BIOLOGY, LEGAL STATUS, CONTROL MATERIALS, AND DIRECTIONS FOR USE

Starling

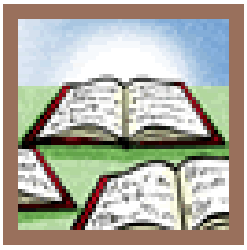
Family: Sturnidae

Introduction: The European starling (*Sturnus vulgaris*) is a non-native invasive species. In 1890, 100 birds were released in New York's Central Park; the North American population is now estimated at more than 200 million. Genetic evidence suggests that all starlings found in North America are descended from the birds released in Central Park.

Bird control in agriculture is an age old problem. Starlings are no exception to this problem. Starlings damage row crops, nuts, fruit, grapes, seedling sugar beets, tomatoes, and lettuce.

Identification: Smaller than blackbirds, with a short tail, pointed head, and triangular wings, starlings look black at a distance, but when seen closer, they are very glossy with a sheen of purples and greens. Their overall length is around 8 inches. Their flight is fast and direct and they walk and run confidently on the ground. Noisy and gregarious, starlings spend a lot of the year in flocks. Further information can be found at either of these sites:

Cornell Lab of Ornithology The Royal Society for the Protection of Birds

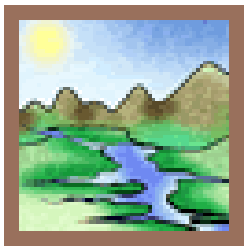


Legal Status: The California Fish and Game Code defines starlings as a nongame bird that may be taken and possessed by any person at any time. Starlings are not covered under the Migratory Bird Treaty Act nor are they subject to any other federal restrictions.

Damage: Damage can be seen in grapes, figs, peaches, blueberries, cherries, apricots, olives, strawberries, nectarines, plums, prunes, apples, persimmons, among other fruit crops; grain in newly seeded fields; and in cattle feedlots, dairies, and poultry ranches. Their excreta is also very damaging in urban environments, resulting in substantial cleaning costs. Their excreta also create unsanitary conditions in urban areas, and can lead to food safety concerns (e.g., Shiga toxin-producing *E. coli* and *Salmonella* spp.) in agricultural areas. Starlings are considered the most damaging bird species nationwide, with estimates of damage to the agricultural industry in excess of $1 billion annually. This does not include damage experienced in urban environments, which would greatly increase the overall damage estimate.

Range: The native range of the European starling extends through Europe, southwest Asia, and northern Africa; they were released into North America in the 1890's. By 1942, starlings were observed on the West Coast, and are now year-round residents throughout lowland California. These residents are joined by large flocks of migrants from the northern states in autumn and winter.

Starling



Habitat: Starlings usually prefer human-altered environments. This includes farms, ranches, open country, open groves, fields, cities, and more open forest and scrub.

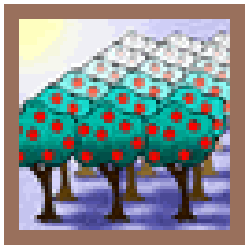
Biology: About mid-September, migrants from as far north as British Columbia begin arriving in California. They merge with residents into large flocks which are found in and around animal feedlots, scattered over pasture and rangeland, or in vineyards.. By mid-March these birds have either paired off to nest or have migrated from California.

Their nest is built in any tree cavity, hole in a building, or deserted woodpecker hole of suitable size. Nests used in successive seasons become foul-smelling. Two to eight eggs are laid, with average clutch size of 4 to 6. Average incubation period of eggs is 11 to 13 days; both sexes assist in this activity. Age at first flight is 19 to 22 days.

The average lifespan of the European starling is 3 to 4 years, although the North American record is 17 years. Annual mortality averages between 40 and 50%, although juvenile mortality is much higher (up to 80% of juveniles do not survive to reproductive age). As fledglings come off the nest they gather in small family groups of up to 10 birds, including one or two adults. These small groups eventually merge together until large flocks are formed. Merging continues until all of the birds in a local area are in one large flock. These flocks are scattered throughout the state in summer and are responsible for

depredations to soft fruits and other summer crops. Population build ups in cattle feedlots begin by mid-October. Starlings share a communal roost at night and, during the winter, as many as 5 million birds have been observed in one cattail and tule roost.

The starling's diet is almost 60 percent animal matter; mainly insects and other small invertebrates. Vegetation consumed is largely berries and other fruit with some seeds and grain. Losses from starlings in feedlots result from fecal-transmitted dysentery in the cattle as well as the value of livestock feed consumed. Starlings can eat remarkable amounts of fruit because of their inefficiency in digesting high-carbohydrate foods. Caged starlings allowed to feed at liberty on blueberries ate 9 ounces per bird per day, nearly 3 times their bodyweight. Similarly, starlings are quite voracious with grapes, eating nearly 14 ounces per bird per day.



Damage Prevention and Control Methods

Exclusion: Exclusion from nesting sites is possible. Close all openings larger than 1 inch to exclude starlings from buildings and other structures to provide a permanent solution. In barns and other outbuildings, heavy plastic or rubber strips hung in open doorways have been successful in excluding starlings while still allowing people and machinery to pass through doorways. In such doorways, 10-inch wide strips should be hung no more than 2 inches apart.

In California, plastic netting has proven effective at protecting vineyards, blueberries, and a few other fruit crops. Netting is expensive, so the cost of netting must be weighed against the amount of crop damage sustained. Efficient net placement can be achieved using tractor-mounted rollers to facilitate installation and removal of netting draped directly over vines. Success has been reported where Canadian vine growers mounted netting strips vertically to cover the fruit bearing portion of the vine only; this has not been tested in California.

Bird spikes (porcupine wire) can be placed on ledges or roofs of buildings to prevent roosting. Netting can also be an effective option when trying to prevent starlings from nesting in ledges of buildings, as well as from perching on rafters in locations such as barns. Proper installation of netting is essential, however, for it to be an effective means of exclusion.

Habitat modification: Roosting or perch sites can serve as entry points into agricultural fields. Where feasible, removal of such sites (e.g., tree stands, evergreen trees, and emergent vegetation in wetlands) can reduce damage to crops. When starlings congregate in urban areas, removal of dense vegetation (such as evergreens) on the lee sides of buildings can reduce the number of perching and roosting sites. Starlings also flock near airports. Airport vegetation kept between 5 to 10 inches should reduce starling or similar bird activity, thereby reducing potential bird-airplane collisions.

Starlings are attracted to the food and water offered at livestock operations, particularly during the winter months. Limiting the availability of food and water wherever possible can yield effective long-term starling control. For example, the following practices, individually or together, can reduce both ration loss and disease transmission:

1. Maintain a clean policy. Clean feed spills.
2. Store all grains and feed in bird proof containers (sealed).
3. If possible, use bird proof livestock feeders; flip tops, magnetic, or automatic release types are good examples.

4. Alternatively, feed in covered areas where possible.
5. Use feed larger than the starling can digest. For example, cubes or blocks larger than ½ inch.
6. Starlings prefer to feed morning to midday. Stagger feed schedules where possible. Consider feeding at night.
7. Starlings are attracted to water. Control water levels in livestock water troughs so starlings cannot access easily. Drain unnecessary water pools.

Frightening devices: Propane cannons or exploders, alarm and distress calls, shell crackers, bird bombs®, and bird whistlers® are used in dispersing starlings from crops. These devices should be used as soon as the birds appear; delays will make bird removal more difficult. A combination of two or more different sounds is often needed to move the birds out of the crop. The cannons or biosonic units should be mounted on stands or telescoping tripod towers above the crop. The units should rotate so the sound is projected over a wide area. Field observations will determine the location where the units should be placed, the number of units to use, and how often they should be moved. Typically, frightening devices have limited effectiveness; efficacy is dependent on availability of alternative food sources and how quickly the frightening devices are implemented following initial starling movements into fields.

Shooting: Starling numbers are too large to reduce through lethal removal via shooting. However, shooting may be effective as a dispersal technique. Frequent harassment via shooting during early morning and later afternoon hours over several days may be enough to disperse starlings to new locations. However, shooting is time-consuming and potentially costly, so alternative methods may be preferred.

Fumigants: No fumigants are registered or practical for use for starlings.

Repellents: A number of chemical repellents have been tried for starlings. The most popular feeding repellent currently used is methyl anthranilate (MA); it is used on numerous fruit and grain crops where it acts as an irritant to pain receptors associated with both the avian sense of smell and taste. In order for MA to be effective, concentrations need to range anywhere from 5,000-10,000 ppm. This is typically unattainable in production agriculture. As such, most studies have shown either no effect or only short-term repellency when MA was applied. Still, it is possible MA could have some merit in high-value commodities where starling damage is expected to be great (e.g., cherries and blueberries). Local growers and pest control agents would have to try it out on a local scale to determine the utility of MA for their specific growing conditions.

Sticky repellents (consisting of nontoxic polybutenes) are sometimes used to discourage roosting along beams, ledges, or signs. They must occasionally be reapplied, which limits their utility in some situations.

Trapping: Modified Australian crow traps and converted cotton trailers have been effective for capturing large numbers of starlings in California. A cotton trailer may be converted to a large mobile trap by constructing an entrance on top and plugging all escape holes. In some instances the slot entrance has proven more effective, while at other times the wire entrance was more successful. The location of the trap is important. Observations should be made to determine starling flyways, resting or perching areas, and feeding areas before the traps are placed in operation. These traps have been most effective when placed in the open near, but not necessarily under, perching or feeding areas.

When a trap is first installed, the bottom should be checked to see that an uneven ground surface does not leave holes that birds can escape through. It may be necessary to use a chicken wire bottom to prevent the entry of predators or ground squirrels. Starlings can escape through holes dug by squirrels. Trap baits that have been used successfully include cull peaches, other soft fruits, raisins, and poultry pellets. Bait placed on the ground inside the trap in large amounts with a little on the top near the entrances is most effective. Bait materials that the birds feed on in the area should be used for best results.

The use of live decoy starlings is usually essential in attracting birds to the trap. Five live decoys are sufficient for the modified crow trap and up to fifteen for converted cotton trailer. Food, water and shade must be supplied at all times. Starlings will die rapidly without water in warm weather. The traps must be kept clean and dead birds removed.

Trapped birds can be removed through a small exit hole, which has been cut into the upper corner of the rear of the trap and covered with a closeable door. A small holding cage can be placed over the hole and the starlings herded into this cage. Euthanize with CO_2 from a bottle. The birds should be disposed of by burying or in plastic bags in the trash.

Toxicants: Avitrol® (4-aminopyridine) is a restricted-use pesticide designed to frighten birds away from an area. Several formulations are legal for use in California. When birds consume the grain or pellets, they behave erratically and sound alarm calls that frighten other birds in the flock away from the treated area. The birds that consume the bait generally die. Avitrol® is primarily used in feedlots and staging areas. Starlings will exhibit bait shyness with Avitrol®; prebaiting for several days before application of the pesticide will increase bait acceptance. All leftover bait and starling carcasses should be picked up and disposed of after treatments are concluded.

The avicide DRC-1339 (3-chloro-4-methylaniline hydrochloride, also known as Starlicide®) is an effective option for reducing starling populations around feedlots and poultry barns. This slow acting toxicant is a restricted-use pesticide that can only be used by USDA/APHIS/Wildlife Services personnel. The toxicant requires 1 to 3 days for mortality to occur, thereby reducing potential bait avoidance concerns. If substantial problems with large populations of starlings occur in a given area, contact Wildlife Services to determine the feasibility of such a baiting program.

Other: The use of captive falcons and handlers has proven effective at reducing bird damage to several crops including wine grapes, blueberries, and strawberries. The falcons primarily serve to disperse birds from desired areas; they rarely kill the target species. Falconers prefer to work in relatively open areas to reduce potential injury to the falcons; this limits applicability in tree crops. The use of falconers is an expensive option, so its use is primarily limited to high value crops.

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