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James W. Koehler
Program Supervisor, Weed and Vertebrate Pest Control, California Department of Agriculture

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The birds under discussion—linnets, horned larks, crowned sparrows and woodpeckers are among those defined as migratory insectivorous birds under Part 10 Migratory Birds, Title 50—Wildlife, Code of Federal Regulations. Migratory insectivorous birds are included in the terms of conventions between the United States and Great Britain and the United States and Mexico for the protection of migratory birds and game animals, concluded respectively August 16, 1916 and February 7, 1936.

There is provision made under Title 50 for the control of depredating migratory birds. Most of the work in states other than California must be done under permit from the United States Fish and Wildlife Service; however, blackbirds, cow birds and grackles are exempted subject to provisions of State law.

Section 16.23 Bart 16, Title 50 designates species of depredating birds in California and this is the only State for which such species are designated. Linnets, horned larks, crowned sparrows and woodpeckers are among the species listed. The regulation permits our County Agricultural Commissioners, whenever it is determined that any of the designated species are seriously injurious to agricultural and horticultural crops, to kill or cause to be killed, under their general supervision and direction, such birds as may be necessary to safeguard crops from their depredations.

The California Department of Agriculture and the cooperating County Agricultural Commissioners are charged with certain regulatory duties in agricultural pest control. This responsibility is recognized as carrying

with it the duty of providing reasonable means for relief from crop damage with the least harm to non-offending species of birds or animals. The primary obligation of official agencies engaged in the control of injurious birds is two-fold—conservation and crop protection.

It is recognized that bird depredation is usually localized and for that reason widespread campaigns to relieve damage are not undertaken but the relief sought is confined to the area involved.

When control is localized and selective, there need be no fear of causing serious reduction of the species. Bird control in California is almost as old as the agriculture of the State itself. Yet the principal offending species of more than half a century, notably the linnet and horned lark, are today as abundant as ever.

Bird control procedures in order to be effective and justifiable demand definite policies and methods.

1. Actual damage or a definite threat of damage to crops must be determined by investigation and survey and decision made that the damage is or is likely to be sufficiently extensive to warrant more drastic steps than deterrent or repellent methods commonly available.
2. Agricultural regulatory agencies participate in control of birds with treated bait materials only if such control is conducted under the supervision of a Department representative or of the local County Agricultural Commissioner.
3. Bait materials treated with poisonous substances are used if and when tests reveal that proper selectivity and effective control can be achieved. Under no circumstance is treated bait

material given or sold for independent use.

4. There is adherence to officially developed methods and techniques and there is follow-up observations of the treatments made.

When practical and economical deterrent or repellent methods are known, the ranchers are instructed in the use of such to the total exclusion of any destruction or killing methods. Every property owner should be willing to go to reasonable lengths to protect his own interests. We have little sympathy for the person who, though physically and financially able to carry on the repellent methods of control work, demands annihilation of the offending birds.

Bait formulas will not be supplied in this discussion as they are available only to the County Agricultural Commissioners in California. Techniques of baiting are given as we believe that such information will assist the general public in understanding that these procedures, combined with selected bait materials, have been developed through careful study to provide a minimum hazard to non-offending species.

CALIFORNIA HOUSE FINCH Carpodacus mexicanus frontalis Depredations. In California the linnet is an abundant resident throughout the State wherever food and water are available. It is most numerous on the valley floors and in the foothills where man's development has created an extensive favorable habitat. The linnet is primarily a seed eater and before the introduction of domestic fruits into California probably lived largely on weed seeds. Linnets attack the ripening fruit of the apricot, cherry, peach, pear, nectarine, plum, prune, avocado, grape, apple, fig, strawberry, blackberry, raspberry and many others. They disbud almond, apricot, pear, peach, plum, prune and nectarine. They also attack milo maize, sunflower, lettuce seed,

broccoli seed, flax seed, miscellaneous vegetable and flower seeds, ornamental fruits and berries and tomato plantlets.

The linnet is relatively a resident bird and usually most linnets of the valley district spend their lives within a few miles of the place where they were hatched. Definite localization of linnet activity is the rule and the fact that it is primarily a resident bird has proved our best ally in linnet control.

Control. The linnet exhibits local and seasonal food preferences in a marked degree. This habit has been adapted to control work and when recommended methods are followed the hazard to other bird life is negligible. Bait materials are exposed in standard bait troughs. The trough is 8 - 10 feet long and is constructed of ¼ inch or ½ inch by 3 inch redwood or pine. The shallow depth of the trough permits free feeding by birds perched upon the edge yet does not permit the bait to blow out. The considerable length of the trough is advised for two reasons: (1) It must reach across the center of the fruit trees from one limb to another and, (2) as linnets are rather belligerent and will not feed freely close together, a small tray or trough will not permit enough linnets to feed at one time.

The number of troughs needed depends entirely upon the number of linnets present and the extent of area in which they are working. A common fault is the construction of too few troughs to adequately handle the work. In general an orchard of 4 or 5 acres may well require 10 troughs. The area covered by linnet activity within the orchard is more important in deciding the number of troughs required than the total population of birds. Troughs are placed 4 to 8 feet high in the trees being attacked and in dead or living trees outside the orchard where

linnets habitually perch.

During the winter when disbudding is in progress, troughs are commonly placed in the trees where disbudding is occurring. They may also be placed on fence posts, on rubbish piles, in shade trees or shrubbery or in any location where the linnets concentrate. In vineyards and in strawberry or other berry patches, the troughs are placed on standards, at a height of 3 or 4 feet above the vines.

The value of proper placement of troughs cannot be overemphasized as this one item may be the cause of complete failure or of very limited success. Time and effort spent in observing the activity of the linnets in relation to the placing of the troughs is well expended. One cannot readily attract linnets, or any species of bird, to food exposed in a location where the bird does not wish to go.

Before treated bait is exposed, extensive prebaiting is necessary. In the first prebaitlng, the length of time necessary to develop acceptance is variable. If troughs are well located and linnets are numerous, acceptance should be well established within one week. When the clean prebait is accepted freely in all troughs, treated bait is substituted. The treated bait must not be left in the troughs more than four days. Seventy-five per cent of the total kill occurs within 48 hours. The process of exposing clean bait and treated bait is then continued alternately until the birds are under control or the damage period is over. Successful prebaiting in the same location does not take nearly as much time as the original.

Unfortunately frightening devices are not very effective for linnet control. They have shown very little value as practical methods of crop protection in commercial orchards. Protection of back yard fruit trees

may be achieved by covering them with small mesh netting or cheese cloth.

HORNED IARKS Otocoris alpestris, subspecies

Depredations. In certain parts of California the horned lark is a serious crop destroyer. The damage occurs mostly in the interior valleys from Sacramento south to the Imperial Valley and along the coastal strip from San Francisco south to San Diego. Horned larks are given great opportunity for damage by the widespread abundance of cultivated products attractive to them. Among the crops severely damaged are plantlets of lettuce, carrots, beets, spinach, turnips, peas, beans, sugar beets, alfalfa, cantaloupes, watermelons, tomatoes and lettuce. Flower plantlets of any variety in commercial seed plantings are frequently devoured. Damage by horned larks usually begins after the first plants break through the surface of the soil and it may continue until the plants reach a height of several inches.

Control. Lavish use of poison grain broadcast or piled in handfuls over the damaged areas by uninformed persons was prevalent prior to the inception of present control methods. Such methods were not effective and entirely too dangerous to wildlife because of large quantities of poison exposed and the manner in which it was exposed.

Horned larks show a marked predilection for the open. They follow along any trail or depression such as a furrow, a seeder track or the depression between bedded crops. This habit assists control work and at the same time is a measure of protection to other birds with different feeding habits. Planet Jr. seeders such as those used for planting commercial truck crops are excellent for exposing baits. The seeder is attached to a pickup or light tractor so as to trail directly in the tire track.

After close observation of the activity of horned larks in each field to be treated, prebaiting may be done. Careful study of the horned lark population involved is of value in determining how close together the baited trails should be made. It is seldom necessary to run them closer than 50 feet and frequently they may be much farther apart. All of the area being attacked should be prebaited and it is usually well to extend the prebaited trails several yards into undamaged territory. Under the seeder method an average prebaiting requires from 8 to 10 pounds of prebait per mile of track.

After acceptance of prebait is observed, one will often find that it develops only in certain localized areas of the baited field and it will not extend from that area no matter how long the bait remains. The treated bait should be exposed in the same trails that were prebaited and should be applied at an average of about 8 pounds of bait per mile of track.

Usually horned lark activity is well out in the center of the field. Most of the other species of birds which may be found in the locality and which are not involved in crop depredation occur about the borders of those fields close to fences or cover. Destruction of innocent species is practically eliminated by baiting only the central portion of the field where the horned larks congregate.

Preventive methods have been quite successful in combatting the depredations of horned larks. The development of these methods is limited only by the ingenuity of the persons concerned. Many methods have been tried--some very successful and others quite unsuccessful.

The use of carbide exploders has proven very successful in preventing damage to newly planted crops. Herding with guns has proven

too costly in labor and ammunition and is generally inefficient and impractical. A great variety of scarecrows has been devised. The general fault of these is, first, they are usually sparsely distributed and, second, they have no motion. To remedy these faults costs more than other methods recommended here.

The "stake and flag" method is successful in many areas. Stakes or laths are fixed in the soil and strips of cloth or paper attached to their tops. The "flag" is usually tied to the top of the stake with a short string or sometimes it is tacked in that position. Flagging affords crop protection in direct ratio to the density of stakes and flags. For complete protection the stakes cannot safely be placed more than 25 feet apart in each direction and in case of persistent attack should not be more than 20 feet apart.

The best of protective methods, namely "Continuous string flagging", is used in many areas. The materials necessary are heavy stakes at least *k* feet long; strong cotton wrapping twine and paper, cloth or plastic streamers 2 to 2½ inches wide and 20 to *2*4 inches long. The stakes are driven firmly into the ground and may be 50 or more feet apart in the row. Those at each end must be braced. The twine is stretched from stake to stake and streamers are fastened at 5 foot intervals; making 10 streamers to each 50 foot section between the stakes.

When properly done this is an efficient method of preventing loss. It is best to install continuous string flagging in advance of or at the first sign of attack upon the crop.

CROWNED SEHRROWS Zonotrichia species and subspecies

Depredations. Direct opposites as to preference of habitat to the

horned larks, crowned sparrows are birds of deep brush, river bottom jungles, dense weed fields, fence rows, brush piles or rubbish heaps. The dense hedges and thick plantings of shrubbery commonly found about many rural and suburban homes are much to their liking. Crop depredations in California by crowned sparrows can be laid to three subspecies—Gambel's, Nuttall's and Golden Crown. Due to its very wide range in the State and to the immense numbers which concentrate here, Gambel's sparrow must be considered by far the most important.

Crowned sparrows are involved in crop depredations in a very wide area and upon a great variety of crops. Commercial losses are found in lettuce, sugar beets, alfalfa, broccoli, beans and other garden and truck crops. Crowned sparrows play a minor part in disbudding attacks upon apricot, almond and other fruit trees. A few trees near a wood pile or a brush pile or ornamental shrubbery may be severely attacked.

Luckily, depredations by these birds are confined to restricted areas where cover is available.

Control. Perhaps the most important factor in the control of crowned sparrows is the elimination of cover, for these birds do not feed many yards from safe territory. All weedy borders along fields and fence rows should be destroyed. Wherever possible trees, shrubbery and brush must also be eliminated. We have found that, in many cases where these bird harbors are eliminated, all damage ceases and there is no necessity to embark upon a control program.

When suppression of crowned sparrows is necessary, prebaiting should first be practiced. Prebait may be exposed in shallow v-shaped troughs placed on standards 2 to 3 feet above ground level only in areas where birds are doing damage. When bait is well accepted, the treated

bait should be exposed and replenished if necessary during the period of exposure which may be for as long as 7 to 10 days. Alternate clean baitings and poisonings must be continued throughout the period of damage if crop protection is to be maintained.

Too little use is made of permanent protective devices where crowned sparrows damage plantlets in suburban areas or at rural homesteads where surrounding shrubbery has created a paradise for birds. In most cases the plants may be grown under frames covered with wire or cloth netting. Damage to plantlets occurs year after year in some localities but the construction of frames will end the trouble permanently.

Flagging has a place in the program of prevention and is worthy of trial in gardens, flower beds and newly planted lawns where the area to be protected is relatively small. The area must be very densely flagged.

WOODPECKERS

Depredations. In addition to the pecking of holes in buildings and poles, the California woodpecker frequently becomes a serious pest about almond or walnut orchards. The Lewis woodpecker has occasionally caused some damage to apples in certain areas of California.

Control. Shooting is a selective method which is effective in the control of the Lewis woodpecker. If shooting is systemized under proper supervision and performed at periods where birds are in the "using" ground or concentration areas, the number may be sufficiently reduced to make other methods unnecessary. Both the shotgun and the 22 rifle have been tried and it was concluded that the shotgun, although more expensive, is the more effective. Unorganized or random shooting is not effective and is not recommended.

We have used some of the chemical repellents which are designed to prevent roosting of birds in certain areas and found them effective against woodpeckers and flickers where they are causing damage to buildings. The materials may be applied on the damaged area of a building and for 2 or 3 feet on either side. Quite often the damaged area is just under the eaves where in many instances there is a small ledge or a place where the bird gets a footing. These areas should definitely be treated. If repellents are not available in local hardware or farm supply stores, they may be obtained from one of several manufacturers.

Where birds are causing damage to buildings, we have had some success by nailing a Victor rat trap near the damaged area. The trap is fastened with the trigger mechanism downward. A small one inch square or circular piece of bright metal is attached to the trigger and serves as an attractant.

In the case of damage to nut crops the trap may be nailed on the trunk of a tree a few Inches above a lateral branch. The branch provides a landing place from which the trap is approached.

Very infrequently we have to resort to treated baits for woodpecker control in orchards and the results have been varied.

Woodpeckers often store acorns in holes in limbs of trees and portions of these limbs make excellent bait stations. The acorns are removed and replaced with treated bait. Additional holes may be drilled if necessary. The limbs are wired to 2x4's and placed in trees so that the baited portion extends 3 to 4 feet above the treetops. Two to three of these limbs so situated in an orchard is usually sufficient for 5 to

10 acres. Woodpeckers have a tendency to alight on the highest perch in an orchard, and the use of well placed artificial perches will attract them to the bait.