducts plant located several miles north of Laramie and also at several points along the Laramie River and railroads north of the city. The Laramie business and residential districts and the city dump to the northeast of the city showed no evidence of rat infestation during the latter part of 1949.

No evidence of rats was found at Casper or other localities in Natrona County during surveys in 1949 and 1950. Previously, in 1948, albino rats were reported inhabiting the Casper city dump, which is located east of the city and along the banks of the North Platte River. According to local officials, these albino rats were entirely eradicated by poisoning during the winter of 1948. There were no further reports of rats in Casper until the summer of 1954, when a few rats were detected and killed in the business and residential districts. In the winter of 1954, a survey disclosed rats at several places in Casper and also showed a light infestation of Norway rats in the outlying city garbage dump.

The surveys showed that a sizable portion of Sheridan County extending from Ranchester and Dayton in the north, to Clearmont, Story, and Ucross in the south, is infested with rats. Also, it was found that rats have spread southward from Sheridan County along Clear Creek into Johnson County, but in June 1950 they had not reached the city of Buffalo. In the surveys of 1950, no evidence of rats was found in the extreme northern part of Sheridan County, from which it was concluded that rats had not migrated northward from this county into adjoining Big Horn County, Montana.

The rat infestations at Laramie, Casper, and Sheridan are isolated from other infested localities in Wyoming and adjacent States by extensive and barren uninhabited areas which restrain the natural migration of rats. In all probability, rats were introduced into these areas by means of the railroads or other man-made transport, reaching Laramie from about 1947 to 1949, Casper between 1950 and 1954, and Sheridan during the early 1920's.

Discussion

The foregoing information indicates how domestic rats have invaded extensive areas in the northern Rocky Mountain States and have become firmly entrenched in localities having wide diversity in physiography, vegetative cover, and land utilization. Many of these infestations have developed during the past 30 years despite rat-poisoning campaigns conducted at local and county levels.

In localities of the northern Rocky Mountain States where rats had become firmly established before control operations were undertaken, poisoning campaigns have resulted only in a temporary reduction of the rodent population and have failed to prevent the spread of rats into adjoining uninfested areas. At three localities in Utah, notably Blue Creek in Box Elder County, Kimball Junction in Summit County, and the Ingraham ranch located 2 miles south of Mona, Juab County, poisons have been utilized to eradicate incipient and isolated infestations. In each of these places the rats were detected and destroyed before they had time to propagate and become well established. It appears highly probable that rats will continue to follow a pattern of population expansion

similar to that of the past, and new areas in the Rocky Mountain States will continually be invaded unless control measures more effective than the brief poisoning campaigns employed in the past are initiated and maintained.

The failure to recognize the extreme propensity of rats for becoming entrenched in any environment that provides them with adequate food and harborage has been the chief reason why effective, permanent control has not been achieved in the Rocky Mountain States. With few exceptions, all of the rodent control work in these States has been conducted on a request or complaint basis due to lack of personnel at both State and local levels for this purpose. A few cities such as Salt Lake City and Provo, Utah, and Boise and Lewiston, Idaho, have made noteworthy progress toward eradication of rats from their business and residential districts. In these cities, highly effective control programs, based on the elimination of food supplies, harborages, and breeding places of rats, were initiated during the 1940's. In other localities where eradication or control of rats has been attempted by brief poisoning campaigns and without regard to the elimination of rat harborages and food supplies, little or no success has been achieved. The experience acquired in the northern Rocky Mountain States during the past 30 years has clearly demonstrated that control of the Norway rat is a highly skilled profession, and to be successful, a control program must have intelligent planning, trained leadership and guidance from the State level, and full support and cooperation of the public in order to eliminate the food supplies and harborages upon which rats are dependent.

The domestic rat is unquestionably the most destructive mammalian pest, and a serious menace to public health. Sylvatic plague exists in native rodents in most of the western and Pacific Coast States. Urban sections adjacent to areas where wild rodents are infected with sylvatic plague, face a plague threat through the possible infection of domestic rats by transfer of fleas from native rodents, as noted by Hartwell and associates (*4*). With the exception of murine typhus, which in North America is mainly confined to the southeastern States, and sylvatic plague, which exists in wild rodents in the western States, other ratborne diseases including leptospirosis, trichinosis, ratbite fever, and salmonellosis may occur anywhere that rats exist.

It is now the opinion of public health workers that the ideal approach to control of domestic rodents is through a program of education whereby the general public is made aware of the menace to public health and the severe economic losses caused by rats. Local, county, and State departments of health, which have established procedures for reaching all segments of the population in matters of public health, are in a position to initiate an educational program of this nature. County agricultural extension agents are in an extremely advantageous position to distribute information to the residents of rural areas relative to the advantages of rat control and the importance of maintaining their premises free of harborages and breeding places of rats. Municipal officials who have responsibility for the collection and disposal of garbage and refuse should take steps to eliminate open refuse dumps by providing sanitary landfills or other approved methods of refuse disposal. In the areas of infestation, open dumps are a serious obstacle to the success of rat control programs. In areas presently uninfested, open dumps should be eliminated as a practical rat-exclusion precaution.

The following basic measures are essential to the success of a permanent control program:

1. Good general sanitation, with particular emphasis on proper garbage and refuse storage, collection, and disposal.
2. Rat stoppage and rat eradication in existing buildings.
3. Ratproof construction of new buildings.
4. Rat-poisoning programs.

The enactment of suitable rodent control and other sanitation ordinances is essential to obtaining the first three items listed. All four items are considered essential in a complete and continuous program. No one measure will be adequate, and all should be encouraged, although it may not be possible to initiate all phases of a control program simultaneously.

Summary

Investigations on the distribution and control of domestic rats were conducted in Colorado,

Idaho, Montana, Utah, and Wyoming, from 1947 until 1955. The studies showed domestic rats to be present in each of these States, and in the majority of cases, the areas of infestation are rapidly expanding despite periodic poisoning campaigns which have been used as the principal method of control during the past 30 to 40 years.

Since the northern Rocky Mountain area is one of the few remaining sections in this country where much territory is wholly free of rats, there exists a real challenge for local, county, and State departments of health, and other agencies concerned with safeguarding public health and the general welfare to undertake programs to eradicate rats in the infested areas and to prevent their migration to presently uninfested areas.

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