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“Nest Boxes for Native Cavity Nesting Birds”

Populations of native cavity nesting birds have been in long-term decline throughout New York State, and across the country. Loss of suitable nesting sites and competition from non-native birds are the major factors in these population declines.

The New York State Department of Transportation (NYSDOT), through it’s ownership of approximately 1% of New York State, has the potential to enhance nesting opportunities for native cavity nesting birds by the well-thought-out placement of nest boxes. However, it is critical that the decision to place nest boxes be carefully planned so that boxes are of the appropriate type, placed in suitable habitat and are monitored on a regular basis during the nesting season. Failure to consider these factors will result in enhancing nesting opportunities for non-native birds and thus further the plight of our native species. This bulletin will provide basic information and recommendations regarding the proper use of nest boxes on and adjacent to NYSDOT property. For more information, please refer to the references at the bottom of this document.

**Eastern Bluebird (Sialia sialis)**

New York’s official state bird, the Eastern Bluebird, historically nested in suitable natural cavities (holes or hollows in trees or wooden fence posts) or cavities excavated by other bird species that offer protection from predators, competitors and the elements. In addition, these nest sites had to be the correct size and needed to be located in the appropriate habitat for bluebirds, i.e. short-grass fields or large mowed areas with scattered shrubs for perching.

**Natural History** - Eastern Bluebirds are usually monogamous and usually mate for life. Bluebirds will usually have 2 nests per year with a first nesting period from mid-March through May and a second nesting period in June - July. The typical clutch consists of 3-5 eggs which are incubated for 14 days with the young fledging (leaving the nest) in 17 days after hatching. The breeding territory for bluebirds ranges from 2-25 acres with one bluebird pair rarely nesting within 300 feet of another bluebird pair.

**Locating a Bluebird Nest Box** - Bluebird nest boxes must be placed in the proper habitat, be solidly constructed, be mounted correctly and be monitored regularly if they are to attract and be successfully utilized by bluebirds or other native cavity nesting birds.

Bluebirds prefer to nest in areas that do not have concentrated human activity and that contain large lawns or other mowed areas with short grasses and a scattering of shrubs or saplings nearby for perching. Tall grasses discourage bluebird use as bluebirds have difficulty locating and capturing food (grasshoppers) in the thick cover. Even in good habitat, bluebirds are discouraged from nesting within urban areas (competition with starlings and house sparrows), within 50 feet of well-used pedestrian areas or highways, within 50 feet of woods or brush (competition from house wrens), within 100 feet of buildings (competition from starlings and house sparrows), in
heavily shaded areas, near water (competition from tree swallows) or within 300 feet of another bluebird nest. Bluebird boxes should be mounted on a smooth steel pipe (to discourage climbing predators) and placed 5-6 feet above the ground (to facilitate monitoring) with the entrance hole facing away from the direction of the prevailing weather (usually to the east).

**Selecting a Bluebird Nest Box Design** - There are two basic types of bluebird nest box designs to choose from - the Standard or Duncan Box and the Peterson Box. Bluebirds will readily accept either box, however the larger, more expensive and more difficult to construct Peterson has been shown to be slightly better in attracting bluebirds. Regardless of which design is chosen, it is critical that the box retain the following features: 1. Properly sized and placed entrance hole; 2. Adequate ventilation; 3. Adequate drainage; 4. No pressure-treated lumber, 5. No dark colored paints of stains; 6. A minimum front roof overhang of 5 inches; and 7) no external perch placed on the front of the box.

**Monitoring a Bluebird Nest Box** - If prior arrangements are not made to monitor the nest box at least once per week during the nesting period, then DO NOT install the box. The New York State Bluebird Society and/or local birding and conservation groups can usually assist with monitoring efforts. Failure to frequently monitor nest boxes can actually hurt bluebird populations by increasing nesting success of aggressive non-native cavity nesting competitors, such as house sparrows and starlings. In addition, nest box monitoring provides important biological information regarding the status of bluebirds. At a minimum, nest boxes should be checked once per week during the nesting season (mid-March thru August) to check for nesting activity. If a house sparrow or starling nest is found, it should be immediately removed (this is legal as these species are unprotected). If a bluebird, tree swallow or house wren nest is found the box should be monitored sufficiently to determine: 1. Dates for egg laying, hatching and fledging; 2. Number and color of eggs (usually 95% blue and 5% white); 3. Number of chicks hatched; 4. Number of chicks fledged; 5. Any indicators of nest failure; and 6. Any evidence of blowflies, ants or wasps.

After each nesting attempt, all nest material should be removed from the box to enhance subsequent nesting opportunities. The old nest material should be removed from the vicinity of the box to avoid attracting predators to the nest box.

**Bluebird Competitors** - Several species of birds compete with bluebirds for the use of nest boxes; some of these competitors are beneficial while others should be strongly discouraged as inadvertently increasing their numbers will actually hurt bluebird populations. **Tree Swallows** are migratory, beneficial, native cavity nesters that often utilize “bluebird” nest boxes. Tree swallows eat many biting insects, do not kill bluebirds and usually don’t arrive on the nesting grounds until after bluebirds have had a chance to establish a nesting territory. Tree swallows will nest “side-by-side” with bluebirds, however will drive away any other tree swallows within their nesting territory, therefore placing 2 boxes in tandem (10 to 15 feet apart) will allow nesting opportunities for both species. **House Wrens** and **Black-capped Chickadees** are also native cavity nesters that will use nest boxes. These species will not compete directly with bluebirds when box location is appropriate and, like tree swallows, will not kill or drive-off bluebirds. House wren use of nest boxes can be avoided by not placing boxes in or within 50 feet of brushy
areas or hedge rows. Black-capped chickadees are not significant users of nest boxes, however their use seems to be greater when boxes are placed on trees or in or within 50 feet of forested areas. **House Sparrows** are resident, non-native cavity nesters imported from Europe in the 1800's and represent the greatest threat to our native cavity nesting song birds. House sparrows do not migrate, so they are often the first to claim any available nest boxes. House sparrows are also extremely aggressive and will drive-off other birds that have started nesting in a box (there are many reports of house sparrows killing adult and nestling bluebirds in boxes!). The best way to avoid house sparrow competition is to NOT place boxes in urban areas, within 100 feet of any buildings (especially barns) and to monitor boxes at least once/week during the nesting period and remove any house sparrow nests (this is legal). Failure to prevent house sparrows from successfully rearing young in nest boxes is more harmful to bluebirds than not putting-up any boxes at all! **European Starlings** are also non-native cavity nesters that were inadvertently introduced into the US in the 1800's, however since starlings are larger than bluebirds, having the correct size entrance hole will prevent starlings from entering the nest box (1 ½ inch diameter round hole or 2 3/4 inch by 1 3/8 inch oval hole).

**Bluebird Predators** - Raccoons are a significant predator of bluebird nest boxes, however they can be deterred from reaching into the box by having the roof over-hang at least 3 inches over the front of the box. In addition, all bluebird nest boxes should be equipped with adequate predator guards to deter house cats (yes, your feline pets kill millions of songbirds annually), raccoons, climbing snakes, etc. that quickly adapt to obtaining an easy meal at unprotected boxes.

**American Kestrel (Falco sparverious)**

The American Kestrel, or Sparrow Hawk, is the smallest North American falcon and is dependant on the existence of natural tree cavities or artificial nest boxes for nesting sites. These colorful predatory birds (raptors) are the smallest cousin of the Peregrine Falcon and are frequently seen perched or “hovering” along New York’s highways, especially the interstates. Kestrels are beneficial members of the ecological community primarily for the large numbers of rodents and insects that they consume on a daily basis. Although kestrels will occasionally consume small birds, their normal diet consists of meadow voles, deer mice, shrews and large insects such as grasshoppers and katydids.

**Natural History** - Kestrels belong to the falcon order and are classified as raptors or bird of prey. Raptors are roughly characterized by the presence of a hooked beak, sharp talons, large, forward-facing eyes and a predatory life style. Kestrels begin nesting in late March by locating a suitable natural tree cavity, an unused nest cavity excavated by a pileated woodpecker or an artificial nest box. Kestrels usually lay 5 eggs (1 per day) that are white, pinkish-white or cinnamon in color and uniformly covered with small brown spots. Incubation, mostly by the female, generally begins with the laying of the penultimate egg and lasts 29-30 days. Fledglings become well feathered within 20 days and fledge 28-30 days after hatching.

**Locating a Kestrel Nest Box** - Kestrels hunt for rodents by perching or more frequently hovering above fallow grassy fields, hay fields, lightly grazed pastures or infrequently mowed areas (not lawns, golf courses, etc. due to scarcity of cover for rodents, grasshoppers, etc.).
Therefore, kestrel boxes should be located only along highways with extensive ROW, or adjacent hayfields, fallow fields, wet meadows or pastures. Nest boxes should be spaced at least ½ mile apart and be mounted at least 10 feet but not more than 20 feet above the ground (lower is easier to install, monitor and maintain). Iowa DOT and New York DOT have both experimented successfully with installing kestrel boxes on the “back” of interstate highway signs within the ROW. In both cases, these programs relied heavily on local volunteers to construct, install, monitor and maintain the nest boxes.

**Selecting a Kestrel Nest Box Design** - The dimensions for a kestrel nest box are not as critical as with a bluebird box, however care should be taken to provide adequate ventilation, drainage, entrance hole size, depth, ease of monitoring, 3-4 inches of nesting material in the bottom of the box (wood shavings or straw), protection against predators and protection from prevailing weather.

**Monitoring a Kestrel Nest Box** – Do not install the box if prior arrangements haven’t been made for monitoring. Kestrel boxes should be monitored at least 3 times per year and more frequently if kestrels actually nest in the box or if starlings are attempting to nest in the box. At a minimum, the boxes should be visited in late February, prior to territory establishment, to make any necessary repairs, clean the box and add nesting material. The second visit should occur in mid-April early in the nesting period to confirm occupancy by kestrels and remove any starling nests (Eastern Screech Owls may also use the box and should not be disturbed). Subsequent visits will depend on whether kestrels are nesting in the box. If no kestrels are using the box early in the nesting period, a second visit should still be made during late May. If Kestrels are nesting in a box, disturbance during the first 2 weeks of the 30 day incubation period should be kept to a minimum to avoid nest abandonment. Subsequent visits should record: 1. Dates of egg laying, hatching and fledging; 2. Number of eggs; 3. Number of nestlings; 4. Number of fledglings; and any signs of nest predation.

**Kestrel Competitors** - The competitor of greatest concern with kestrel nest boxes is the nonnative cavity nesting European starling. Starlings can easily enter any hole that a kestrel can enter, therefore they can not be excluded by entrance hole diameter as with bluebird nest boxes. The two best methods to discourage starling use of kestrel nest boxes are to locate the boxes at least 200 feet from any buildings or bridges, and to monitor the boxes during the early portion of the nesting period and remove any starling nests. Once kestrels have established a nest, starlings will not be able to drive them off. To determine if starlings are using a nest box, carefully observe the area for the presence of adult starlings and check the box for sign of starling use. Starlings place a layer of grass over the wood shavings or straw nesting material placed in the box and starlings lay six or seven pale blue eggs (kestrels lay 5 eggs that are white, pinkish-white or cinnamon and are evenly covered with small brown spots.

**Kestrel Predators** - Using a 3 inch diameter entrance hole and placing boxes on existing steel sign posts should exclude or discourage most nest predators due to the difficulty in climbing these smooth posts and their isolated nature in the ROW, e.g. away from buildings, bridges and travel corridors such as hedge rows, streams and over-grown areas. In addition, the 3 inch diameter entrance hole will exclude raccoons from entering the box.
Wood Duck (Aix sponsa)

Wood Ducks, considered by many to be the handsomest of all North American ducks, like all waterfowl have suffered dramatic population declines due primarily to loss of wetland habitat for nesting, brood rearing, feeding and security. Wood duck populations were especially hard hit due to their dependence on suitable natural tree cavities, in close proximity to wetlands, for nesting. In addition to wetland losses (NYS has lost over 60% of it’s original wetlands), the clearing of New York’s Woodlands for forest products and agriculture, and collection by market hunters in the 1800's severely reduced the number of potential nesting sites for wood ducks.

Natural History - Wood ducks are native to North America and are classified as secondary cavity nesters, i.e. they are unable to excavate their own nest site and therefore are dependent upon natural forces or other birds, such as the pileated woodpecker, to excavate the nest hole. Contrary to what one might expect, wood ducks usually select a cavity in a living tree, not a dead tree (probably for better nest concealment). Wood ducks are migratory, usually not arriving on their New York nesting grounds until late March. Wood ducks prefer to nest at least 100 feet from shore over impoundments of standing water at least 3 feet deep with scattered pockets of emergent vegetation. Wood ducks will nest up to 400 yards from water, however this is an extreme and nest boxes should be placed much closer quality brood rearing wetland habitat. Wood ducks lay an average clutch of 12-13 eggs and typically incubate the eggs for 29-30 days. Usually within 24 hours of hatching, the hen wood duck leaves the nest box and calls softly (or not so softly to the stragglers) until all the ducklings climb up and drop out of the box to join the waiting hen in the water (or ground if in the forest). At this point, the ducklings follow the hen to safety in the marsh vegetation (or across the land to the marsh if hatched in the forest).

Locating a Wood Duck Nest Box - It is best to place wood duck nest boxes above water, however, boxes can be successfully placed in forests up to 400 yards from water. When placed above water, boxes should be mounted at least 4 feet above the ordinary high water elevation. Wood ducks prefer impoundments that are at least 10 acres in size with water depths ranging from 1 foot to 6 feet. For brood rearing purposes, these impoundments should contain a mixture of approximately 25% quiet, open water and 75% vegetation comprised of 30-50% shrubs, 40-70% herbaceous emergents and 0-10% trees. For best results, nest boxes should be placed at least 150 feet from shore, however 60 feet is acceptable. All nest boxes should be equipped with a predator guard to protect the nest from raccoons and climbing snakes. If nest boxes are located on land, they should be in forested areas and be no more than 400 yards from water with acceptable brood rearing habitat. The greater the overland distance, the higher the mortality rate will be as the 1 day old ducklings are lead from the nesting area to the brood rearing area. On land, boxes should be at least 10 feet high but not more than 20 feet. The greater the distance the greater the chances of injury as the flightless, 1 day old ducklings drop from the box. Boxes should be placed at a density of approximately 1 per acre.

Selecting a Wood Duck Nest Box - There are many types of boxes available ranging from traditional wood boxes to metal, plastic and cavities excavated with a chain saw. For NYS DOT purposes, the traditional wooden box is probably the best choice due to performance, availability and aesthetic appearance. Regardless of which box design is used, common features must include, ventilation, drainage, entrance hole 3 inches high by 4 inches wide, 3-4 inches of nest
material added to bottom (wood shavings or straw), roughened inside front for ducklings to climb up, paint inside of entrance hole dark and install predator guard.

**Monitoring a Wood Duck Nest Box** - Wood duck nest boxes must be monitored at least 2-3 times per year to insure the box is in good repair and to assess nesting success. At a minimum, wood duck boxes should be monitored during late winter/early spring when access is available over the ice. During this time the box should be inspected, all necessary repairs made, last years nesting material removed and new nesting material added to the box. To collect biological information and assess the success of the box, subsequent monitoring during the nesting period may be required, as necessary.

**Wood Duck Competitors** - A variety of other birds will utilize wood duck nest boxes. **Hooded Mergansers** will frequently nest in wood duck boxes. Hooded mergansers are also native secondary cavity nesting waterfowl that often arrive on the nesting grounds slightly before wood ducks. Use of boxes by any waterfowl should be considered a success. **Kestrels** will use wood duck boxes if the box is located over land and near fallow fields, hayfields or pastures. **Screech Owls** will also nest in wood duck boxes and in addition will use the boxes as diurnal roost sites. All 3 of these bird species are beneficial native cavity nesters, are protected by federal law and should not be disturbed in any way. **Red and Grey Squirrels** will also nest in wood duck boxes, however can be discouraged through the installation of a predator guard and removal of nest material during monitoring visits.

**Wood Duck Predators** - The installation of a predator guard with each wood duck box is Essential. Predators quickly adapt to visiting artificial nest boxes for a potential meal. Without a predator guard, raccoons and snakes will likely find and eat many clutches. Without a predator guard, nest boxes can become death traps for the incubating female wood duck and her clutch of eggs. It’s better not to install a wood duck nest box at all than to install one without adequate protection against predators.

**Eastern Screech Owl (Otis asio)**

Eastern Screech Owls are native secondary cavity nesters that have been in steady decline over the last 20 years. Screech Owls prefer habitat that includes a mix of small woodlots interspersed with open grassy fields and abandoned orchards with a water source. It is believed that abandoned farmland that is reverting to forest, as well as a decrease in natural nesting sites, are having a negative impact on screech owl populations.

**Natural History** - The eastern screech owl is strictly nocturnal, stands 7-10 inches tall, has a home range of 75-100 acres and comes in two color phases - red and grey. Screech owls are opportunistic predators, consuming a wide variety of prey items including mice, voles, shrews and large insects such as moths and grasshoppers. Screech owls are in turn, often preyed upon by great-horned owls and therefore will utilize nest boxes as safe sites to consume nighttime meals, as well as, daytime roosting locations. Screech owls mate in late winter and will mate for life. Screech owls make no effort to build a nest in the nest cavity. In early spring, the female owl will lay 4-6 white eggs and incubate the eggs for 27-30 days. After hatching, the female will continuously brood the chicks for another 14 days. During the incubation and brooding periods
the male will provide all the food for the female and nestlings. The young owls usually fledge about 30 days after hatching. After fledging, the adults continue to feed the young for several weeks with the family unit staying together until the young disperse in late summer or early fall.

**Locating a Screech Owl Nest Box** - Boxes should be placed in a wooded area about 15 feet above the ground on a large, living tree. Screech owls seem to avoid boxes placed on poles or other artificial supports. The best sites should include a mixture of open forest, meadow, orchard and water from a stream or small wetland area. Screech owl boxes should be installed by the end of February.

**Selecting a Screech Owl Nest Box** - Much less information exists regarding use of artificial nest boxes by screech owls than exists for other species. However, it appears that good success occurs with the basic box design used for American Kestrels. Whatever design is used, the entrance hole should be 3 inches in diameter, no nesting material should be placed in the box and an appropriate predator guard should be installed.

**Monitoring a Screech Owl Nest Box** - Monitoring a screech owl box is more difficult than with other species because screech owls use boxes to roost and feed throughout the year, as well as to nest. Therefore, boxes should be monitored infrequently from late winter through early summer with extreme care taken not to disturb feeding, roosting or nesting screech owls. Evidence of screech owl use would include presence of eggs, nestlings, pellets, food scraps from prey items or screech owl feathers in the box. Since screech owls do not add nesting material to a box, the presence of any leaves or sticks inside the box would indicate use by another species. Do not remove nest material from the box until first determining what species put it there. Nest material from kestrels should be left in-place while material from starlings or squirrels should be removed.

Since screech owls roost and eat, as well as nest, in boxes, care must be taken while monitoring to minimize disturbance. During December or January, check the box for evidence of recent owl use, e.g. owls or fresh food items (birds, rodents) seen in box. If recent owl use is confirmed, do not remove any material from the box. If no recent owl use is evident, clean-out the box and/or make repairs as necessary.

**Screech Owl Competitors** - Other species that may use screech owl nest boxes include American Kestrels, grey squirrels, red squirrels and starlings. The best way to reduce use of screech owl boxes by other species is to carefully select the location of the box. **American Kestrels** are federally protected, beneficial, native cavity nesters that will readily use nest boxes. The best way to avoid having kestrels use a **screech owl** box is to locate the box in a wooded area. Kestrels prefer to nest in fields or on the edge of fields. **Red Squirrels** prefer nest boxes located in or near conifer plantations or along old stone walls while **grey squirrels** prefer large trees located in oak, hickory or beech forests. Unfortunately, there is no way to prevent **starlings** from using a screech owl box, however boxes located at least 200 feet from buildings or other structures will decrease use by starlings. If starlings are observed nesting in a screech owl box, the nesting material should be removed until the starlings abandon the box.
Screech Owl Predators - A 3 inch diameter entrance hole should exclude predation by raccoons, however in southeastern New York predator guards should be installed to exclude predation by opportunistic climbing snakes such as black rat snakes and the eastern black racer.

References:


