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13.1.6. Life History and Habitat Needs of the Wood Duck

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Species Profile—Wood Duck

Scientific name: *Aix sponsa*
Weight in pounds (grams):
Adults—male 1.5 (682), female 1.5 (673)
Immatures—male 1.5 (668), female 1.4 (614)
Age at first breeding: 1 year
Clutch size: 12, normal range 7–15
Incubation period: 30 days, range 26–37
Age at fledging: 56–70 days
Nest sites: Tree cavities or artificial nest boxes within about 0.6 mi (1 km) of water.
Food habits: Omnivorous. Plant foods include primarily acorns, maple samaras, elm seeds, and moist-soil plant seeds. Animal foods consist mainly of aquatic-associated and nonaquatic insects, but also some aquatic invertebrates.

The wood duck is North America's most widely distributed endemic species, and most of its wintering and breeding range falls within the 48 contiguous states (Fig. 1). The wood duck inhabits forested wetlands and, because of its need for nest cavities, is closely tied to North America's remaining forest resources. Habitat destruction, market hunting, and liberal hunting seasons contributed to drastic declines and, in some cases, regional eradication of local wood duck populations. Subsequent implementation of hunting restrictions and the high reproductive rate of the species are responsible for the recovery of wood duck populations to current stable levels.

As prairie duck populations continue to decline, hunting pressure on the wood duck continues to increase. The wood duck is popular with hunters and consistently ranks high among species in Atlantic and Mississippi flyway duck harvests. Harvest pressure and continued degradation of riparian and lowland hardwood forests increases the need for a thorough understanding of wood duck population dynamics. Equally important to sustaining current wood duck population levels is an understanding of annual life cycle events and requirements.

Distribution

Three distinct wood duck populations occur in North America: the Atlantic, Interior, and Pacific. The Atlantic population includes states of the

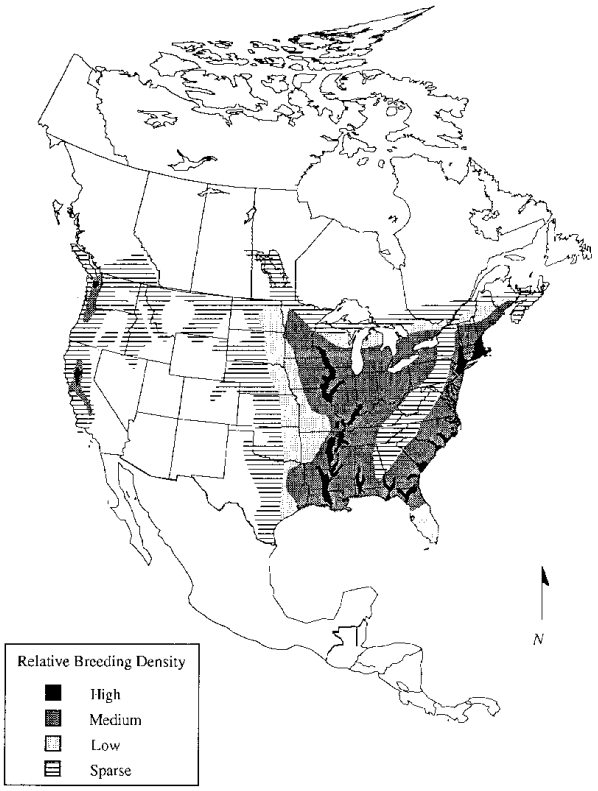

Fig. 1. Current wood duck breeding distribution (after Fredrickson et al. 1990).

Atlantic Flyway and southeastern Canada, the extreme northern range of the wood duck. The Interior population includes wood ducks throughout the Mississippi Flyway, part of Ontario, and the eastern tier of states in the Central Flyway. Historically, the Rocky Mountains and treeless portions of the Great Plains created a discontinuity between the Interior and Pacific populations. As woody riparian corridors developed in the plains, a westward expansion by breeding wood ducks occurred throughout the Great Plains states after the 1960's (Fig. 1). Currently, northern portions of the Pacific and Interior populations are contiguous. The Pacific population ranges principally from British Columbia southward into Washington, Oregon, California, northwestern Idaho, and western Montana, but small numbers of breeding wood ducks are also present in Nevada, Utah, New Mexico, and Arizona. Wood ducks breed throughout most of their range but are at particularly high breeding densities in the Mississippi alluvial valley (Fig. 1). Wintering wood ducks use the more southern habitats throughout their range; habitats of greatest importance include California's Central Valley and the southern states of the Mississippi and Atlantic flyways (Fig. 2).

Population Status and Harvest

Traditional aerial census techniques are ineffective in forested habitats; thus, the current status of wood duck populations can only be approximated.

The average annual wood duck harvest before 1963 was <165,000 birds, but during 1980–1989, an annual average of 1,067,000 wood ducks was harvested in the United States (Frank Bellrose, personal communication). While the dramatic increase in wood duck harvest levels since the 1960's can be attributed to an overall increase in the continental wood duck population, the interactions between wood duck population

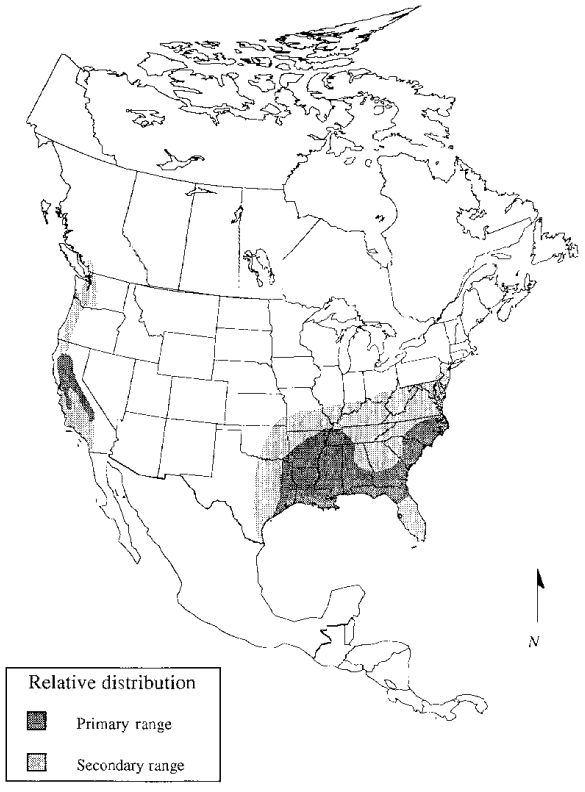

Fig. 2. Wood duck winter distribution (after Bellrose 1980).

dynamics and harvest levels is poorly understood. Current research and historic events suggest harvest regulations can have an effect on wood duck populations in some situations. For example, female wood ducks breeding in northern areas are extremely susceptible to hunting during early seasons that open before the onset of migration. In addition, northern birds are subjected to continued harvest pressure as they migrate southward to winter because waterfowl hunting seasons open in succession from north to south.

Spring Migration and Breeding

In southern regions, wood ducks breed and winter in essentially the same areas. Birds that nest farther north begin northward movements in late winter. Wood duck nests are initiated as early as late January in the South, early March in the Midwest, and mid March to early April in the North. Migrating female wood ducks lack the fat and protein reserves necessary for egg production when they arrive on the breeding grounds. Therefore, upon arrival, wood duck pairs disperse into forested and riparian habitats where females forage intensively in preparation for egg laying.

During this time, nesting pairs also begin searching for suitable cavities, primarily in tracts of forest adjacent to important waterways. Although natural cavities within 0.3 mile (0.5 km) of water and near forest canopy openings are preferred, wood ducks will nest ≥0.6 mile (1 km) from water when necessary. The availability of suitable cavities varies within the wood duck's range (Table 1) because some tree species develop cavities more readily than others. Large trees, ≥12 inches (30 cm) dbh (diameter breast height), produce the most important cavities for wood ducks. Cavities with an entrance size of ≥3.5 inches (8.9 cm), an interior basal area of ≥40 square inches (258 cm^2), and height ≥6 feet (2 m) above the ground are preferred for nesting.

Average clutch size is 12 eggs, but more than one female may contribute to a clutch (dump nest), which can result in clutches of more than 60 eggs. These huge clutches are rarely incubated, but successful dump nests of less than 30 eggs are common in nest boxes. A wood duck clutch is incubated for an average of 30 days at middle latitudes and a few days less in the South.

Female wood ducks and their broods are highly mobile. Initial movements by broods after leaving a nest can be up to 2.4 miles (4 km) but average 0.8 mile (1.3 km), mostly along waterways. Shallowly flooded habitat with good understory cover, such as shrub–scrub or emergent vegetation, is the most important habitat for wood duck broods. Duckling survival ranges from 36 to 65% with most mortality (86–91%) occurring the first week after hatching. Common duckling predators include mink, raccoon, snapping turtle, bullfrog, largemouth bass, and other large predatory fishes.

The bond between the female and her brood begins to weaken after about 4 weeks; ducklings fledge between 6 and 8 weeks. Some early-nesting

Table 1. *Nest cavity density in some North American tree species.*

Location	Species	Cavity density	
		Number/acre	Number/hectare
Southeastern Missouri	Blackgum, green ash, pumpkin ash, red maple	0.13	0.33
Illinois	Black oak, bitternut hickory, mockernut hickory, blackjack oak, red oak, American elm, hackberry	0.21	0.51
Massachusetts	Apple, ash, maple	—	—
New Brunswick	Silver maple, American elm	2.23	5.50
Indiana	American beech, American sycamore, red maple	0.50	1.23
Minnesota	Quaking aspen, American elm, sugar maple, basswood	1.70	4.20
Wisconsin	Silver maple, sugar maple, basswood, quaking aspen	0.26	0.65
Mississippi	American sycamore, American beech, blackgum, shagbark hickory, water oak, cherrybark oak	0.08	0.19
	Overcup oak, slippery elm, sugarberry	0.09	0.23

females in southern latitudes renest, successfully producing two broods before finishing the Prebasic molt (Table 2). Females begin the Prebasic molt in early spring, but it is interrupted during nesting and is not completed until late summer (Fig. 3), when the females regain their flight feathers. Conversely, males may acquire their eclipse plumage as early as mid-May. After the female begins incubation, the male wood duck begins the Prebasic molt and becomes flightless about 3 weeks later. After regaining flight (in about 22 days), the male begins the Prealternate molt and returns to Alternate plumage by late summer.

Post-breeding Dispersal and Fall Migration

After completing the Prebasic molt and before southward migration begins, adult and immature males, as well as some immature females, disperse radially from their breeding and natal areas into new habitats. At southern latitudes, this dispersal tends to be lateral, but in central and northern regions, northward dispersal is most common. In late September, wood ducks begin migrating south. During peak migration in October and November, wood duck numbers fluctuate erratically at migration stopovers where they form large roosting flocks (>100 birds). On the wintering grounds, smaller groups (<30 birds) are more common.

Behavior and Pairing

Wood ducks begin courting before fall migration. Courting activity drops off during harsh weather in winter and resumes in spring. Courtship activity is more intense in fall than in spring; courting parties are larger and displays are longer and more frequent. Wood ducks breed as yearlings, but evidence suggests that only about 40% of the surviving yearling females nest each season. Yearling females produce smaller clutches and fledge fewer young than experienced nesters. The productivity of young male wood ducks may also be low. When compared with adult drakes, yearling males do not perform courtship displays with the proper orientation and timing. Thus, early pairing by inexperienced males is unlikely.

Table 2. *Length of breeding season and frequency of double brooding in wood ducks.*

Location	Mean length of breeding season (days)	Captured females (*n*)	Double-brooding females (%)	Mean interval between clutches (days)
Alabama	159	231	9.2	37
South Carolina	157	275	7.6	47
California	134	1,540	3.6	26 ± 1.7
Missouri	132	924	2.2	33 ± 1.8
Massachusetts	95	—	—	—

Foraging Ecology

Food habits of adult wood ducks are sex related and seasonally driven (Fig. 4). During winter, nearly 100% of the diet of wood ducks consists of plant foods, of which 75% may be acorns. An increase in animal foods in the diet (to about 35%) occurs in both sexes in early spring. This percentage remains constant for the male wood duck through summer and fall while undergoing the Prebasic and Prealternate molts, but increases to about 80% for the female during egg laying. Female wood ducks increase the amount of invertebrates in the diet to meet daily protein needs during egg laying. After egg-laying, animal foods compose less of the female's diet, while consumption of high-energy seeds increases to meet the daily dietary requirements of incubation (Fig. 4).

Wood ducks consume a variety of plant and animal foods (see Appendix), typically by pecking or dabbling at foods on the surface. Subsurface and bottom feeding are rare. Therefore, shallow depths are important to make food available to foraging wood ducks. Because wood ducks feed mainly on the surface or at the edge of wetlands, nonaquatic and aquatic-associated invertebrates make up a large percentage of the invertebrates consumed. Live-forest and emergent vegetation are common wood duck foraging habitats. Wood ducks do not forage readily in agricultural fields unless shallowly flooded, live-forest habitats are not available.

Habitat Management

The wood duck carries out its entire annual cycle within a forested wetland complex, including a mixture of habitats such as live forest, greentree

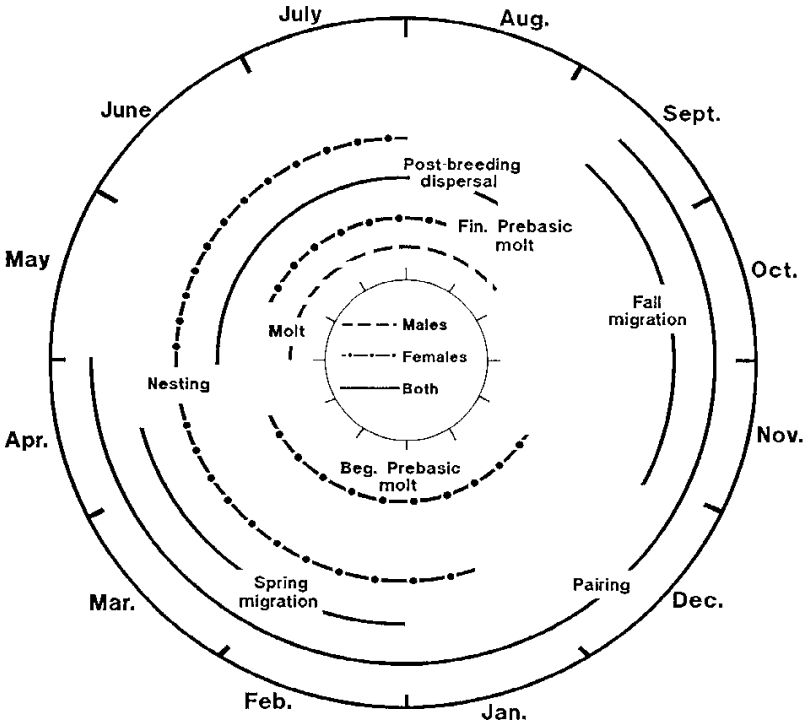

Fig. 3. The chronology of important life history events in the annual cycle of the wood duck.

reservoirs, rivers, oxbows, riparian corridors, beaver ponds, shrub–scrub, and robust emergent vegetation. Such habitats have been destroyed or modified across the continent. For example, only 17% of the original forest acreage remains in the Mississippi alluvial valley today. In addition, certain management practices have detrimental effects on tree vigor and mast production. Flooding before fall senescence or beyond dormancy into the growing season reduces mast production, causes tree damage, and may eventually kill trees. Improper flooding regimes change tree species composition in a stand from desirable oak species that produce small acorns, easily eaten by waterfowl, to the more water-tolerant overcup oak, which produces very large acorns that are unsuitable for waterfowl food. Water depths ≤8 inches (20 cm) are ideal for foraging wood ducks, while loafing and roosting sites can be maintained where water levels are higher.

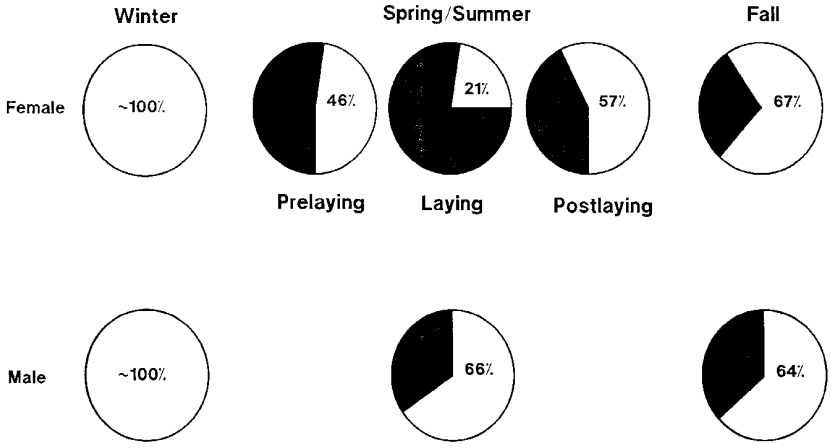

Fig. 4. Proportion of plant (open) and animal (dark) foods consumed by wood ducks throughout their annual cycle.

Timber management within greentree reservoirs and naturally flooded forests is an important component of habitat management for wood ducks. Most timber harvest practices remove large, overmature trees, the primary source of wood duck nest cavities. Although selective thinning within a stand promotes regeneration of desirable shade-intolerant red oak species, some large and overmature trees should be preserved as potential wood duck nest sites. In addition, a mix of species within a stand should be encouraged because desirable mast species may not form cavities. Elm and maple are important components of most wood duck habitat because they provide protein-rich samaras in spring and suitable nest cavities (Table 1).

Nest boxes are a useful management tool where natural cavities are scarce but good brood habitat is available. Currently, nest box management may contribute approximately 150,000 juvenile wood ducks to fall flights in the Mississippi and Atlantic flyways. Although this constitutes only a small portion of the juvenile component in the eastern fall flight, nest boxes, when properly erected and maintained, can substantially increase local populations.

Wood ducks will readily nest in boxes constructed of wood, metal, or plastic. Rough-cut cypress boxes are durable, economical, and blend well with the environment within a few years. Although plastic and metal boxes are durable, internal temperatures of boxes placed in the direct sun in the South are high enough to kill developing embryos.

Whatever the construction material, boxes must be predator-proof. Inverted conical shields or smooth, wide pieces of metal wrapped around the pole or tree beneath a box can keep raccoons and some snakes from entering boxes. Predation can also be discouraged by placing boxes on poles over water or by mounting boxes on bent metal brackets that suspend them 2 feet (0.6 m) from a tree or post.

Annual maintenance and repair of boxes is necessary for continued use by wood ducks. Boxes with unsuccessful nests are unavailable for use until debris from the nest is removed. The frequency of box checks necessary for maintenance depends on climatic conditions and the types of use boxes receive during winter (e.g., screech-owl roosts, squirrel or raccoon dens).

Number and placement patterns of nest boxes within habitats influence box use, nest success, and dump-nesting rates. When box management began 50 years ago, some local wood duck populations were small, and box use was higher when boxes were placed in highly visible, clumped arrangements rather than as widely spaced single units. As wood duck populations grew, high dump-nesting rates, nesting interference, and overall decreases in production occurred. In some situations, single, well-spaced boxes may decrease dump-nesting and nesting interference; however, in prime wood duck breeding habitats hidden boxes simply require more effort to maintain. Boxes acceptable to nesting wood ducks must also be accessible to managers for maintenance and data collection. Although wood duck boxes can increase local production, the preservation of bottomland hardwoods and proper water and timber management in these habitats are paramount to the continued success of continental wood duck populations.

Summary

Although current wood duck populations are stable, continued preservation and proper management of bottomland hardwood and riparian forest resources are imperative. Wood duck population estimates are inaccurate; hence, managers have little knowledge about population cycles or the effect of increased hunting pressure on the continental population. Moreover, protecting North America's remaining forest resources in the face of increasing agricultural and commercial development remains difficult. In particular, forest resources in the lower Mississippi alluvial valley must be carefully preserved and managed to continue providing wintering habitat for a large percentage of the continental wood duck and mallard populations.

At the local level, wood duck populations can be boosted by production from nest boxes, but more information is needed on the density-dependent effects of box placement on nesting interference. Nest box maintenance can be expensive and time consuming. Thus, management for natural cavities should be encouraged. Flooding of greentree reservoirs should simulate natural hydrology and reflect wood duck water depth needs. Remaining forested habitats should be protected and maintained in the best possible condition to sustain larger numbers of birds throughout their annual cycle as high quality habitat continues to disappear.

Suggested Reading

Bellrose, F. C. 1980. Ducks, geese and swans of North America. Third ed. Stackpole Books, Harrisburg, Penn. 540 pp.

Delnicke, D., and K. J. Reinecke. 1986. Mid-winter food use and body weights of mallards and wood ducks in Mississippi. Journal of Wildlife Management 50:43–51.

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Grice, D., and J. P. Rogers. 1965. The wood duck in Massachusetts. Massachusetts Division of Fish and Game, Final Report Federal Aid in Wildlife Restoration Project W-19-R. 96 pp.

Trefethen, J. B., editor. 1966. Wood duck management and research: a symposium. Wildlife Management Institute, Washington, D.C. 212 pp.

Appendix. Common and Scientific Names of Plants and Animals Named in Text.

Plants

Red maple	*Acer rubrum*
Silver maple	*Acer saccharinum*
Sugar maple	*Acer saccharum*
*Maple	*Acer* spp.
*Asiatic dayflower	*Aneilema keisak*
*Beggarticks	*Bidens* spp.
*Watershield	*Brassenia schreberi*
Bitternut hickory	*Carya cordiformis*
Shagbark hickory	*Carya ovata*
Mockernut hickory	*Carya tomentosa*
Sugarberry	*Celtis laevigata*
Hackberry	*Celtis occidentalis*
*Buttonbush	*Cephalanthus occidentalis*
*Barnyard grass	*Echinochloa crusgalli*
*Barnyard grass	*Echinochloa muricata*
American beech	*Fagus grandifolia*
Green ash	*Fraxinus pennsylvanica*
*Ash	*Fraxinus* spp.
Pumpkin ash	*Fraxinus tomentosa*
*Soybeans	*Glycine max*
*St. John's-wort	*Hypericum walteri*
*Rice cutgrass	*Leersia oryzoides*
*Sweetgum	*Liquidambar stryraciflua*
*Primrose willow	*Ludwigia leptocarpa*
*Water milfoil	*Myriophyllum pinnatum*
*White waterlily	*Nymphaea odorata*
Blackgum	*Nyssa sylvatica*
*Panic grasses	*Panicum* spp.
*Floating paspalum	*Paspalum fruitans*
American sycamore	*Platanus occidentalis*
*Smartweeds	*Polygonum* spp.
Quaking aspen	*Populus tremuloides*
*Pondweeds	*Potamogeton* spp.
Apple	*Pyrus malus*
Cherrybark oak	*Quercus falcata*
Overcup oak	*Quercus lyrata*
Blackjack oak	*Quercus marilandica*
*Water oak	*Quercus nigra*
*Nuttall oak	*Quercus nuttallii*
*Pin oak	*Quercus palustris*
*Willow oak	*Quercus phellos*
Red oak	*Quercus rubra*
*Post oak	*Quercus stellata*
Oak	*Quercus* spp.

Black oak	*Quercus velutina*
*Blackberry	*Rubus cuneifolius*
*Sassafras	*Sassafras albidum*
*Slough grass	*Sclera reticularis*
*Big duckweed	*Spirodela polyrrhiza*
*Baldcypress	*Taxodium distichum*
Basswood	*Tilia americana*
American elm	*Ulmus americana*
Slippery elm	*Ulmus rubra*
Elm	*Ulmus* spp.
Black haw	*Viburnum prunifolium*
Grapes	*Vitus* spp.

Vertebrates

Wood duck	*Aix sponsa*
Mallard	*Anas platyrhynchos*
Snapping turtle	*Chelydra serpentina*
Largemouth bass	*Micropterus salmoides*
Mink	*Mustela vison*
Screech-owl	*Otus* spp.
Raccoon	*Procyon lotor*
Bullfrog	*Rana catesbeiana*

Invertebrate taxa

*Spiders	Araneida
*Crayfish	Astacidae
*Midges	Chironomidae
*Water boatmen	Corixidae
*Scuds	*Gammarus* sp.
*Whirligig beetles	Gyrinidae
*Sowbugs	Isopoda
*Back swimmers	Notonectidae
*Damselflies	Odonata
*Dragonflies	Odonata
*Orb snails	*Planorbis* sp.
*Caddis flies	Trichoptera

*Common wood duck foods.

Note: Use of trade names does not imply U.S. Government endorsement of commercial products.

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