

EXPERIMENTS IN THE ECONOMIC CONTROL OF THE  
WESTERN CROW<sup>1</sup> (*CORVUS BRACHYRHYNCHOS*  
*HESPERIS*).

BY LEON L. GARDNER.

THE status of the Crow in its relation to agriculture has been a much discussed question, the final balancing of accounts leading, according to Kalmbach,<sup>2</sup> to the conclusion that the good done by this bird neutralizes the harm. There are unusual situations, however, in which the Crow may be of enormous detriment to crops, one instance of which brought to the attention of the Bureau of Biological Survey, United States Department of Agriculture, is described in the present paper.

In the region of Goodnoe Hills, Klickitat County, Washington a very promising enterprise in raising almonds and apricots was developing. It was reported, however, by the farmers of that region that in fall enormous flocks, amounting to "millions of crows," came into this region and destroyed practically the entire crop of fruit and nuts, together with considerable acreages of watermelons. These reports were partially confirmed in communications from Professor R. J. Barnett of the State College at Pullman, Washington. The Biological Survey immediately undertook to investigate the damage and to originate some method of control. For this purpose the writer was sent to the Goodnoe Hills in the summer of 1919 where, with the coöperation of Mr. L. K. Couch, the Bureau representative in that state and Mr. B. W. Cooney, the County agricultural agent, experiments were conducted that led to some interesting observations and results. These experiments have been briefly referred to in the literature<sup>3</sup> but are here reported in full for the first time.

<sup>1</sup> Acknowledgements are due the U. S. Biological Survey for permission to use this material for publication.

<sup>2</sup> Kalmbach, E. R. *The Crow in Its Relation to Man.* Bulletin No. 621, U. S. Dept. Agr. Feb. 1918.

Kalmbach, E. R. *The Crow in Its Relation to Agriculture.* Farmers Bulletin No. 1102, U. S. Dept. Agr. Aug. 1920.

<sup>3</sup> Kalmbach, E. R. *Farmers' Bulletin No. 1102* U. S. Dept. Agr. 1920 p. 18.  
Kalmbach, E. R. *National Geographic Magazine*, Vol. 37, 1920, p. 337.

It was stated that damage commenced about the last of July among the apricots and continued through the almond season, or to early in November by which time practically the entire crop would be lost. Witnesses reported that Crows preferred almonds to other crops and that they would pull them off the trees and fly to a rookery in a deep, rocky gorge some three miles east in an air line. The statement that Crows carried the almonds away proved, fortunately, to be erroneous, for the final and successful solution of the problem was based entirely on the exact method by which the nuts were procured and consumed.

Klickitat County in which the Goodnoe Hills are located is divided into two distinct regions by the amount of rainfall received by each. The eastern half is arid with almost desert conditions, while the western portion receives an abundance of rain and is heavily forested. The county borders the Columbia River which here runs in a gorge approximately 1000 feet deep. The Goodnoe Hills are in the eastern arid section of the county. The mountains on the north (or Washington) side of the gorge rise as a steep wall in two tiers. The first ascent is about 1000 feet and quite abrupt in nature, terminating in a long level bench some 4 miles in width and paralleling the river for many miles. The second acclivity is approximately 800 feet in height rising in a more gentle slope above the first and like it forming a plateau. These elevations may be likened to the first two steps of a giant stairway.

Deep rocky gorges or canyons cut through this plateau region and these in the rainy season contain streams emptying into the Columbia. The Goodnoe Hills are located on the lower bench and are bounded by the river to the south, mountain wall to the north and gorges on the east and west. That to the east is a wide, deep and rocky canyon known as Rock Creek which is set aside as an Indian Reservation, and which served as the base from which the Crows operated.

Transportation to the Hills is difficult. A branch line, the Spokane, Portland and Seattle Railroad runs several trains a day on the north bank of the river. A two horse "stage" connects the Hills with the railroad, making one trip a day consuming from 11 in the morning until 3:30 P.M. to complete the round trip.

This region, as has been mentioned, is arid, the upper bench, with slightly more rainfall, is typical scrub oak country while the lower bench, with only about 8 inches of annual precipitation, is treeless and sage covered. The soil is exceptionally rich, with a most astonishing capacity to retain water. No irrigation is practiced, and, in spite of this, excellent and large apricots were grown as well as fancy watermelons. The land was set out to about 1000 acres of apricots and 600 acres of almonds chiefly the soft shelled varieties, and also to many large melon patches.

The Goodnoe Hills were reached August 15, 1919, by means of the County agent's automobile, from Goldendale, the stage being entirely too slow. Observations were conducted as to the prevalence of the Crows and the character and amount of damage being done.

The town consists of one building comprising post office, grocery, dry goods and hardware store, town hall and information bureau, but not serving in the capacity of a hotel. The region is sparsely settled with large orchards of apricot and almond trees, much of it owned by outside investors and cared for by the local residents. Houses were scattered over a wide area and no accommodations for living existed. In this extremity one of the inhabitants rose to the occasion and offered the use of his hay loft which was gladly accepted. However the beards of wheat that formed our beds and the abundance of flies soon impelled us to hunt for other quarters and these we found in a deserted shack two miles north, which was offered us on the condition that the watering trough for the stock be filled daily. Water is exceedingly scarce in the Hills and bathing almost a lost art as all water is used for drinking and culinary purposes. No method has as yet been provided for drawing on the waters of the Columbia scarcely four miles distant.

The residents estimated "millions" of Crows, a feeling that any grower might easily acquire on seeing the huge flocks and the havoc they wreak upon his crops. Along the entire river it was noticed that Crows were abundant but we were not prepared for the enormous numbers met at the Goodnoe Hills. The almonds were ripening fast and Crows had assembled in mass from the surrounding country for the annual feast. They were in flocks of hundreds to thousands. The usual formation was in one enormous

flock which worked as a unit in some selected orchard with a few outlying and unimportant groups feeding at random from other orchards. When in the air, this large host looked at a distance like a huge cloud of gnats.

It was difficult to estimate the exact numbers but an approximation could be made with the larger group when they settled to work in an orchard. In a 20-acre almond orchard there were about 1500 trees. To each one of these trees one could count from ten to thirty Crows with an average of fifteen to the tree. The flock on our arrival numbered perhaps 15,000 which, in a short time, nearly doubled in size until we estimated fully 30,000 members in the various groups.

There are several factors producing such large numbers of Crows, not the least of which is the abundance of safe nesting sites in all of the gorges along the Columbia River, which are little inhabited, and the nesting sites afforded by the forests of the region, are free from molestation. Rock Creek canyon forming the eastern limit of the Hills is a wide and rocky gorge that, in the rainy season, has a stream of some size. This region is rocky, forbidding and desolate with scattered cotton wood and sycamore trees affording excellent nesting sites. An immense rookery exists here from which a goodly supply of Crows issues each year. This constitutes the nucleus of the marauding flock but it gains large accessions from other regions chief of which seems to be the John Day area on the Oregon side of the river.

So completely had the Crows taken possession of the Goodnoe Hills that in the nesting of the current year many of them did not take the trouble to repair to Rock Creek but built their nests in the almond trees (none were seen in the apricots) and successfully reared their broods in open contempt of man.

Apricots were largely picked on our arrival and at that time no damage was occurring to this fruit. It was stated, however, that considerable havoc had been wrought to them. At the time of arrival the almonds were ready to pick and Crows were by far more interested in the nuts than the fruit.

With regard to the almond damage there was no argument. The destruction of an \$800 crop was complete in two days after which the Crows moved on to a new orchard. It was a curious

fact that the vast majority of birds were in one flock which seemed to select one particular orchard (usually the best cultivated) where they would work continuously until the entire crop was destroyed before moving on. In this way one could find orchards in which every tree was absolutely stripped bare of nuts while in other areas trees would be heavily loaded. The ground around the trees was strewn with almond husks and shells and not a square inch of soil was to be found that did not bear countless Crow tracks. An idea of the extent of damage can be gained by the accompanying figures with the tree stripped bare and the nuts and hulls on the ground. The almonds most attacked were the soft or paper shelled varieties—Nonpareil, Ne Plus Ultra and especially the I.X.L. Hard shelled kinds as the Drake and Jordan are a little too hard for the Crows and are not eaten except in unusual circumstances.

The chief time of Crow damage was in the morning from 9 o'clock until noon, and again at 5 in the afternoon. Beginning at 7 A.M. Crows would begin to straggle into the Hills from Rock Creek and settle in the chosen orchard. They came in groups of twos and threes calling vociferously all the while. Gradually these increased in size until there were flocks of several hundred at a time and finally a steady stream of Crows would be pouring in from the canyon until the numbers at work in the orchards increased to enormous proportions. About noon a return flight to the canyon occurred in which the major portion of the flock would take a siesta. Around 4 P.M. these again returned to finish the days feeding.

It was a practice of the Crows, after a hot afternoon's work, to spare themselves the trouble of flying any considerable distance to water by feeding on watermelons. They were never seen to attack melons in the morning but always after a dry day's work. Furthermore green melons were sought and eaten as well as ripe ones indicating it was the moisture they were seeking. In any event the damage amounted to practically 100% of the crop, no melon being spared unless it happened to be concealed in the vines. Some of the farmers had discovered this and it was interesting to see how easily a melon could be protected in this way. The crudest attempt at concealment such as covering with a weed was

sufficient. In this way large melons were preserved when only partially concealed. Had every melon in the patch been covered, however, the result might have been different. The lack of observation on the part of the Crow in these instances seems most surprising.

In the past various attempts at control had been instituted without any success. Shooting had been tried but served merely to cause the Crows to move temporarily to adjacent orchards or keep out of range in the same orchard. Scare-crows and the exhibition of dead Crows had no effect nor did attempts to decorate trees with cloth strips serve to deter the marauders. A depressing feeling of helplessness had settled on the residents, nearly all of whom were sure that failure would result, so offered us scant help and no encouragement. Indeed one farmer sent word that we need not waste any time trying to save his crop, a statement he was shortly to retract.

It certainly must be remarked that these were the boldest Crows we had ever seen. They often flew, cawing loudly, within easy shotgun range over our heads and would remain, without fear, in the very orchard in which we were working. Once having seen the flock wreak its destruction in an orchard one was inclined to share in the disheartened feeling.

Since other measures had failed it was felt that poisoning with strychnine offered the best hope of success. A readily available source of bait was sought; this being found in the jackrabbits (*Lepus t. townsendii*) that swarmed in the neighboring brush and this supply was promptly requisitioned.

The Crows were found to be working in two large orchards (which may for purposes of conveniences be designated as A and B) located in the north west portion of the Hills. To reach these the flock, coming from Rock Creek, had of necessity, to cross the entire breadth of the Hills, flying over many orchards as yet untouched. The route led over our shack and we came, in time, to interpret their raucous calls as jeers of derision at our impotence.

A considerable number of rabbits were collected and taken (Aug. 17) into orchard B where the largest number of birds were at work, and at which point it was hoped to establish a central baiting ground. These mammals were cut open and left in a

heap. At the same time several rabbits were taken to another orchard (C) some distance east.

On the 18th the bait in B was inspected. On our approach a huge cloud of Crows mixed with Magpies (*Pica pica hudsonia*) and Ravens (*Corvus corax sinuatus*) was stirred up. The rabbits were totally consumed, much to our satisfaction. Those left in C were also completely picked clean, the tracks indicating it was Crow work. Accordingly more rabbits were collected and put in the same area. In the afternoon a visit was made to Rock Creek. Crows were found at their noon siesta and many old nests were located with an abundance of evidence in feathers and droppings that, for miles up and down the creek, a vast rookery existed.

Aug. 19, the bait was again visited and an immense flock of Crows found sitting around. The rabbits this time were only partially eaten, a fact that was somewhat disturbing since so large a flock should have made short work of the meat. However, more rabbits were collected and again put out.

It was now felt that enough had been done to gain the confidence of the Crows, since we had carefully refrained from shooting or premature poisoning operations, and it was decided to conduct a vigorous campaign over a large region at one time. The fact that our bait had been eaten in orchard C indicated that Crows were wandering over a large area and gave rise to the hope that sweeping operations could be conducted. It was decided to commence on the following day using everything that came to hand including the melons, on which we had had our eyes for some days. As a source of bait a neighbor had contributed an old horse and this we planned to distribute over a considerable extent of territory. It was feared that if all our bait was in one spot the first crow to be poisoned would give the alarm and thus scatter the flock whereas, in the present arrangement, a considerable killing might reasonably be expected.

On August 20, poisoning operations were commenced after due warning to all of the residents. The horse was led into orchard B, beside the heap of rabbits and there dispatched. It was then skinned and dusted with a mixture of strychnine, 1 part and saccharine, 8 parts. This was well rubbed in to the warm moist flesh. The carcass was now disarticulated and

the following distribution made. A leg was taken into the adjacent orchard (A); one leg in an orchard on the far eastern side of the hills near Rock Creek (D); two legs were located in a centrally situated orchard (E) and the carcass left in its original position. Two large melon patches were planted in almost the center of the Hills and these were well poisoned by splitting the melons, dusting with strychnine-saccharine mixture and leaving prominently exposed. Rabbits were collected and these were dusted with poison and distributed around. In the evening the horse carcass was visited and found to be drying so fast that it was sprinkled with a can of water.

Early the morning of the 21st, the bait was inspected with the following findings. Four Magpies from the carcass; from the rabbits nothing; from the melon patches twenty-one Horned Larks (*Otocoris alpestris merrilli*), seven jack rabbits and several mice. The Crows had not yet fed from our bait.

In the afternoon the Crows made a sally on the melon patches and immediately thereafter flew out with great commotion. We visited it at once and found one Crow in convulsions. A search in a nearby orchard revealed ten more Crows in distress. Of these three were already dead, one recovered and flew away on our approach and the others were in convulsions. The seven living Crows were taken to our shack where later all but three died and these practically completely recovered. Later five more Crows were found in the melon patch three of them living and these were added to our collection. The outcome with these ten Crows was as follows. Four died by nightfall, two died the next day and four made partial recoveries (one of these was complete). The wing muscles recovered better than the legs so that while they were able to fly they could not hop gracefully. The poison set up a severe gastro-enteritis that greatly debilitated them.

More rabbits were now collected and set out in an orchard in the southeast area of the Hills (F). It had been suggested that pork cracklings were good bait and these were tried. A considerable quantity was placed in the orchard (C) located in the north central region.

On walking through the orchards a Crow was surprised feeding from one of the rabbit carcasses. It flew to a fence post and within a few seconds had a convulsion which proved fatal.



August 22, the following findings were noted. Three Magpies in B (the carcass) nothing in A (one leg). In C where the pork cracklings were placed there was found one skunk (*Mephitis occidentalis notata*) and innumerable pocket mice (*Perognathus p. parvus*) that had filled their cheeks with the cracklings. In D on the eastern edge of the hills one Crow lay near a rabbit. From the two legs in E nothing was obtained. In the melon patches one Horned Lark, five jack rabbits, many mice and one immature Ring-necked Pheasant (*Phasianus torquatus*). In F (southeast) seven Magpies and one Crow.

The Crows never again entered the melon patches. The carcass, four quarters, rabbits and pork cracklings had yielded but three Crows and a few Magpies. The Crows were still at work in the almond trees in the very orchards poisoned meat was placed and it had to be reluctantly admitted that the work was practically a complete failure.

In the dry air the horse carcass dried very rapidly while the rabbits were dessicated in two days; after which they were useless. It was now noted that the flock of Crows had greatly increased in size and that almond damage was very extensive after each days' work.

From this date on no further Crows were poisoned by means of meat bait. In some mysterious manner the flock took cognizance of the changed conditions and fed no more from that source. Recognizing that this was to be the outcome and faced with failure we were forced to a serious inventory of all available possibilities.

Very careful observations were now made as to the exact tactics of the Crows and from these the successful solution was found. By remaining quietly under the trees it was observed that almonds were not picked from the limbs nor were they carried any distance, as had been reported. A number of Crows settled around each tree while several flew into the tree and walking out on a limb knocked a number of almonds to the ground by rapping sharply on the branch with the beak. Those on the ground then husked and cracked the nuts and ate them. The Crows in the tree then came to the ground and others flew up and shook off nuts. In this manner working very leisurely the entire tree was stripped.

The Crows on the ground greatly outnumbered those in the tree. It was amusing to note that the group standing around the tree moved with the sun in such a manner that they were always in the shade.

With these observations two possible lines of control suggested themselves. (1) it might be feasible to use No. 0 steel traps a considerable number of which were on hand and (2) poisoned almonds spread under the trees might be taken by the birds. It was thought also that as melons had been successfully used they might be of value when distributed through the orchards. Finally as a last resort pans of poisoned water were thought of only to be immediately rejected as being sure to kill everything. There were numerous Meadowlarks, Horned Larks, Pheasants and Grouse roaming through the orchards and we were anxious not to poison these.

Melons were therefore collected and put out in several orchards on the northeast portion of the area. A large sack of almonds was picked and poisoned with strychnine alkaloid and saccharine by splitting the nut and dusting in a small portion of the powder. These were taken to orchard A (northwest) and after leveling a place under each tree three almonds were placed in each cleared spot which then showed up very prominently. This orchard had been well stripped of nuts and most of the Crows were working elsewhere. We therefore went the rounds of the various orchards and cautiously drove the flock into the almond baited one, getting several thousand Crows there. In about half an hour there was a tremendous uproar, the flock rose out of the orchard, every Crow yelling lustily. The air was thick with Crows wheeling and turning in the greatest confusion and making away with all speed. A prompt visit to the place revealed only two Crows affected. The result was a disappointment.

We resolved to make one more attempt to use rabbits as bait and these were collected at Alderdale some sixty miles east of the Goodnoe Hills by means of poisoned melons spread through the sage brush. Some days after our visit to that place Mr. Cooney, the County agent, received a letter from a farmer in that neighborhood enthusiastically informing him that a new disease had appeared among the jack rabbits of that region, as he had found

a number stretched out dead across the road, and expressing the hope that it would exterminate them.

These carcasses were poisoned and spread in orchards in the southeast region of the Hills. A survey of results for the past two days revealed the following: In A where the almonds were left there were many mice that had gnawed into the nuts. One Meadowlark (*Sturnella neglecta*) had picked into an open nut with fatal results. Most of the nuts had dried and split open and while there were many Crow tracks around, few of the nuts had been eaten. One dead Crow was found spread out in a tree in the attitude typical of strychnine poisoning. In B, around the horse carcass, eight dead Magpies lay. There were no Crows, nor had any been in the orchard, neither did they ever enter it thereafter, nor the ten acres just adjacent. The presence of the carcass and dead Magpies served to warn them away. Magpies were easy to poison for while they joined in the almond depredations they seemed to prefer meat if it was to be had. They were not abundant in the orchards, just a few strays from Rock Creek, practically all of which we poisoned. Dead birds were removed to keep the bait effective. In C (pork cracklings) we found an ever increasing number of dead mice and one Meadowlark. In an apricot orchard directly east, two Crows were found. They had been dead several days and as on opening the stomachs no cracklings were found, it was felt that they had been poisoned from the melons in the foray of August 21. In the orchards in which melons were put out there were found only jack rabbits. The melon patches yielded no returns. Crows had not been in either patch; all melon damage had ceased and it was not considered worth while to put out more poison there.

A resumé work of the work to date was not encouraging. The almond crop in several large orchards was a complete loss. The flock of Crows had enormously increased in size and had commenced depredations in the southeast side of the Hills while a large number of Crows were hard at work in the southwest area. Meat bait was now recognized to be useless and was definitely abandoned.

On considering the results from almond poisoning it was felt that considerable improvement could be made in the method and

that the only hope lay in this direction. In the first place it was noted that any almonds that were, even slightly split open after our introduction of poison were left untouched by the Crows. This splitting it was discovered could be overcome by the use of nuts a little under ripe. By the means of a sharp knife the nuts could be slit gently and poison inserted after which they could be closed and appear as if untouched. In addition the Crows preferred choice large nuts and these we determined to use. Finally by scattering the nuts singly in the rows between trees it was possible to cover a wide area with a minimum of bait. As each almond was put on the ground the area was cleaned and leveled around with the feet so that each nut became very prominent.

One of the neighbors had attempted for years to shoot the Crows without success and had great faith in hanging up dead Crows. We however had little confidence in this as in the very melon patches treated this way Crow damage was still 100%. Indeed Crows ate melons right alongside the stake on which hung the dead bird. We therefore wasted no time in putting up stakes but turned all dead Crows over to the man who had faith.

August 25, before putting out fresh almonds, a tour of inspection showed a number of Magpies around the various meat baits. We now selected the largest and finest nuts to be found; choice large I.X.L. variety and poisoned them. These were taken to the southeast area where a large flock was at work and spread through two orchards (G and H).

August 26, early in the morning a tremendous commotion was heard from one of the freshly poisoned orchards (G). There was much cawing and chattering on the part of the Crows and a cloud of them rose straight into the air. On going over there five dead Crows were found. A visit was made to the north-west portion of the Hills where a number of Magpies were found around the horse bait and one Badger (*Taxidea taxus*) lay dead beside a rabbit it had eaten. All of the bait was much dried and from this period on none of it was effective except the horse carcass which for some time continued to give us a steady crop of Magpies.

On our return to the southeast we heard a tremendous clamoring,

above the high wind, coming from nearly a mile away and saw a huge flock rising in the air from the second orchard (H) treated with almonds there. On arrival two poisoned Crows were found.

We were busy for some hours preparing more almonds and at the end of this time revisited the orchard designated G to see if the Crows had returned. A laughable sight met us. The orchard is in a draw on one side of which we stood, as if an amphitheatre, with the almond trees below. On looking down we saw two Crows in convulsions. On the opposite side of the draw sat the flock of Crows without a sound, sitting in a wheat field, heads all turned toward the fluttering victims; a most solemn and serious conclave.

From this time on the flock was in a continuous tumult with the tide of events distinctly unfavorable to them. We poisoned large quantities of nuts and spread around a large area. An immense number of the birds settled in the southwest portion of the hills where we had not, as requested, "bothered" to work. The farmer who had sent that message now hurried over to ask for help.

August 27, the flock made a sudden foray back to the original feeding grounds A and B but were met by poisoned almonds and after losing three of their number were on the wing again. All day the flock was in a tremendous uproar. From every orchard they tried they were soon in the air cawing and calling and setting up a great clamor. The neighbors now began to pick up many dead Crows and to notify us in great glee where the loudest noise was coming from and of the antics of the flock, which was in the air most of the day carrying on a loud "pow wow" all over the Hills, not knowing where to strike.

August 28, this day was marked as was the previous one by much confusion and calling on the part of the flock. There was very little attempt to enter the orchards but most of the day the flock spent sitting disconsolately in the wheat fields. A good number of dead Crows was found so we now had plenty of material to furnish our neighbor to hang on his stakes.

August 29, this marked the last attempt of the flock to overcome the unfavorable circumstances that involved them. They descended in a huge body on a choice orchard which we had

already prepared. Within a very brief time, not more than five minutes, there was again a tremendous uproar with every bird making a desperate effort to get away as rapidly as possible and calling continuously as they went. Fifteen Crows were in convulsions and a survey of the trees showed no appreciable damage.

This marked the end of the active campaign. The Crows had now tried every portion of the Hills and had been met by poison and a consequent loss of a few of their numbers, causing the flock acute alarm. The flock now grew noticeably smaller. There were very few Crows noted in the orchards but the major portion spent their time in the wheat fields. Within a day of two the flock had dwindled to a tenth of their original number.

On September 2, an estimate was made of the total Crow population which did not exceed 2000 birds and this by the 8th had dwindled to scarcely twenty Crows. Dead birds were found in many localities, an Indian reporting the finding of a number in Rock Creek.

A survey of the bait at this time yielded many Magpies from the meat, innumerable mice from the almonds, two Meadowlarks from almonds and a considerable number of jack rabbits. One Coyote (*Canis lestes*) was found from the carcass, one house cat died from eating a Crow body and several Indian dogs had fed on the horse.

It rained a little for several days and freshened the meat bait. No visits were made to the carcass for some time. During this time the man scent became faint, Coyotes were attracted and seven more were poisoned. In communications from the County agent, word was received that later in the fall Ravens were attracted to the carcass and were killed. Since they were alleged to kill and eat young sheep the farmers were much pleased at this result.

*Summary.* For some years Crows had destroyed valuable almond crops in the Goodnoe Hills region of Washington. Efforts of the farmers which included shooting, use of scare-crows, belling and stringing the trees had proved unavailing. The damage not only continued, but increased to such proportions that the crop annually was a total loss and the almond growing enterprise threatened with annihilation. Melons were also pecked into and destroyed.

On investigation an enormous flock of Crows estimated at 30,000 birds was found at work in the Hills. Experiments at poisoning them with meat baits demonstrated that this was ineffectual as the Crows' predilection for almonds was too great.

The use of poisoned almonds, when properly conducted, proved successful in protecting the crops but demonstrated anew the exceptional sagacity of this bird. The first reaction was one of extreme panic at some of their number being fatally affected by their chief article of diet. This was manifested by tumultuous clamoring and confusion of the flock while sudden sallies and forays were made into distant parts of the Hills only to be met by the same fatal consequences. The flock then rapidly reacted to the changed environment by abandoning attempts at feeding from the almonds and indeed, by departing from the entire region.

Melons were treated with poison and after one experience, in which a number of Crows were killed, no further visits were made to the melon patches.

The actual number of Crows poisoned was extremely small not exceeding 1% of the flock. The results were, however, highly satisfactory. Many orchards were rendered immune from damage and large melon patches were protected by the same means.

The flock was scattered but did not cease all depredations. A large number of Crows shifted their activities across Rock Creek, to Sundale some 10 miles east of Goodnoe Hills. At this point there were a few stunted almond orchards which were stripped of the crop through lack of efforts at protection. Large and choice watermelons are the chief agricultural product of the area and these were afforded complete immunity from the Crows by the use of poisoned melons.

Unfortunate by-products of the campaign consisted in the killing of twenty-two Horned Larks, four Meadowlarks, and one pheasant. However, this was more than counter-balanced by the destruction of a number of Ravens, and eight Coyotes.

*Fort Riley, Kansas.*