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EXPANSION OF THE BREEDING RANGE OF THE BUFFLEHEAD IN CALIFORNIA

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Historically, the Bufflehead (*Bucephala albeola*) has maintained a small, isolated breeding population in extreme northeastern California, restricted to parts of Butte, Lassen, Modoc, Plumas, Shasta, and Tehama counties (Figure 1, inset). Prior to 1996, there were no known breeding records from California south of Lake Almanor, Plumas County (San Miguel 1998). However, the Bufflehead occasionally breeds outside of its principal range, and extralimital records to the south have been recorded recently in Colorado (Ringelman and Kehmeier 1990), Minnesota (Mattsson 1986), South Dakota (Whitt 1999), and California (San Miguel 1998, Patten et al. 2003). San Miguel (1998) described three cases of extralimital breeding in California from 1996, and Patten et al. (2003) reported a brood found on the Salton Sea in 1999. These successful breeding efforts were discovered in a variety of habitats in Inyo, Los Angeles, Riverside, and Tuolumne counties, up to 850 km south of the species' traditional breeding range (San Miguel 1998).

Whereas the 1996 records from Los Angeles and Inyo counties and the 1999 record from Riverside County were truly extralimital, the Tuolumne record may represent expansion of the breeding range. In 2002, there appeared to be a "Bufflehead explosion" in the Sierra Nevada, with nine breeding records reported from Alpine, El Dorado, Sierra, and southern Plumas counties. The Bufflehead continued to breed at several sites revisited in 2003, and four new breeding locales were discovered that year. Further inquiry revealed an additional breeding record for 2001. All but three of the sightings were made by multiple observers and/or me.

The sudden expansion of the Bufflehead's range in California was made apparent in 2002 by the posting of many breeding records on the Sierra Nevada birding list-server (<http://groups.yahoo.com/group/sierra-nevadabirds/>). In the fall of 2002, I posted a general request for breeding records and contacted those who had already posted their observations for details. During 2003, I queried as many birders and biologists frequenting the central Sierra as possible, regarding nesting Buffleheads. Since 2001 I have compiled 17 records of Bufflehead broods south of Lake Almanor, and thus outside of the Bufflehead's known breeding range (Table 1). These records, including one of a site with multiple breeding pairs and two of sites with multiple years of consecutive breeding, suggest a true expansion of the breeding range.

The records form loose clusters of breeding in the southern Lake Tahoe basin, Gold Lake/Lakes Basin area north of Bassetts, and the Hennes Pass area between Bassetts and Truckee (Figure 1). Because no systematic censusing was performed, however, these aggregations probably represent a bias in concentration of birder and biologist effort. Several of these sites consist of atypical habitat, including a rock quarry, a sandy beach hundreds of meters from the nearest tree, and river oxbows adjacent to open meadows. Most sites, however, are well-wooded alpine lakes, more typical of the species' preferred breeding habitat. In none of these cases was the actual nest cavity discovered. Note also that these broods were often found unattended by adults (Table 1) and might easily have been overlooked were it not for astute observers.

The Bufflehead's prospective range expansion in California does not fit the normal pattern for this type of phenomenon. Given the trend toward warmer temperatures (i.e., global climate change), most species' distributions might be expected to shift northward in latitude or upward in elevation. This pattern has already been demon-

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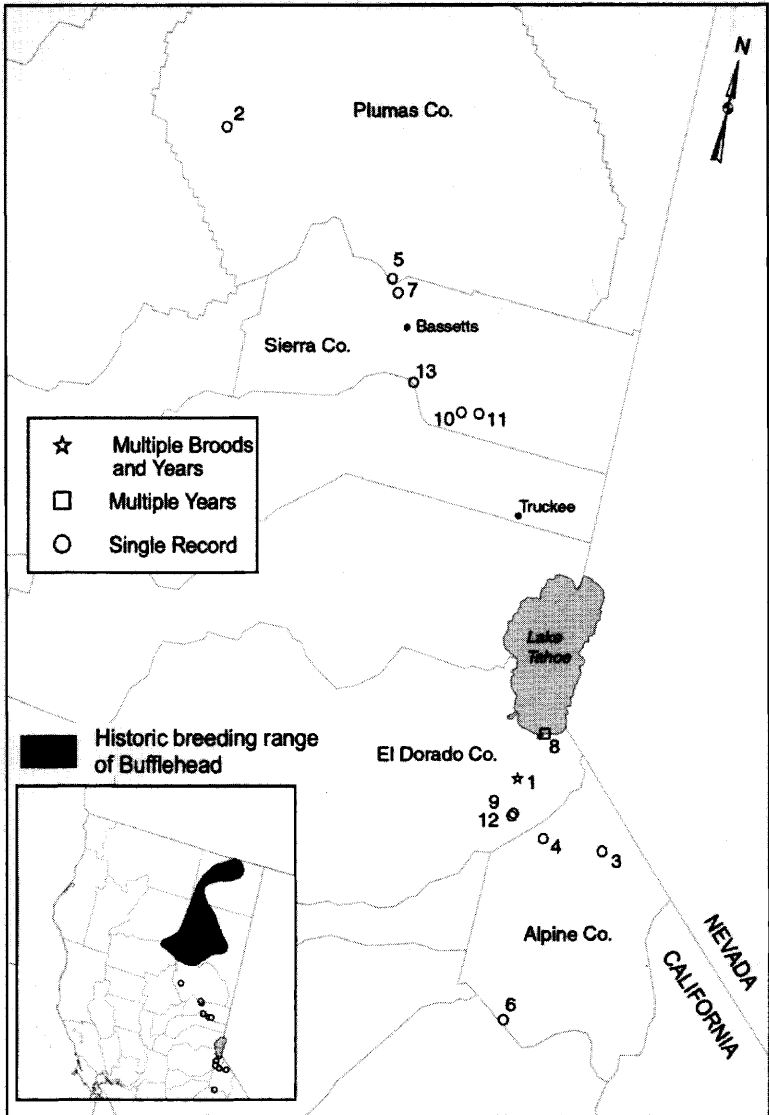


Figure 1. Bufflehead broods found south of Lake Almanor, Plumas County, California, 2001–2003. See Table 1 for description of records. Inset: distribution of current records relative to historic breeding range.

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Table 1 Bufflehead Broods Found South of Lake Almanor, Plumas County, California, 2001–2003

Date ^a	County	Lake	Elevation (m) ^b	No. Chicks ^a	No. Adults ^a	Location No. ^c
2001						
27 June	El Dorado	Osgood Swamp	1999	7	1	1
2002						
18 June	El Dorado	Osgood Swamp	1999	8	1	1
22 June	Plumas	Thomson Lake	1679	7	1	2
22 June	Alpine	Indian Creek Res.	1707	11	1	3
23 June	Alpine	unnamed pond	2167	7	1	4
26 June	Plumas	unnamed pond	1977	7	1	5
5 July	Alpine	Sword Lake	2091	4	4	6
13 July	Sierra	unnamed pond	2012	9	1	7
15 July	El Dorado	Lake Tahoe	1905	2	2	8
19 July	El Dorado	unnamed pond	2219	4	0	9
2003						
15 June	El Dorado	Osgood Swamp ^d	1999	6	5	1
15 June	El Dorado	Osgood Swamp ^d	1999	7	5	1
5 July	Sierra	Webber Lake	2073	7	0	10
6 July	Sierra	Little Truckee R.	1984	8	0	11
7 July	El Dorado	Elbert Lake	2304	10	2	12
9 July	El Dorado	Lake Tahoe	1905	9	0	8
16 July	Sierra	unnamed quarry	1841	7	1	13

^aInitial observation.^bMean elevation = 1992 ± 161 m.^cSee Figure 1.^dTwo breeding pairs in 2003.

strated for several diverse avian taxa (Thomas and Lennon 1999, Root et al. 2003). There may be several reasons for this primarily boreal species to be expanding its range to the south. One explanation may be an increase in habitat availability. Spring is coming earlier in the west, as demonstrated by earlier pulses of spring run-off (Cayan et al. 2001). This temporal shift should translate into earlier break-up of ice on alpine lakes. It is possible that habitats now exploited by the Bufflehead in the Sierra Nevada have always been suitable in terms of food and cavity availability but were previously unavailable because of lingering ice. The Bufflehead has demonstrated an ability to adjust its breeding schedule at a site up to two weeks according to spring temperatures and the consequent timing of spring thaw (Savard et al. 1991, Gauthier 1993). Furthermore, earliest hatch dates are a full month earlier in California than in Alaska (Erskine 1972), underscoring the phenological plasticity of the species as a whole. However, the Bufflehead is highly unlikely to “short-stop,” that is, to halt migration prematurely to breed at southern locations because of abnormally favorable conditions, as do many species of dabbling duck, such as the Blue-winged Teal, *Anas discors* (Bellrose 1976: 277). Because of fairly strict nest-site requirements, most cavity-nesting ducks demonstrate strong philopatry, and the Bufflehead is no exception (Erskine 1961, 1972, Gauthier 1993).

Perhaps there has been an increase in available cavities. Aging forests in the Sierra Nevada are becoming more decadent. A combination of periodic drought, beetle infestations (by *Dendroctonus*, *Ips*, *Scolytus*, and others), and a shift in United States

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Forest Service policy on snag removal has resulted in a substantial increase of standing dead trees since the middle of the last century. This increase may have led to an increase in available Northern Flicker (*Colaptes auratus*) cavities, the Bufflehead's preferred nest site. Curiously, Breeding Bird Survey data from 1966 to 2002 suggest that flickers may have been declining across the Sierra Nevada during that time (trend = -0.82 , $p = 0.36$, 27 routes; Sauer et al. 2003). The Bufflehead uses nest-boxes regularly (Gauthier 1988), and the species appears to be benefiting from the nest-box programs initiated in northern California within its historic range (T. Rickman pers. comm.). Most of the 13 sites I report are far from nest-box programs, and in many cases the ponds are surrounded by an abundance of snags with seemingly suitable cavities. The Bufflehead is likely benefiting from a complement of available cavities.

The expansion may be the result of an increase in population in the core of the species' range. Bufflehead numbers have increased across North America since the mid-1950s (Gauthier 1993), and there is evidence that the Bufflehead's density in northeastern California has increased since the 1980s (T. Rickman pers. comm.). It is possible that these newly exploited sites have always been suitable and available, but now Bufflehead populations have reached a point where second-year females prospecting for nest sites must go farther afield as a result of competition, both inter- and intraspecific, for these sites. Savard et al. (1991) found that mortality of Bufflehead ducklings was higher on ponds with several broods than on ponds with single broods, implying density-dependent mortality. Other cavity-nesting ducks appear to be increasing in northern California as well, including the Hooded Merganser, *Lophodytes cucullatus* (Stallcup 2002) and Wood Duck, *Aix sponsa* (Sauer et al. 2003; T. Rickman pers. comm.). The proliferation of these two species almost certainly has been the result of the installation of Wood Duck boxes at wetlands throughout California (Stallcup 2002). The California Waterfowl Association reported that it has placed over 5400 nest boxes in the state since 1991, producing approximately 30,000 Wood Duck nestlings annually (1999; www.calwaterfowl.org/Woodduck.htm; accessed 7 June 2004).

In recent years in eastern Plumas County (Eagle Lake Ranger District), Wood Ducks have been producing more eggs than Buffleheads have, in nest boxes that as recently as the 1980s were used only by the Bufflehead (T. Rickman, pers. comm.). If Wood Ducks or Hooded Mergansers are competing with Buffleheads for nest boxes, it is likely that the smaller Bufflehead might be forced to look elsewhere for suitable cavities.

The expansion of the Bufflehead in California is likely the result of a combination of factors including, but not limited to, those relating to both habitat and nest-site availability south of its historic range and population growth within the historic range. Unfortunately, there are few data that could support any of the hypotheses. Only time will tell whether this incursion is temporary or long-term. A coordinated monitoring effort, coupled with detailed habitat assessments of breeding ponds and nest cavities, would help resolve these questions. During 2004, while this article was in review, I learned of a few instances of continued breeding. Osgood Swamp has seen its fourth consecutive year of Bufflehead breeding, and a few other sites have demonstrated repeated breeding effort as well. Thus, through 2004, the expanded range appears stable at least as far south as the Tahoe Basin.

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