

Belted Kingfisher

Ceryle alcyon (formerly *Megaceryle alcyon*)

DESCRIPTION

The belted kingfisher is a pigeon-sized member of the Alcedinidae family found throughout much of the United States and Canada. This piscivorous bird has a stocky body, heavy bill, and a large head with a double-pointed crest. Both the male and female are blue-gray on the back and head with a white collar around the neck and white underparts. Males have a single blue-gray band across the chest and females have a blue-gray pectoral band with a rufous band across the lower breast and rufous sides (Hamas 1994).

BODY SIZE

Belted kingfishers display little if any sexual dimorphism in size. Some researchers report that females tend to be slightly larger than males; however, other sources state that either member of a breeding pair may be larger than its mate (Salyer and Lagler 1946, Hamas 1994). Body length, as measured from the tip of the bill to the tip of the tail, is approximately 33 cm (National Geographic Society 1999). Average body weights of male and female kingfisher during the spring in Minnesota were 143.6 g ($n = 8$, range 138 – 150 g) for males and 151.6 g ($n = 6$, range 138 – 169 g) for females (Hamas 1994). During fall migration, body weights have been reported to range from 125 to 215 g (Muray and Jehl 1964, and Dunning 1993 as cited in Hamas 1994).

DISTRIBUTION

During the breeding season, belted kingfisher occur throughout much of the United States and Canada (Figure 1) excluding high elevation areas (>9,000 feet) of the Rocky Mountains and the northern most regions of Alaska and Canada (Hamas 1994, DeGraaf and Yamasaki 2001). Kingfishers do occur in xeric regions such as the central grasslands during the breeding season, but populations are limited and breeding is localized (Hamas 1994).



Figure 1. Range of belted kingfisher in North America

The southern limit of the belted kingfisher's range closely coincides with the northern limit of the ringed kingfisher's range (*Ceryle torquata*) (Hamas 1994).

MIGRATION

Belted kingfishers overwinter throughout much of their breeding range, although they do migrate from most of Canada and the northern tier of the United States. Migration from northern regions is dependent upon the severity of the winter and individuals may remain in these areas provided ice-free conditions persist. Migrating belted kingfisher may travel as far south as northern South America (Hamas 1994). Southern migration of the belted

kingfisher from Canada and the northern United States begins by mid-September and continues throughout November (Hamas 1994). Belted kingfishers migrate from these northern regions where ice accumulation limits food availability. However, some individuals remain near open water areas throughout much of New England including Connecticut, Rhode Island, Massachusetts, coastal New Hampshire, and Vermont (Ellison 1985, Veit and Petersen 1993, and DeGraaf and Yamasaki 2001). In Vermont, for example, a few males remain behind in ice-free areas to maintain previously established territories (Ellison 1985). The northern breeding migration occurs during late March and early April for much of northern New England, including New Hampshire, Massachusetts, and Vermont (Hamas 1994).

HABITAT

Habitat use by belted kingfisher during both the breeding and non-breeding season is dependent upon the availability of clear water bodies for foraging (Hamas 1994). Belted kingfisher will use a variety of freshwater and coastal habitats, provided prey is available, including ponds, lakes, rivers, streams, reservoirs, large vernal pools, estuaries, and harbors (DeGraaf and Yamasaki 2001). Despite their apparent indiscriminate use of aquatic habitats, kingfisher prefer calm, clear waters that are free of dense mats of aquatic plants or floating debris. Aquatic plants, floating debris, or silt stirred up by heavy rains or wave action can hamper foraging by obscuring visibility. When foraging on large lakes or coastal waters, belted kingfisher select sheltered locations where wave action is limited (Hamas 1994). Salyer and Lagler (1946) found that kingfisher preferentially selected smaller lakes over larger water bodies where turbidity affected visibility. When foraging in stream habitats, belted kingfisher appear to select territories where there is a greater concentration of riffles as opposed to pools (Davis 1982). Researchers found that riffle habitats contained a greater number fish, the principal prey of the belted kingfisher, and that the kingfisher appeared to use the presence of riffles as a guide to habitat quality.

Kingfishers also require foraging perches along these water bodies from which they can hunt. Foraging perches include bare, projecting branches, telephone wires, or pier pilings (Hamas 1994). In New England during both the breeding and non-breeding seasons, belted kingfisher will forage at pond, lake, stream, river, riparian, estuary/salt marsh, and coastal beach habitats (DeGraaf and Yamasaki 2001).

During the breeding season, the availability of nesting locations, principally earthen banks, will limit belted kingfisher populations (Ellison 1985). For example, Davis (1982) found that of 24 available nesting banks within his study area, 13 banks were utilized by breeding pairs of belted kingfisher, six banks were unsuitable because of substrate composition or human activity, and the remaining five were unused because of competitive exclusion by other nesting pairs. Kingfisher preferentially select nesting sites located near their foraging territory, but nest sites can be up to a mile from the feeding territory (DeGraaf and Yamasaki 2001). Along streams, nest site selection may be the overriding factor that determines territory location (Brooks and Davis 1987 as cited in Hamas 1994).

Kingfisher nests are typically excavated burrows located in earthen banks. Earthen banks chosen for nest sites often lack vegetative cover, particularly woody vegetation, because roots interfere with excavation (Brooks and Davis 1987, as cited in Hamas 1994). Suitable bank substrates include sandy clay soil and soils with high sand (>75 percent) and low clay (<7%) content (Cornwell 1963 as cited in Hamas 1994, Brooks and Davis 1987 as cited in DeGraaf and Yamasaki 2001). Banks with a high content of clay, gravel, or rock often are unsuitable for nest construction because birds are unable to excavate burrows in these substrates. Burrows may be located in a streambank or riverbank or along a ditch, road cut, landfill, or sand/gravel pit (Hamas 1994). Other less typical sites include sand dunes, sawdust piles, dredge spoils, mud slides created by beaver activity, furrows in a plowed field, and holes in dead trees or tree stumps.

Little is known about the roosting requirements of this species. Published information indicates that

belted kingfisher will roost in both coniferous and deciduous trees (Hoyte 1961 as cited in Hamas 1994). More specifically birds may selectively roost at the tip of small branches that would not support the weight of potential predators (Brewster 1937, as cited in Hamas 1994).

In The Primary Study Area: Table 1 contains a summary of the literature review and observational data on the use by belted kingfishers of the natural community types found within the primary study area.

HOME RANGE AND TERRITORIALITY

Belted kingfishers are solitary except during the breeding season when pairs form monogamous bonds (Hamas 1994). Males first establish breeding territories as a means of attracting a mate. Once a pair bond is formed, both the male and female aggressively defend their territory. During the breeding season, nest site protection seems to be the primary reason for territoriality with the security of the foraging site secondary.

Researchers have found that the size of the breeding territory and fledging success (i.e., fledging/nest) appear to be related to the concentration of prey (g/m) and that the smallest territories typically include the richest sources of food (Davis 1982). The size of breeding territories expressed as miles of shoreline ranges from 0.5 – 1.36 miles (Salyer and Lagler 1946, Brooks and Davis 1987 as cited in USEPA 1993). At Lake Itasca in Minnesota, home range for a breeding pair ranged from 0.5 – 5.0 linear miles from the nest site (Cornwell 1963 as cited in Hamas 1994).

Individual belted kingfishers including young of the year, also maintain a feeding territory outside of the breeding season. Davis (1980) found that non-breeding territories are less than half as large as breeding territories. In addition, the size of non-breeding territories is inversely related to food density (Davis 1982). The size of non-breeding territories, expressed as miles of shoreline, ranges from 0.24 – 0.64 miles (Salyer and Lagler 1946, Brooks and Davis 1987 as cited in USEPA 1993).

Table 1. Habitat use by belted kingfishers in the primary study area

Habitat Codes and Natural Community Classifications																					
Wetland Habitats								Terrestrial Habitats													
ROW	ROW & PAB	SHO	PFO				PSS	PEM	WM	VP	SW	MW	HW		OF	AGR	RES				
Medium-gradient stream	Low-gradient stream	Riverine pointbar and beach	Mud flat	Red maple swamp	Black ash-red maple-tamarack calcareous seepage swamp	Transitional floodplain forest	High-terrace floodplain forest	Shrub swamp	Deep emergent marsh	Shallow emergent marsh	Wet meadow	Woodland vernal pool	Spruce-fir-northern hardwood forest	Northern hardwoods-hemlock-white pine forest	Successional northern hardwood forest	Red oak-sugar maple transitional forest	Rich mesic forest	Cultural grassland	Agricultural cropland	Residential development	
B	B	B	B					B	B	B		B									

ROW = Riverine Open Water
 SHO = Shorelines
 PFO = Palustrine Forested
 PSS = Palustrine Scrub-Shrub
 PEM = Palustrine Emergent
 WM = Wet Meadow
 PAB = Palustrine Aquatic Bed
 VP = Vernal Pool
 SW = Softwood Forests
 MW = Mixed Forests
 HW = Hardwood Forests
 OF = Open Fields
 AGR = Agricultural Croplands
 RES = Residential
 Season of Use
 B = Breeding
 M = Migration
 W = Wintering
 Y = Year-round
 Shading = observed in study area

BREEDING

Belted kingfishers are seasonally monogamous, and following the formation of a pair bond both the male and female excavate a nesting burrow within their territory. Nesting burrows are occasionally reused, but kingfishers do not show a high degree of nest site fidelity (Hamam 1994). In Vermont, nest construction occurs in April and nesting begins in early May (Ellison 1985). Eggs are laid from early April to early July, but the timing of egg laying varies with geographic location (Hamam 1994). In Massachusetts, egg dates range from 14 May to 6 June (Veit and Petersen 1993). In the northern part of their range, belted kingfisher only produce one brood per year, although individuals may re-nest if their first clutch is destroyed or abandoned before mid-June (Hamam 1994). Sharpe (1868, as cited in Hamam 1994) reported that birds in the southern United States may produce two broods per year.

The first egg of a clutch is laid within a week following the completion of the nest (Hamam 1994). Successive eggs are laid over several days and incubation does not begin until the clutch is completed. Clutch size ranges from 5 – 8 with an average clutch containing 6 – 7 eggs (DeGraaf and Yamasaki 2001). Egg production is energetically costly for the female with a clutch of five to seven eggs representing from 37 – 57 percent of the female's body weight (Hamam 1994). During the 22- to 24-day incubation period, both the male and female spend time on the nest (Bent 1940 as cited in DeGraaf and Yamasaki 2001, Hamam 1994). Typically, all of the eggs within a clutch hatch within a 12 – 18 hour period (Hamam 1994). The female and occasionally the male brood the young continuously for 3 – 4 days following hatching (Hamam 1975 as cited in Hamam 1994). Brooding ceases by the time the young are 6 days old.

GROWTH AND DEVELOPMENT

At the time of hatching, the young weigh from 9 – 13 g, their eyes are closed, and they lack natal down (Hamam 1994). The chicks grow rapidly during their first 10 days (5 – 6 g/day) and reach adult weight by the time they are 16 days old, but lose some weight before fledging (Brooks and

Davis 1987 as cited in USEPA 1993, Hamam 1994). For the first 3 – 4 days the adults feed the young an oily bolus of regurgitated fish, but after 5 days they young are able to consume whole fish brought to the nest by the adults. The fledglings leave the nest at about 27 – 29 days of age following complete development of their juvenal plumage. Young are able to capture live prey about a week after fledging, but are also fed sporadically by the adults for approximately 3 weeks. Fledglings may remain in their natal territory or disperse when they are capable of foraging for themselves (Hamam 1994). The literature presents conflicting information on dispersal, with one source reporting that adults drive young from the natal territory and another reporting that the adults disperse (Ehrlich *et al.* 1988, Hamam 1994).

MOLT

Young birds retain their juvenile plumage through October or November. The pre-basic molt begins in December or January and is completed by April or May (Hamam 1994). The degree to which birds undergo the pre-basic molt is variable and appears to be related to whether birds are residents or migrants. The definitive plumage molt for the belted kingfisher begins in late June or July (Hamam 1994). For residents, this molt is completed by late October or early November. For migrants, the molt is suspended in mid-September and is completed by November or December on their wintering grounds (Hamam 1994).

FOOD HABITS AND DIET

Belted kingfishers feed primarily on fish, but they also take mollusks, crustaceans, insects, amphibians, reptiles, young birds, small mammals, and some berries (Hamam 1994). The kingfisher will feed on the most readily available prey, which is dependent upon the habitat in which they are foraging. Analysis of regurgitated pellets indicates that belted kingfishers preferentially feed on those species of fish that are most abundant within shallow water (Hamam 1994). Most fish caught by kingfishers are found within 60 cm of the surface, which means they are taking fish that either swim near the surface or are located in shallow water (Hamam 1994).

Specific prey taken by belted kingfishers includes three-spined sticklebacks (*Gasterosteus aculeatus*), trout (Salmonidae), mummichogs (*Fundulus heteroclitus*), crayfish (*Cambarus* spp.), and stonerollers (*Campostoma anomalum*) (Hamas 1994). In one study conducted in Ohio, prey brought to nestlings included 37.6% stonerollers, 26.1% unidentified cyprinids, 12.7% minnows, 10.2% non-minnows, and 13.3% crayfish (Davis 1982). Fish taken by belted kingfishers typically are less than 10.2 cm long (Imhof 1962, as cited in Hamas 1994). Fish greater than 12.7 cm in length are considered too long for the kingfisher to eat (Salyer and Lagler 1946).

ENERGETICS AND METABOLISM

In captivity, a post-absorptive adult kingfisher weighing 130 g requires an average of 55 – 61 kcal per day regardless of the season (Vessel 1978, as cited in Hamas 1994). The average ingestion rate for adults is 0.50 g/g-day and the ingestion rate for nestlings has been reported to range from 1.0 – 1.75 g/g-day (White 1936, Alexander 1977, both as cited in USEPA 1993). Davis (1982) estimated that at maximum growth rate, nestling belted kingfishers could consume approximately 11.2 fish/day. A water ingestion rate for adult birds has been estimated to be 0.11 g/g-day (USEPA 1993).

POPULATIONS AND DEMOGRAPHY

Population Densities: Population densities have been reported as 1 pair per 1.8 sq. mi. in Minnesota (Cornwell 1963, as cited in DeGraaf and Yamasaki 2001). In New Brunswick, population densities of belted kingfisher were estimated to be 10 birds for every 5,250 ft of stream, and for a river in Ohio populations were estimated to be 5 pairs for every 32,810 ft of shoreline (White 1953, Brooks and Davis 1987, both as cited in Hamas 1994).

Age at Maturity and Life Span: Both male and female belted kingfishers reach sexual maturity at one year and breed the spring following hatching (Hamas 1994). No information was found in the literature on life expectancy for this species.

Mortality: Unlike other higher-level consumers, the belted kingfisher does not appear to be highly susceptible to environmental contaminants such as DDT, most likely because the small prey kingfishers eat do not accumulate high level of toxins (Hamas 1994). Neither DDT nor polychlorinated biphenyls (PCBs) appear to significantly impair the reproductive success of the belted kingfisher (Fox 1974, Heinz *et al.* 1984, both as cited in Hamas 1994). However, this species will withdraw from badly polluted waterways (Hall 1983, as cited in Ellison 1985).

Nestling mortality for belted kingfisher is generally low and chicks that die are generally lost during the first few days following hatching. In Minnesota, hatching success was approximately 87 percent and fledging success was 97 percent (Hamas 1975, as cited in Hamas 1994). Nematodes, tremetodes, and helminthes are known internal parasites (Hamas 1994). Shooting at fish hatcheries has been documented as a cause of adult mortality.

Enemies: Nest predators of the belted kingfisher include skunks (*Mephitis mephitis*), mink (*Mustela vison*), raccoons (*Procyon lotor*), and snakes. Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), and other raptors are the chief predators of adults and juveniles (Hamas 1994).

STATUS

General: In New England during the breeding season, the belted kingfisher is uncommon, but widespread (DeGraaf and Yamasaki 2001). During the winter, the belted kingfisher is uncommon and its occurrence is dependent upon the severity of the winter. Based on Breeding Bird Surveys conducted between 1982 and 1992, the continental population of belted kingfishers is showing a decline of 1.1% per year, whereas prior surveys (1965 – 1979) indicated no significant long-term population trends (Hamas 1994).

In The Primary Study Area: Belted kingfishers were commonly seen in the primary study area in suitable habitats during the 1998 – 2000 field surveys. Three nests were found in the primary study area along the main stem in 1998 (Figure 2).

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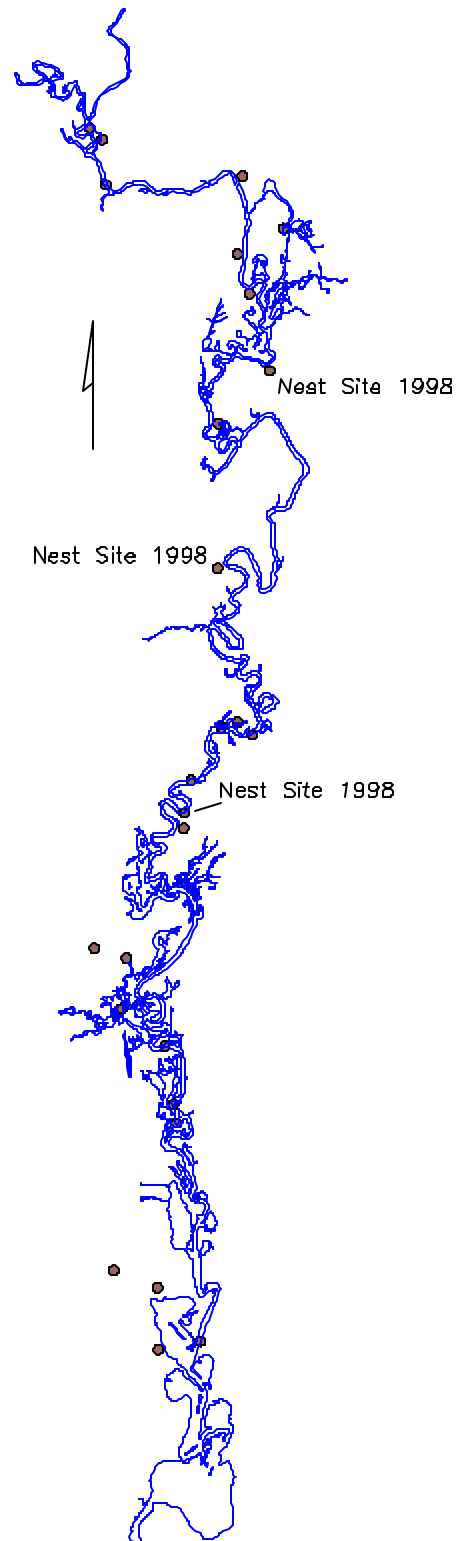


Figure 2. Belted kingfisher sightings in the primary study area

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