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An Evaluation of Burrow Destruction As a Ground Squirrel Control Method

Dennis C. Stroud
Wildlife Extension, University of California, Davis, California

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Dennis C. Stroud, Wildlife Extension, University of California, Davis, CA 95616

Several researchers have suggested that the presence of burrows is a limiting factor for ground squirrel populations and that the destruction of these burrow systems can reduce the rate of reinvasion following control. However, no one has yet tested the potential value of burrow destruction as a control method.

In April, 1983, a population of California ground squirrels (spermop_ilus beechevi was trapped and removed from a 6.5 acre (2.6 ha) area on the U. C. Davis campus. On a part of the plot from which one-half of the squirrels (70) were removed, all burrow openings (189) were destroyed by digging down to a depth of 1 foot (0.3 m). The other portion of the plot was left intact and served as a control. Reinvasion was monitored from May to September by trapping, marking, and releasing squirrels; all burrow systems were mapped as they were re-opened.

Reinvasion and population growth on the 2 halves of the study plot were nearly identical. At the end of the study, slightly more than the original number of **burrows were** re-opened, and the rates of growth for both populations were nearly identical; there were 32 squirrels in the burrow-destruction population and 28 in the control population. Observations on the treatment plot and the mapped distribution of opened burrows in September indicated that ground squirrels mainly opened old systems instead of digging new ones. It was concluded that burrow destruction was not an effective control method under the conditions of this study.

Urban/Suburban Squirrel Control in Private Residences

Donald J. Franke, Sun Pest Control, 2945 McGee Trafficway, Kansas City, MO 64108

Gray squirrel (Sciurus carolinensis damage to roofs is becoming a major concern to homeowners especially with the steadily increasing construction of houses with wood shingles. Besides causing roof damage (rain leaks), electrical wires are often gnawed. The gray squirrel is finding excellent nesting area' in attics and overhang voids.

Bird feeders and dog leash laws also contribute to squirrel population increasing almost unchecked. During the past 5 years, calls from homeowners have been increasing on squirrel damage to homes.

In an attempt to control squirrel damage, the following procedure has been developed. Some of the steps may be familiar to the average squirrel fighter, but the sequence of steps as well as the importance of each is the secret to success. To date, this method has been 100'% successful when followed exactly as given:

1) Trap, or by some other means, remove all squirrels living in the house or attic. This is usually accomplished by trapping and removing squirrels until a 2 week inactive period is obtained. At that point, it can be assumed that all the persistent squirrels have been removed. Release the squirrels at least 5 miles (8 km) from the house.

2) Clean out the area where squirrels have been nesting. Vacuum or sweep up all nesting materials and droppings. Scatter Naphthalene crystals (moth balls) in the areas that squirrels inhabited. The objective is to remove all odors which will draw future problem squirrels.

3) Patch entry holes with heavy gage screen or sheet metal flashing and finish as desired.

4) Apply squirrel repellent around the hole and along areas where squirrels run. If the pests are gaining access to the roof by powerlines or phonelines, apply the repellent to these lines. If access is from a tree, apply repellent to the trunk of the tree, or preferrably trim branches back from the structure.

By following these steps, squirrel problems can be eliminated both now and for a long time in the future.

Rodent Management on the Northern High Plains

Ardell J. Bjugstad, Rocky Mountain Forest and Range Experiment Station, South Dakota School of Mines, Rapid City, SD 57701

Rodent damage on the Northern High Plains has caused estimated economic losses of millions of dollars per year. The Columbian ground squirrel (Citellus columbianus) caused $800,000 damage in Montana during 1973, whereas prairie dogs (Cvnomvs ludovicianus caused a loss of $2 million in South Dakota during 1980. Initial control of prairie dogs in South Dakota would cost approximately $1.2 million dollars and maintenance measures would be needed about every third to fifth year depending on percentage success of the initial control and management practices thereafter. Results of a cost-benefit study in South Dakota indicated that the annual maintenance control rate (equal to repopulation of the site) must be below 10% or prairie dog control will not be economically feasible. Realistic projections of annual prairie dog repopulation rates of 30% ere untolerable. Thus, emphasis on well-planned range management after prairie dog control is extremely important for successful and economically sound rodent management on the Northern High Plains. This can be achieved through proper stocking and distribution of livestock, and appropriate selection and application of rodenticides.

Rodent Populations and Crop Damage in Minimum Tillage Corn Fields

Richard E. Young, Department of Animal Ecology, Iowa State University, Ames, IA 50011
William R. Clark, Department of Animal Ecology, Iowa State University, Ames, IA 50011

No-till and disced cropfields were examined in southwest Iowa to determine small mammal population densities, movements, and impacts of rodent depredations on corn seedlings. Two replicates of the treatments corn planted into. corn stubble, corn planted into chemically treated sod, and corn planted into spring-disced fields were studied during the 1982 and 1983 growing seasons. Grids of 100 Sherman live traps were established at the edge and middle of each field to determine rodent densities and document possible encroachment of small mammals from nearby habitats. Trapping experiments were conducted for 6 consecutive days during May, August, and November. To assess crop damage, 5 164 ft. (50 m) transects were established in the edge and middle of each field. Corn seedlings were examined every other day for the first 10 days post-emergence.

Deer mice (peromyscus maniculatus) dominated communities of small mammals comprising 71 and 69% of all captures in 1982 and 1983, respectively. Thirteen-lined ground squirrels (SpP,rmoohilus tridecemlineatus composed 14 and 12% of all captures in the respective years. Total individuals captured in both y years were 199, 182, and 223 at edge locations on corn-corn, corn-sod and spring-disced fields, respectively. At middle grid locations, 180, 150, and 216 individuals were captured for these respective fields. A total of 9 species were represented on the 3 tillage treatments; 8 on corn-corn fields, 7 on corn-s-od fields, and 6 on spring-disced fields. Shannon's diversity values (H') for rodent communities in corn-corn treatments were 0.32 and 0.52 (middle and edge, respectively) 0.43 and 0.45 for corn-sod, and' 0.21 and 0.42 for spring-disced fields.

Rodent damage resulted' in complete mortality to plants damaged because detected damage was from digging. Overall, damage caused by rodents (0.0%) was less frequent than insect (12.1x), weather (9.5K), and mechanically related (4.5x) damages.

Rodent-Agriculture Interactions in No-Tillage Crop Fields

Kent E. Holm, Department of Forestry, Fisheries and Wildlife, University of Nebraska, Lincoln, NE 68583
Ron J. Johnson, Department of Forestry, Fisheries and Wildlife, University of Nebraska, Lincoln, NE 68583
Walter W. Stroup, Biometrics and Information Systems Center, Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, NE 68583

Acreage in reduced- and no-tillage farming systems has increased markedly in recent years, a trend that is expected to continue. However, small rodent populations thrive in these fields and at times dig and consume newly planted seeds and seedlings.

During 1983, no-tillage corn, wheat and grain sorghum fields in western (Red Willow Co.) and eastern (Saline and Jefferson Cos.) Nebraska were evaluated to determine the distribution and food habits of the rodent species present, the damage to crops, and the availability of alternate rodent food sources. During June (post-emergence) and August (maximum corn height), 676 rodents were captured in 11 corn fields, and during July, 105 rodents were captured in 2 wheat and 2 sorghum fields. Species captured included thirteen-lined ground squirrels spermophilus ilus tr decemlineatus Ord's kangaroo rats Diopodomys ordii deer mice (Peromysous maniculatus), ndT-thern grasshopper mice (onychomys leucogaster voles (Microtus spp.), hispid pocket mice (Pero nathus hispidus western harvest mice Reithrodontomys to megalotis house mice (M= musculus and short-tailed shrews (Blarina bre i auda). Rodents were distributed throughout study fields although the sample size of several species was not great enough to determine patterns.

Damage to newly-planted corn seeds and seedlings was greater in the western area than in the eastern area, and was more severe on terraces than between terraces. Because of excessive rainfall, sampling was delayed in the eastern area and may have caused the amount of damage to be underestimated. Foods other than corn available to rodents in the study fields included wheat and pigweed (Amaranthus sp.) as well as various other seeds, insects and insect larvae.

Knowledge of the foods eaten and foods available to rodents in reduced- and no-tillage fields will permit better evaluation of their beneficial and harmful aspects and will enhance predictability of rodent responses to such damage control measures as toxic baits or repellents. The economic impact of small rodents on reduced- and no-tillage farming systems will increase in the years to come; information about these rodents and the damage they cause will be of increasing importance.

Efficacy Evaluations of Ultrasonic Rodent Repellent Devices

Stephen A. shumake Denver Wildlife Research Center, Building 16, Federal Center, Denver, CO 80225

Efficacy tests involving the use of simulated field and field structures have been developed to assess repellency of commercial ultrasonic rodent repellent devices. The simulated field structure consisted of a 740 square feet (68.7 m2) building that was partitioned into two 350 square feet (32.5 m2) rooms and a 38 square feet (3.7 m2) central harborage area containing 12 wild Norway rats (Rattus **noryegicus** Animals were allowed to enter either room to obtain rolled oats in 30 small paper packets glued to the floor at a density of 1 per 10.75 square feet (1/m2). Each room was also instrumented with 4 photocell sensors to measure rate traffic as the test progressed. A single ultrasonic device was typically attached to the far end of 1 room and measures (oat consumption, packet damage, photocell counts) were taken during 1 week baseline and 2.5 week test periods. Field test structures varied in floor area from 96.7 to 2,472.5 square feet (9-230 m2) and were of metal or wood construction. All contained existing Norway rat, house mouse (ice musculus) or field mouse (peromyscus maniculatus infestations. No rodent control was conducted at these sites other than the application of selected sample devices. Rodent activity (packet destruction, food consumption, rodent tracks) was measured during 3 successive 3-week-intervals (twice/week) with the sample devices operating during the middle interval. Repellency effects were evaluated with 20, 25, and 40 kilohertz (KHz) devices in both simulated and field t st structures. Distribution of efficacy test data are currently restricted pending enforcement actions by the Environmental Protection Agency and the Federal Trade Commission.

Removing Rattlesnakes From Human Dwellings Using Glue Boards

James E. Knight, Cooperative Extension Service, New Mexico State University, Box 4901, Las Cruces, NM 88003

A method using glue boards to remove rattlesnakes (Crotalus soo.) is being tested. Preliminary results of tests conducted in controlled situations indicate the method may be very effective. The glue boards are cardboard or plastic rectangles covered with a sticky material similar to fly-paper glue. The glue boards are tacked on anchored plywood approximately 24 x 16 x 1/4 inches (61 x 40.6 x 0.6 cm). The glue boards are arranged to form a minimum area of 12 x 6 inches (30.5 x 15.2 em). It is important to avoid attaching anything the snake can use for leverage that might allow it to exert enough pressure to overcome the glue. A small hole should be made in the plywood to allow retrieval of the board with a hook. The glue board is placed tightly against the wall because snakes tend to follow walls rather than proceed across an open area. So far, this method has been tested on 2 bullsnakes (pituophis melanoleucus and 7 diamondback rattlesnakes (C. atrox) that were put in a 4 x 15 foot (1.2 x 4.6 m) water though. Lengths of the diamondbacks tested were 5:5 feet (1.7 m), 5 feet (1.5 m), 4.5 feet (1.4 m), 4.7 feet (1.4 m), 5.2 feet (1.6 m), 5.3 feet (1.6 m) and 4.2 feet (1.3 m). The 2 bullsnakes were 5 feet (1.5 m) and 5.4 feet (1.6 m). Initial contact time was a function of the activity of the snake but varied from 10 minutes to 12 hours. All snakes were left on the glue boards for at least 2 hours to be sure they could not escape. In all cases, however, their struggling ceased within 15 minutes. Size of the snake does not seem to effect the chance of success because of correspondingly increasing surface area. Field tests are presently being conducted to determine considerations in less controlled situations.

The Viability of Rabies in Carrion

Joseph M. Schaefer, Kansas Fish and Game Commission, P.O. Box 4034, Wichita, KS 67204

The viability of rabies virus in carrion is a major factor in affecting the chances that a scavenging animal could contact the disease. The purpose of this study was to determine the viability of rabies virus in brains and salivary glands of rabid striped skunk (*Mephitis mephitis*) carcasses exposed to different controlled temperatures. Brain samples from skunks that exhibited furious symptoms had a higher mean titer (9.58 f 1.97 log MICLD50/0-03 ml, N = 5) than did those from nonfurious skunks (7.18 t 0.66 log MICLD50/0-03 ml, N = 20, F = 13.9, df = 1,23, p < 0.005). Rabies virus remained viable at 10oC throughout the 22-day study period in carcassees of skunks that had shown either furious or paralytic rabies. No significant correlations were found between viral-titer and time in these 2 groups (t = 0.053, df = 17, furious; and t = 1.61, df = 22, paralytic). A strong inverse relationship between time and stability of virus was shown with carcasses exposed to 240 C (11 paralytic and 1 naturally furious, t = 13.66, df = 21). The virus was still viable at 2 weeks (240 C), but its strength was greatly diminished. Rabies virus was detected in only a few salivary gland samples. A probable explanation fur this could be that the highly concentrated inoculant dosage caused rapid death which did not allow the virus sufficient time to infect the salivary glands. These data suggest that oral transmission of rabies virus among scavenger species may be a common occurrence.

Ideas For Reducing Cattle Losses to Mountain Lions

Harley G. Shaw, Arizona Game and Fish Department, P.O. Box 370, Chino Valley, AZ 86323

The wolf (Cams lupus) and grizzly bear (Ursus horribilis) were eliminated from Arizona's fauna early in the 20th century. Black bears (Ursus americanus) have never been a serious problem in cattle depredation. Coyotes (Canis yatrans) were perhaps reduced in numbers during the 1080 era, but they still remained abundant. Over a half century of efforts to control mountain lions (Felis concolor) via hunting and trapping have been relatively unsuccessful. With the possible exception of temporary reductions on the North Kaibab, no evidence exists that lions have been reduced greatly in numbers anywhere in the state.

Recent research has reconfirmed heavy calf losses to lions in parts of Arizona. They are probably the greatest single source of mule deer (odocoileus hemionus) mortality in the state. Conversely, they have become a prized big game trophy animal and have assumed a positive economic value of their own. Members of the populace at large probably view them as a desirable part of the state's fauna.

To date, I believe, we can conclude:

1) With existing techniques, lion control is economically unfeasible in Arizona.

2) Sporting harvest does little to reduce lion populations in Arizona.

This suggests strongly that we should look for means other than direct control for reducing lion losses. These possibly include:

1) Modified cattle management: where possible, keeping calves out of lion habitat until they reach about 400 pounds (181 kg).

2) Improved management of native prey: increasing densities of mule deer to absorb more of the lion predation.

3) Manipulation of habitat: opening dense chaparral or pinyon-juniper stands to make them less desirable as lion habitat.

We are designing studies in Arizona to test these options in hope of easing strain between ranchers, deer hunters, lion hunters, and preservationists.

The Use of Ultralight Aircraft For Aerial Control of Coyotes

James E. Knight, Cooperative Extension Service, New Mexico State University, Box 4901, Las Cruces, NM 88003

The changing complexion of modern animal damage control, coupled with the lack of funding available to government, has created the need for innovative methods of conducting control programs. Ultralight aircraft are presently being tested to determine their effectiveness, efficiency and safety for aerial gunning coyotes.

It is hoped that this project will determine if the Ultralight is capable of functioning as an economical method of aerially shooting coyotes **(canis latrans** The initial investment normally required ($5000) and the minimal operating costs ($2.00/hour) give the Ultralight a potential advantage of saving thousands of dollars over more traditional aerial control methods. The Ultralight requires less than 75 feet (22.9 m) to become airborne and climbs at 850 feet (259.1m) per minute. Once aloft, the aircraft has favorable low speed handling characteristics as well as fast cruise capabilities. Normal aerial control speed would be 20 to 27 miles (32.2 to 43.5 km) per hour. Landings are made at approximately 24 miles (38.6 km) per hour, and with a slight headwind, touchdown occurs at little more than* normal walking speed, so the pilot has the ability to land in extremely small areas with or without the use of the engine.

A 12 gauge shotgun is mounted to the front of the airframe. The gun is primarily aimed by moving the aircraft but allowance for crab and pitch is made by movement of pedals. Firing is accomplished through an enclosed cable connected to the steering crossbar.

The formal testing of the Ultralight will take place in February. Part of the study area will be aerial gunned using a helicopter and other parts will be aerial gunned using the Ultralight. Efficiency will be analyzed regarding cost, time, and harvest per unit of effort.

Occurrence and Behavior of Wild Dogs in Newly Established Agricultural Areas

Philip S. Gipson, Alaska Cooperative Wildlife Research Unit, University of Alaska, Fairbanks, AK 99701

The 1976 Alaska State Legislature initiated a program to make substantial amounts of state land available for agricultural development. Approximately 150,000 acres (60,729 ha) were used for agriculture in Alaska during 1982. The state's goal is to have 500,000 acres (202,429 ha) in agricultural production by 1992. The largest agricultural development to date is the Delta Grain Project which opened approximately 60,000 acres (24,291 ha) of wilderness lands to barley production. Agricultural developments have far reaching impacts on native and feral wildlife. Wild dogs have responded positively to land clearing and the removal of wolves (Canis lupus) from newly settled lands.

A statewide mail survey of biologists, hunting guides, and farmers asking for information about the distribution and abundance of wild and free-ranging dogs indicated that populations of wild dogs may have existed in 26 areas of the state. Eight of the reported wild dog populations were in or adjacent to new agricultural developments.

A population of wild dogs in the Delta Barley Project was intensively studied from 1979 through 1983 by direct observation, radio telemetry and tracking in snow. Packs of 4 to 7 wild dogs were observed foraging and socializing at the Delta Junction garbage dump for periods of 10 to 50 minutes. Pack members were also observed hunting in barley fields and overgrown pastures, along the Delta River and on the right-of-way of the Alaska Oil Pipeline. Five pups and their mother were fitted with radio transmitters at a den near the Delta Junction dump. Wild dogs traveled over areas of 5 to 25 square miles (8 to 40 km2). Sign in snow indicated wild dogs often encountered and marked trails and scent posts of tame dogs, foxes (Vulnes vulpes) coyotes (), and occasionally wolves. On 2 occasions wild dogs approached cabins where domestic dogs in heat were penned. The owner of a tame female dog was bitten by a wild male after approaching them while they were tied. Complaints were received of dogs killing domestic sheep and harassing cattle and moose (Aloes aloes). Extreme cold did not appear to effect behavior of wild dogs. Adults and pups were commonly active when temperatures were between -100 and -30oC and on occasion, pups were away from the den when temperatures were below -450C.

Awards

GREAT PLAINS WILDLIFE DAMAGE CONTROL AWARD RECIPIENTS

EDWARD L. KOZICKY, 817 So. Moor Dr. R.R. 3, Godfrey, IL 62035

WALTER E. HOWARD, Wildlife and Fisheries Biology, University of California, Davis, CA 95616

JAMES E. MILLER, USDA-Extension Service, Room 3428-South Building, Washington, DC 20250

ROBERT J. ROBEL, Division of Biology, Kansas State University, Manhattan, KS 66502

CRVIS "GUS" GUSTAD, U.S. Fish and Wildlife Service, P.O. Box 25486, Denver Federal Center, Denver, CO 80225

STATE WILDLIFE DAMAGE CONTROL AWARD RECIPIENTS

Colorado- - - - - -KATHLEEN A. FAGERSTONE, U.S. Fish and Wildlife Service, Denver Wildlife Research Center, Building 16, Denver Federal Center, Denver, CO 80225

Kansas- - - - - - -JOHNNY RAY, Kansas Fish and Game Commission, Sunrise Mobile Home Park, Lot 2, Ottawa, KS 66067

Montana - - - - - -WILLIAM PERRY, U.S. Fish and Wildlife Service, Cascade, MT

Nebraska- - - - - -ROBERT M. TIMM, Department of Forestry, Fisheries and Wildlife, University of Nebraska, Lincoln, NE 68583

North Dakota- - - -WILLIAM K. PFEIFER, 1603 N. 18th, Bismark, ND 58501

New Mexico- - - - -WILLIAM D. FITZWATER, bioLOGIC Consultants, 3919 Alta Monte, NE, Albuquerque, NM 87110

Oklahoma- - - - - -JACK McPHETRIDGE, U.S. Fish and Wildlife Service, 536 So. Highland, Ada, OK 74820

South Dakota- - - -JERRY REIDEL, Department of Game, Fish and Parks, Waterton, SD

Texas - - - - - - -DALE WADE, Texas Agricultural Extension Service, Research and Extension Center, Box 950, Route 2, San Angelo, TX 76901

Wyoming - - - - - -CRAIG MAYCOCK, U.S. Fish and Wildlife Service, Rock Springs, WY

Workshop Participants

A total of 89 people registered for the workshop.
They arrived from 19 states and the District of Columbia.

ANDELT, WILLIAM F., SW Area Extension Office, 1501 Fulton Terrace, Garden City, KS 67846

ANDRINE, DOUG, Barton Co. Land & Cattle Co., Route 2, Ellinwood, KS 67526

BENNETT, JIM, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

BERTWELL, BRUCE, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

BJUGSTAD, ARDELL J., Forest Service, SD SM & T, Rapid City, SD 57701

BONWELL, BILL, U.S. Fish & Wildlife Service, Room 105, 600' E. Monrow St., Springfield, IL 62701

BRAZDA, EDWARD, State Board of Agriculture, 109 S.W. 9th Street, Topeka, KS 66612

BUTLER, JULIE A., Leawood Police Department, 9617 Lee Blvd., Leawood, KS 66206

CAPEL, STEVE, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

CASE, RONALD M., University of Nebraska, 7210 Francis St., Lincoln, NE 68505

COLE, DICK, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

CONDRAY, JERRY L., 2317 C Street, Garden City, KS 67846

DEMAREE, JOHN R., Route 2, Box 25, Laramie, WY 82070

DEUTSCH, DEAN, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

DONALDSON, BYRON R., New Mexico Game & Fish, 3225 Siringo Road, Santa Fe, NM 87501

FAGRE, DANIEL B., Texas A & M University, 1708 Austin Ave., College Station, TX 77840

FARRINGER, RUSSEL, U.S. Environmental Protection-Agency, 224 Green Arbor Dr., Fredericksburg, VA 22401

FISHER, DARYL D., University of Nebraska, 4241 Y Street, Lincoln, NE 68503

FITZWATER, WILLIAM D., Bio Consultants, 3919 Alta Monte N.E., Albuquerque, NM 87110

FLINT, JON I., 2333 NW 45th St. Terr., Topeka, KS 66618

Fox LLOYD, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

FRANKE, DON, Sun Pest Control, Inc., 2945 McGee Trafficway, Kansas City, MO 64108

GARCIA, VICTOR, Garcia's Control Services, P.O. Box 857, Las Vegas, NM 87701

GIPSON, PHILIP S., University of Alaska, 4721 Stanford Drive, Fairbanks, AK 99701

GOYEN, LESTER, Pratt Feedlot, Box 945, Pratt, KS 67124

GREEN, JEFF, USDA-ARS, U.S. Sheep Station, Dubois, ID 83423

GUSTAD, ORVIS C., U.S. Fish & Wildlife, 13273 West Utah Circle, Lakewood, CO 80228

HARROLD, RICHARD, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

HAWKINS, W. ALEX, JR., Kansas Board of Agriculture, 2712 Lawrence Avenue, Lawrence, KS 66044

HENDERSON, F. ROBERT, 2121 Browning Ave., Manhattan, KS 66502

HENDRICKS, HARRY, Barton Co. Land & Cattle Co., Rt. 2, Ellenwood, KS 67526

HLAVACHICK, BILL, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

HOLM, KENT E., University of Nebraska, 202 Nat. Resources Hall, Lincoln, NE 68583-0819

HOMMES 0. WENDELL, 6811 Hawkins Bend, Lincoln, NE 68516

HOWARD, WALTER E., University of California, Davis, CA 95616

HUFFMAN, DICK, Huffman Real Estate Inv. Ctr., 1539 E. Central, Wichita, KS 67214

HUFFMAN, LOUIS E., U.S. Fish & Wildlife, 901 Tomahawk Rd., North Platte, NE 69101

JENSEN, CATHY, Velsicol Chem. Co., 341 E. Ohio, Chicago, IL 60611

JOHNSON, RON J., Univ. of Nebraska, Dept. Forestry, Fisheries, and Wildlife, 202 Natural Res. Hall, Lincoln, NE 68583-0819

KELLY, ROBERT P., U.S. Fish & Wildlife Service, 4825 Mandarin Circle, Lincoln, NE 68516

KITTS, JAMES R., Minnesota Agric. Ext. Serv., Fish & Wildlife Dept., St. Paul, MN 55108

KNIGHT, JAMES E., New Mexico State University, Box 4901, Las Cruces, NM 88001

KOBEL, CRAIG, Kansas Fur Harvesters, R.R. #2, E1 Dorado, KS 67042

KOZICKY, ED, NAASHC, 817 Southmoor, Godfrey, IL 62035

KRAMER, JOE, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

LAMBLEY, DALE, Kansas Board of Agriculture, 109 S.W. 9th St., Topeka, KS 66612

LINN, JONATHAN W., Faultless Pest Control, 1905 W. 43rd St., Kansas City, KS 66103
LITTAUER, GARY A., New Mexico State University, Box 5702, Las Cruces, NM 88003
LITTLE, RON, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124
LOVEN, J.E., U.S. Courthouse, Room B 10, Ft. Worth, TX 76102
MARTINEZ, ED, Kansas Board of Agriculture, Box 1333, Great Bend, KS 67530
MCDANIEL, HARLEY, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124
McGREW, JOHN C., Colorado State University, 405 Smith Street, Ft. Collins, CO 80524
MILLER, JAMES E., Ext. Service, U.S.D.A., 3428 S. Building, Washington, DC 20250
MONTEI, DARRELL, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124
MONTEI, KENT, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124
MOORMAN, ROBERT B., Iowa State University, 1223 9th Street, Ames, IA 50010
MORRIS, KARL D., ICI Americas, Inc., P.O. Box 208, Goldsboro, NC 27530

NELSON, BYRON, Schendel Pest Control, 5217 8th, Great Bend, KS 67530

NORWOOD, FRED, Research Products Company, P.O. Box 1057, Salina, KS 67401

OGDEN, RON, U.S. Fish & Wildlife Service, 600 E. Monrow St., Rm. 105, Springfield, IL 62701

PETERSON, BERKELEY R., 10913 Maple Grove, Oklahoma City, OK 73120

PIERCE, ROBERT A., Univ. of Arkansas, Coop. Ext., P.O. Box 391, Little Rock, AR 72205

POWELL, JEFF, 615 South 10th, Laramie, WY 82070

PRIEST, JEFFREY, R.R. #1, Box 21, Simpson, IL 62985

ROBEL, ROBERT J., Kansas State University, Division of Biology, Manhattan, KS 66506

ROWAN, LYNELL, 6535 Quivira, Shawnee, KS 66216

SALMON, TERREL P., Univ. of California Coop. Ext., Wildlife Extension, Davis, CA 95616

SAUER, WARREN C., Calif. Dept. of Food & Ag., 1220 N Street, Sacramento, CA 95814

SCHAEFER, JOSEPH M., 336 Country Acres, Wichita, KS 67212

SCHENBECK, GREG, U.S. Forest Service, 270 Pine Street, Chadron, NE 69337

SEXSON, KEITH, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124
SHAW, HARLEY G., Arizona Game & Fish Dept., P.O. Box 370, Chino Valley, AZ 86323
SHUMAKE, STEPHEN A., 7750 W. Woodard Cir., Denver, CO 80227
SNELL, WALTER W., 626 E. Mary, Garden City, KS 67846
SNIDER, CARL, Research Products Company, P.O. Box 1057, Salina, KS 67401
SORENSEN, STEVE, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124
SPARNICHT, ROBERT, Velsicol Chem. Corp., Box 68, Lindsborg, KS 67456
STAVLOV, OMAR, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124
STOOKEY, JOE, Dixon Spring Ag. Center, Simpson, IL 62985
STROUD, DENNIS, Wildlife Ext., U.C. Davis, 2800 Bidwell St. #1, Davis, CA 95616

TERWEDON, HENRY, Velsicol Chem. Co., 341 E. Ohio, Chicago, IL 60611

TIEMANN, LARRY, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

T1.1M, ROBERT M., Univ. of Nebraska, 202 Natural Resources Hall, Lincoln, NE 68583-0819

TOMOSON, LEONA J., Animal Control-Olathe Police, 100 W. Santa Fe, Olathe, KS 66061

TUSH, RICHARD L., 1519 Quincy, Eureka, KS 67045

URESK, DANIEL W., U.S. Forest Service, 4406 Ridgewood, Rapid City, SD 57701

WARD, CHARLIE, Kansas Fish & Game Commission, R.R. #2, Box 54A, Pratt, KS 67124

YOUNG, RICK, Iowa State University, 906 20th St., Ames, IA 50010