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Grasshopper Campaigns in Saskatchewan During the 1930s

**A Report for
Saskatchewan Western Development Museum's
"Winning the Prairie Gamble" 2005 Exhibit**

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Grasshoppers are a major pest of cultivated crops in Saskatchewan. In the past, the majority of damage inflicted by grasshoppers has been to cereal grains. With the introduction of a more diversified agricultural landscape in recent years, grasshoppers continue to cause severe economic losses in the province.

Grasshopper is the name given to a very large and diverse group of insects. Saskatchewan has more than 85 species, while North America has more than 600 species. According to Saskatchewan Agriculture and Food, “All members of the group are characterized by chewing mouth parts, slender bodies, wings that fold lengthwise, large powerful hind legs for jumping and a gradual change in form and size as they develop.”¹ Only a few species of grasshoppers are considered to be of economic significance in Saskatchewan because of the crop damage they cause. These include the Two-Striped Grasshopper (*Melanoplus bivittatus*); the Migratory Grasshopper (*Melanoplus sanguinipes*); Packard’s Grasshopper (*Melanoplus packardii*); and the Clear-Winged Grasshopper (*Camnula pellucida*).

Grasshopper outbreaks tend to occur every eleven to fifteen years in Saskatchewan. Traditionally drier areas like the southwestern portion of the province, known as Palliser’s Triangle, are more prone to serious grasshopper infestations. During the Depression of the 1930s, the hot and dry weather conditions created perfect conditions for major grasshopper outbreaks in the farming regions of the province — outbreaks that persisted throughout the decade. According to James Gray, the area of the province infested by the “plague of grasshoppers” grew from mildly infested 1,600 square miles in 1931 to over 100,000 square miles by 1939. Gray provides the following colourful description:

By far the worst pests were the grasshoppers that came on the winds from Montana and North Dakota in numbers beyond all calculation, even beyond the exaggerative genius of the yarn spinners of the prairies. Single flights would descend out of nowhere, devour everything in sight and move on. They ate the handles off pitch forks, armpits out of shirts on farmers backs, clothes off the lines.²

Saskatchewan farmers played an active role in the well-organized “Hopper Campaigns” of the 1930s. The development of the mechanical grasshopper poison spreader by farmers proved to be very effective in the efforts to control the insects and save crops.

¹Saskatchewan Agriculture and Food, “Farm Facts: Grasshoppers” (December 1999), 1.

²James H. Gray, *Men Against the Desert* (Saskatoon: Western Producer Prairie Books, 1967), 36.

2. Grasshopper Campaign of the Early 1920s

The first serious infestation of grasshoppers in Saskatchewan, since the time of agricultural settlement, occurred between 1919 and 1923. In 1920, local “Hopper Brigades” were mobilized in ninety-seven Saskatchewan municipalities to assist farmers in the fight against grasshoppers. “Merchants, bankers, school teachers, machine men, etc., quite generally joined in the campaign, and the school children were widely enlisted...” the Saskatchewan Department of Agriculture reported. “All this organization work was done before the grasshoppers began to hatch, and the [grasshopper] scouts were watching for outbreaks in all parts of the infested districts before the date when hatching might be expected.” The government reported that 1,400,000 acres of crop, or one tenth of all cultivated acreage in the province, had been saved in 1920. The dollar value of the crop savings was conservatively estimated to be at least \$25 million.³

Methods for the control of grasshoppers were developed during this period that lasted well into the 1940s. These methods involved a combination of agricultural practices — programs of tillage and land management — and the thorough but efficient use of poison bait. Mixing stations were established in rural municipalities throughout Saskatchewan during the early 1920s (and again in the 1930s) at which grasshopper bait was prepared and distributed to farmers. The first grasshopper poison used was paris green, an arsenical easily identified by its colour. When crude white arsenic appeared on the market, it was quickly adopted because of its low price and high toxicity. A trail of dead animals during every campaign was mute evidence of the danger to all other animals, including man.

3. Grasshopper Campaigns in the 1930s

In 1934 and again in 1938 there were outbreaks of grasshoppers that were the heaviest the Saskatchewan had known since the time of agricultural settlement.⁴ According to James Gray, the grasshopper outbreaks made the great drought of the Depression far worse than it otherwise would have been. Essentially, the millions of grasshoppers that descended on Saskatchewan throughout the 1930s helped to hasten the spread of the “dust bowl.” “The abandoned land became the incubation areas for the insects which were carried by the winds onto the farms on which crops were still being grown,” Gray explains. “As the extent of abandonment increased, so did the size of the incubation beds.”⁵

Saskatchewan’s second major “Hopper Campaign” was underway by the fall of 1933. The staff of the Field Crops Branch of the provincial Department of Agriculture held 1,097 emergency meetings with 47,875 farmers in 223 municipalities throughout the infested area.⁶ At these

³Saskatchewan Agriculture, *History of Organized Grasshopper Campaigns in Saskatchewan, from 1919 to 1940*, by S.H. Vigor (Regina: [1956?]), 10.

⁴Ibid, 2.

⁵Gray, 36.

⁶*History of Organized Grasshopper Campaigns in Saskatchewan*, 16-17.

meetings, officials explained the nature of the threat which, according to a department bulletin distributed that fall, was ominous:

A severe outbreak of grasshoppers will almost inevitably occur next spring throughout the widespread area where the pest is so abundant this August and September. Such natural enemies as are present are incapable of preventing the outbreak, and it would be extremely dangerous to depend on the weather to destroy the pest before enormous damage occurs to crops next season. Conditions so far have been very favorable to maximum egg-laying by the adult grasshopper. ... The present prospects therefore indicate an infestation of such intensity that — with 'normal' weather and crop conditions, and should no consistent efforts be made to control the pest — fully half the crop would be destroyed over the greater part of the eighteen million acres of cultivated land that is affected in Saskatchewan.⁷

During the 1934 Hopper Campaign, municipal councils in infested areas of Saskatchewan were asked to set up voluntary grasshopper committees. Each committee member was supplied with bulletins on grasshopper control and asked to visit about ten to twelve of his neighbours. Every farmer was asked to study the grasshopper problem on his own farm and to work out a suitable plan of tillage and poisoning operations. "[A] great deal of credit is due to these volunteers in the grasshopper battle," S.H. Vigor of the provincial agriculture department wrote, "for the excellent preparations that were made by farmers and municipal councils to fight grasshoppers as they appeared."⁸

Gray calls the 1934 Hopper Campaign in Saskatchewan "easily the greatest thing of its kind ever seen in Canada." The directors of the campaign distributed 90,000,000 pounds of sawdust, 35,000,000 pounds of bran and 180,000 gallons of sodium arsenite to farmers around the province. Even though a tenth of the crop was destroyed and \$20,000,000 in damage was done, the campaign was called a success. "The test that year was not the destruction but what was saved and a conservative estimate was that within the Palliser Triangle 40 percent of the entire grain crop was saved from destruction by the exertions of the farmers and their expert advisors," Gray explains. "Unfortunately, in the heart of the Triangle what they were able to save did not amount to much for the wheat that was harvested that year barely exceeded four bushels to the acre."⁹

Nothing in the experience of 1934 prepared anybody for the disaster of 1938. Large invasions of grasshoppers from United States during the 1937 harvest time, combined with hot, dry weather conditions, brought about a major build-up in the grasshopper population in 1938.¹⁰ Almost all

⁷Government of Saskatchewan. Department of Agriculture, *1933 Emergency Program for Grasshopper Control in Saskatchewan*, prepared by K.M. King, S.H. Vigor and J.G. Taggart (Regina: King's Printer, 1933), 2.

⁸*History of Organized Grasshopper Campaigns in Saskatchewan*, 17.

⁹Gray 41-2.

¹⁰*History of Organized Grasshopper Campaigns in Saskatchewan*, 20.

arable land in Saskatchewan, or 83.35% of land lying south of 53° 30' was infested. The outbreak extended into north-western and north-central Saskatchewan, up to Meadow Lake and Nipawin. "Settlers who had never been faced with the problem deluged provincial and federal authorities with calls for advice and assistance," Riegert writes. "Here the farmers simply did not know how to cope with the infestations and what to do to save their crops."¹¹

There was no Hopper Campaign in southern Saskatchewan in 1938 or 1939. Severe drought had destroyed the crops and there was nothing or little to save. The nine-year fight against grasshoppers had left many farmers disillusioned.¹²

4. Poisoned Grasshopper Bait

The poisoned bait method of killing grasshoppers that had been developed in the early 1920s was used throughout the 1930s. The bait recipe, however, continued to evolve. Liquid sodium arsenite replaced the paris green and crude arsenic of the earlier campaigns. Not only was it just as potent in killing grasshoppers, its use eliminated the dust hazard in mixing stations. Over the years, the poison was mixed with a variety of ingredients, including horse manure, bran, and low-grade wheat flour. "By 1939 most grasshopper baits consisted of sawdust, with a small amount of wheat flour," federal entomologist Paul Riegert explains in his book, *From Arsenic to DDT*. "This cheap and effective mixture was the result of many years of experimentation."¹³

Spreading the poison grasshopper bait was the responsibility of the farmers. In the 1920s and early 1930s, farmers spread the bait by hand, carrying it in pails, and scattering it as thinly and as widely as possible across infested areas. They used spoons or pieces of lathe or even their hands to spread twenty to twenty-five pounds of bait per acre.¹⁴ The hand-spreading method was not always efficient, as it tended to land the bait in gobs rather than in small grains, creating waste that was hazardous to livestock. In addition, the pails of bait were heavy, and the arsenic mixture burned the farmers' hands where they were cut or nicked.¹⁵ Hand spreading was adequate for the control of grasshopper species which preferred the habitat of ditches and roadsides. As the Depression wore on, however, stubble species became more prominent. More efficient spreading methods were required if entire fields were to be covered.

While federal research scientists and provincial agriculture officials led the grasshopper campaigns of the 1930s, they never got around to inventing an easy way of spreading grasshopper poison bait. The farmers, therefore, had to develop techniques of their own. Years of continuous exposure to grasshoppers bred a sense of defeatism in many Saskatchewan farmers. There were those, however, whose initiative could not be stifled. As Riegert states: "It

¹¹Riegert, *From Arsenic to DDT*, 249.

¹²Ibid, 250.

¹³Ibid, 244.

¹⁴*History of Organized Grasshopper Campaigns in Saskatchewan*, 26.

¹⁵Gray, 40.

was inevitable that the time would come for the invention of a better bait spreader.”¹⁶

5. Mechanical Grasshopper Bait Spreaders

One of the first grasshopper poison bait spreading machines was built in Saskatchewan for the municipalities of Borden, Maymont, and Richard in May of 1937. This machine was used primarily for the spreading of bait along road allowances, but it could also be rented by the farmers to bait their fields.¹⁷ Eventually, many types of poison bait spreaders were being constructed and used by Saskatchewan farmers, as Riegert explains:

The number and types of mechanical spreaders made by a variety of craftsmen associated with farming was incredible. By and large, they all used the same principle, that of a revolving circular plate or disc, onto which the bait was dropped from an overhead hopper, and from which it was flung centrifugally, thus spreading the flakes of bait as the disc spun around. Power was supplied in a myriad of ways ranging from hand-cranked to chain-drives off sprockets mounted on and attached to rear wagon-wheels, to belt-driven auxiliary gasoline engines. They were mounted on buggies, wagons, trucks and carts; most of them were home-made and improvised.¹⁸

Not all of these mechanical bait spreaders proved entirely satisfactory, however. In an effort to develop a more effective and efficient machine, research work was done by the University of Saskatchewan on types of spreader blades, speeds, shielding, hoppers, hopper feed openings and particularly on a suitable type of agitator. In co-operation with the provincial Department of Agriculture, the university published a bulletin showing farmers how to construct a bait spreader, as well as instructions on how to spread bait:

Spread early on bright, sunny mornings... The bait should be on the ground when the grasshoppers start feeding. Grasshoppers do not feed when it is cold, very windy, extremely hot or cloudy. ... [Spread] as thinly as possible. Use not more than 5 gallons of bait per acre. When properly spread it should be almost impossible to see on the ground. Thin spreading gives just as good or better kills than thick spreading, and reduced the danger to livestock. [Spread] right among the hoppers. The bait is readily eaten while it is still moist.

The publication also contained a warning to “Handle poison baits with caution:”

Remember that they contain poisons. Rubber gloves and boots are a wise precaution. The only safe way to dispose of unused supplies of poisoned bait is to spread it thinly on a field. Arsenicals cannot be destroyed — even by burning. Truck boxes or other containers should be well painted or metal covered to prevent the poison soaking into the

¹⁶Riegert, *From Arsenic to DDT*, 248.

¹⁷Ibid.

¹⁸Ibid.

wood.¹⁹

As more and more machines appeared, mechanized grasshopper bait spreading enabled farmers to cover the fields more quickly, to spread the bait more evenly, and to use much less bait per unit area.²⁰ Mechanical bait spreaders were very efficient where large areas required baiting within short periods of time.

While the use of poison bait provided a measure of crop protection, poisoning did not have much of an impact on the reduction of grasshopper populations. Saskatchewan farmers would have to wait for cool, wet weather, parasites and disease which, as has been the case throughout the ages, are primarily instrumental in terminating grasshopper outbreaks.²¹

7. Annual Grasshopper Abundance Surveys

Starting in 1931, annual grasshopper abundance surveys were conducted by research scientists at the Dominion Entomological Laboratory as a service to prairie farmers. During the Depression these surveys were, in Riegert's words, "an integral component of the philosophy of survival."²² The annual surveys were made during the autumn egg-laying period with a view to determining the abundance of adult grasshoppers according to species, and egg abundance. Grasshopper forecast maps and posters were then produced, based upon the survey data. The Hopper Campaigns were based upon these forecasts, enabling provincial authorities to prepare the campaign about six months in advance of the impending insect attack. "The forecasts based on the surveys have been remarkably accurate," the provincial government reported, "and farmers have learned to place great confidence in them..."²³

Grasshopper abundance surveys continue to be conducted to the present day. By the 1970s, however, limited funding as well as pressure to do research rather than service work led to the withdrawal of the federal government scientists from the survey work. Consequently, in 1971, the provincial government took over the grasshopper surveys as a service to farmers. The assemblage and analysis of the data, and the production of an outbreak forecast map, remains the responsibility of the federal Research Station in Saskatoon.²⁴ In 1975, the Research Station developed a computer program to analyze grasshopper survey data, and to draw forecast maps.

¹⁹Saskatchewan. Department of Agriculture. Field Crops Branch, and University of Saskatchewan. Agricultural Engineering Department, *Grasshopper Bait Spreaders* (Saskatoon: Saskatchewan Co-operative Agricultural Extension Program, n.d.), 1-2.

²⁰*History of Organized Grasshopper Campaigns in Saskatchewan*, 22.

²¹Paul W. Riegert, *A History of Grasshopper Abundance Surveys and Forecasts of Outbreaks in Saskatchewan*, *Memoirs of the Entomological Society of Canada*, No. 52 (Ottawa: Entomological Society of Canada, 1968), 96-7.

²²Riegert, *Outbreaks*, 54.

²³*History of Organized Grasshopper Campaigns in Saskatchewan*, 5.

²⁴Riegert, *Outbreaks*, 56.

These maps are now available to farmers on the Internet.

8. Post-War Developments

From 1939 to 1947, cool, moist weather conditions in Saskatchewan proved to be adverse to grasshoppers, causing a decrease their population. In addition, the presence and effects of a fungus disease caused the number of grasshoppers in the province to plummet during the 1940s. Grasshopper outbreaks have occurred in subsequent decades, however, necessitating grasshopper control measures. The peak years of grasshopper infestation in Saskatchewan in recent decades have been: 1963, 1972, and 1985. Another major outbreak is predicted for the spring of 2002.²⁵

Methods for controlling grasshoppers have changed dramatically since the Depression. Following the Second World War, chemical sprays or dusts such as chlordane, toxaphene and dieldrin were increasingly used to kill grasshoppers, even though they were more expensive than bait.²⁶ By the 1960s, it became clear that these chemical insecticides were causing environmental problems. In the 1980s, scientists with Agriculture Canada studied methods of environmentally friendly pesticide application for the control of grasshoppers.²⁷

The Agriculture Canada's Research Centre, Saskatoon, developed a wheat bran bait called "Hopper Stopper" (later called "Ecobait") that is spread, not sprayed. The Brie-Mar® Applicators Division of Peacock Industries, Saskatoon (makers of Hopper Stopper) manufactures truck-mounted bran bait spreaders which can be rented from the Saskatchewan Wheat Pool, the United Grain Growers, chemical suppliers, and rural municipalities.²⁸ It will be difficult to get farmers to shift to bait spreading from conventional spraying methods for pest control. Nevertheless, it is clear that the mechanical grasshopper poison bait spreader, first developed by Saskatchewan farmers during the Depression, has made a comeback.

²⁵Michelle Lang, "Grasshopper Plague Predicted," in *The StarPhoenix* (February 21, 2002), D4.

²⁶Canada. Department of Agriculture. Division of Entomology, *Grasshopper Control in Saskatchewan; Prepared by the Committee on Forest Pests of the Guide to Farm Practice in Saskatchewan*, Processed publication series No. 75 (Ottawa: 1948), 4.

²⁷Dr. Ron Ford, interview with the author (Saskatoon: Western Development Museum, February 1, 2002).

²⁸"New Bran Bait has Wider Appeal for Grasshoppers -- and People," on the Farm Canada web site, <www.news.farmca.com/business/grasshopper.html>, January 2002.

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Appendix A: Chronology of Grasshoppers in the Prairies

- 1818 Invasion of grasshoppers reported in Red River Settlement destroyed the crops of the struggling settlers. Swarms of grasshoppers hatched again in the spring of 1819.
- 1857-1875 Extensive outbreaks of grasshoppers recorded over much of the prairies.
- 1901 "Criddle Mixture," a type of grasshopper poison, was introduced by Norman Criddle. Arsenic and salt were added to fresh horse manure.
- 1917 Specific legislation enacted to deal with grasshopper control. Section 173 of *The Rural Municipalities Act*, known as the "Grasshopper Bylaw," gave municipalities the authority to spend municipal funds for grasshopper control, and to require farmers to spread bait to destroy the insects.
- 1919-1923 First large-scale grasshopper campaign conducted on the Canadian Prairies. Hundreds of bait-mixing stations were established, and the poison "Kansas Mixture" was introduced. Oranges, lemons, and molasses were added to arsenic and bran. Development of mixers came out of this campaign. For the five years the Government of Saskatchewan spent \$871,332.43 in purchasing and distributing 35,656 tons of poison.
- 1919 Cost of grasshopper campaign in Saskatchewan was \$70,000; hoppers destroyed about \$1,600,000 worth of wheat, while the poisoning saved \$2,000,000 dollars worth of crop.
- 1920 The expenditure in Saskatchewan was \$361,879.68 and 8,000 tons of bait were spread. It is estimated that 1,400,000 acres or about \$25,000,000 worth of crops were saved that year.
- 1921 Grasshopper poisoning to the tune of 11,510 tons of poison cost Saskatchewan \$204,624.12. In 1922, the cost was \$151,511.55; in 1923, \$128,797.08.
- 1931 First concerted annual "adult" and "egg" abundance grasshopper survey in Saskatchewan conducted by Norman Criddle which resulted in the first annual provincial grasshopper forecast.
- 1932 Liquid sodium arsenite, made from caustic soda and white arsenic, was used in grasshopper bait mixture instead of powdered Paris green and crude arsenic from earlier control campaigns.

Chronology of Grasshoppers, cont'd.

- 1933 Grasshopper Control Committee established by Saskatchewan's Minister of Agriculture. 6,482 tons of dry bait were produced for \$89,859.93. Bait was spread in 137 municipalities, treating 29 million acres of farmland.
- 1933-34 *The Rural Municipalities Act* was again amended giving municipal councils more powers. If a farmer refused to control grasshoppers on his land, the council could use any other means of destroying them, including the summerfallowing of land under crop.
- 1934 Heaviest outbreak of grasshoppers in Saskatchewan to that date. All cultivated acreage in the entire prairie portion of the province, or 60.74% of land lying south of 53° 30', was infested.
- 1937 Introduction of mechanical bait spreaders of many types — mostly homemade.
- 1939 Almost all arable land in Saskatchewan, or 83.35% of land lying south of 53° 30' was infested by grasshoppers. Infestations extended into northwestern and north-central Saskatchewan, up to Meadow Lake and Nipawin.
- Post-1945 Introduction of new organochlorine insecticides including DDT, chlordane, dieldrin, and toxaphene.
- 1948-49 Major outbreak of grasshoppers in all three prairie provinces.
- Mid-1950s Research begins to show residue problems with organochlorine insecticides. DDT was accumulating in harmful concentrations in the food chain. Dieldrin, widely used for grasshopper control, was showing up in meat and milk products through inadvertent contamination of forage and feed.
- 1960s Federal Department of Agriculture phased out DDT and other organochlorines, which were replaced by less persistent and biodegradable insecticides such as dimethoate.
- 1963 \$40 million worth of crop was lost due to grasshopper attacks in Saskatchewan.
- 1972 Major outbreak of grasshoppers led to full-scale chemical control campaign in the province.
- 1984-1986 Widespread outbreak of grasshoppers cost the Saskatchewan between \$200 and \$300 million.
- 2002 Severe grasshopper infestation predicted for southwestern Saskatchewan.