

A CHANGE IN WATERFOWL SPECIES COMPOSITION IN THE HONEY LAKE VALLEY, CALIFORNIA

ELLIOTT L. MATCHETT¹ AND JAMES S. SEDINGER

Department of Natural Resources and Environmental Science

Mail Stop 186, University of Nevada, Reno

1000 Valley Road

Reno, NV 89512, USA

e-mail: elmatchett@gmail.com

INTRODUCTION

Evidence suggests that species composition of ducks may be changing in some waterfowl breeding areas (U.S. Fish and Wildlife Service 2005²), including that of the western margin of the Great Basin (Hunt and Naylor 1955, Rienecker and Anderson 1960, Jarvis and Harris 1971, Clark 1977³, Bogiatto 1998). In particular, across the western Great Basin, the proportion of gadwall, *Anas strepera*, may be increasing relative to other species of ducks. Before 1980, abundance (breeding pairs and/or number of nests) of mallards, *A. platyrhynchos*, in the Great Basin was similar to (Rienecker and Anderson 1960) or greater than (Hunt and Naylor 1955, Jarvis and Harris 1971, Clark 1977³) that of gadwall. At least one study, however, suggests that gadwall abundance may greatly exceed that of the mallards in recent years (Bogiatto 1998).

Shift in the composition of waterfowl species that breed in the western Great Basin is a function of differences among species in population birth and death rates, and/or immigration/emigration rates. Limitations in suitable duck breeding habitat resulting from human land-use practices may cause less competitive or less adaptable duck species to forego nesting. Alternatively, some species may nest in human modified landscapes where reproductive success is insufficient to maintain the population (e.g., Richkus 2002⁴). Such phenomena may explain declines in northern pintail, *A. acuta*, (hereafter pintail) and scaup spp. (*Aythya affinis* and *A. marila* combined) since the mid-1900s, or increases in gadwall and northern shoveler, *Anas clypeata*, since about 1990 (U.S. Fish and Wildlife Service 2005²).

We documented the species composition of nesting ducks in 2002 and 2003 in the Honey Lake Valley, California, to supplement our understanding of the breeding

¹Current address: P.O. Box 4215, Davis, CA 95617

²U.S. Fish and Wildlife Service. 2005. Waterfowl population status, 2005. U.S. Department of the Interior, Washington, D.C. USA.

³Clark, J. P. 1977. Effects of experimental management schemes on production and nesting ecology of ducks at Malheur National Wildlife Refuge. Thesis, Oregon State University, Corvallis, Oregon, USA.

⁴Richkus, K. D. 2002. Northern pintail nest site selection, nest success, renesting ecology, and survival in the intensively farmed prairies of southern Saskatchewan: an evaluation of the ecological trap hypothesis. Dissertation, Louisiana State University and Agricultural and Mechanical College, Baton Rouge, Louisiana, USA.

waterfowl community in the Great Basin, to assess changes in waterfowl species composition since 1980. To do so, we compared our current findings with past abundance of breeding ducks documented by Hunt and Naylor (1955). Our study provides evidence that the composition of breeding ducks in the western Great Basin has changed since the 1950s.

STUDY AREA

Honey Lake Valley is located in Lassen County, northeastern California in the western Great Basin Desert at an elevation of about 1200 m (Fig 1). Average minimum and maximum temperatures (°C) between 1 April and 31 July were 5.08 and 24.75 in 2002, and 5.14 and 24.11 in 2003 (University of California 2007). Annual precipitation was 13.56 centimeters (cm) in 2002 and 17.78 cm in 2003 (P. Cherny, California Department of Fish and Game, unpublished data), which was lower than the average annual precipitation (23 cm). The Great Basin Desert plant community in northeastern California includes sagebrush steppe (Hickman and Roberts 1993), which is the predominant natural vegetation of the Honey Lake Valley (Fig 1). Vegetation and habitats at Honey Lake are representative of other waterfowl management areas in the western Great Basin (Rienecker and Anderson 1960, Jarvis and Harris 1971, Clark 1977³). Dominant plant species in the valley include: sagebrush, *Artemisia tridentata*; greasewood, *Sarcobatus vermiculatus*; rabbitbrush, *Chrysothamnus* spp.; saltgrass, *Distichlis spicata*; wild rye, *Lemus triticoides* and *L. cinereus*; tall wheat grass, *Elytrigia elongata*; cheat grass, *Bromus tectorum*; five-hook bassia, *Bassia hyssopifolia*; broad-leaved cattail, *Typha latifolia*; alkali bulrush, *Scirpus maritimus*; tule, *S. acutus*; and Baltic rush, *Juncus balticus*. Land use at Honey Lake includes pastures, croplands, uplands, islands, and managed wetlands. Field research was conducted at Jay Dow, Sr. Wetlands (JDW), University of Nevada, Reno and Dakin Unit (DU), Honey Lake State Wildlife Area (HLSWA), California Department of Fish and Game. DU (40°18'N, 120°21'W) is 1,728 ha and JDW (40°10'N, 120°13'W) is 540 ha (see Matchett 2005⁵ for more detailed information).

METHODS

We did not search the same locations for nests as Hunt and Naylor (1955) on the Fleming Unit, HLSWA, and on private land because this research was supplemental to another study. Additionally, we did not search Fleming Unit because nesting habitat was limited on the Fleming Unit during our study due to refuge reconstruction activities. Despite our inability to replicate sites used by Hunt and Naylor, we searched many of the same habitats that were searched by Hunt and Naylor (1955) with the exception of “Dike or Ditchbank”. To account for differences in study design that may influence species composition of nesting ducks, we evaluated relative abundance of species with

⁵Matchett, E. L. 2005. Nesting ecology of waterfowl in a western Great Basin ecosystem. Thesis, University of Nevada Reno, Reno, Nevada, USA.

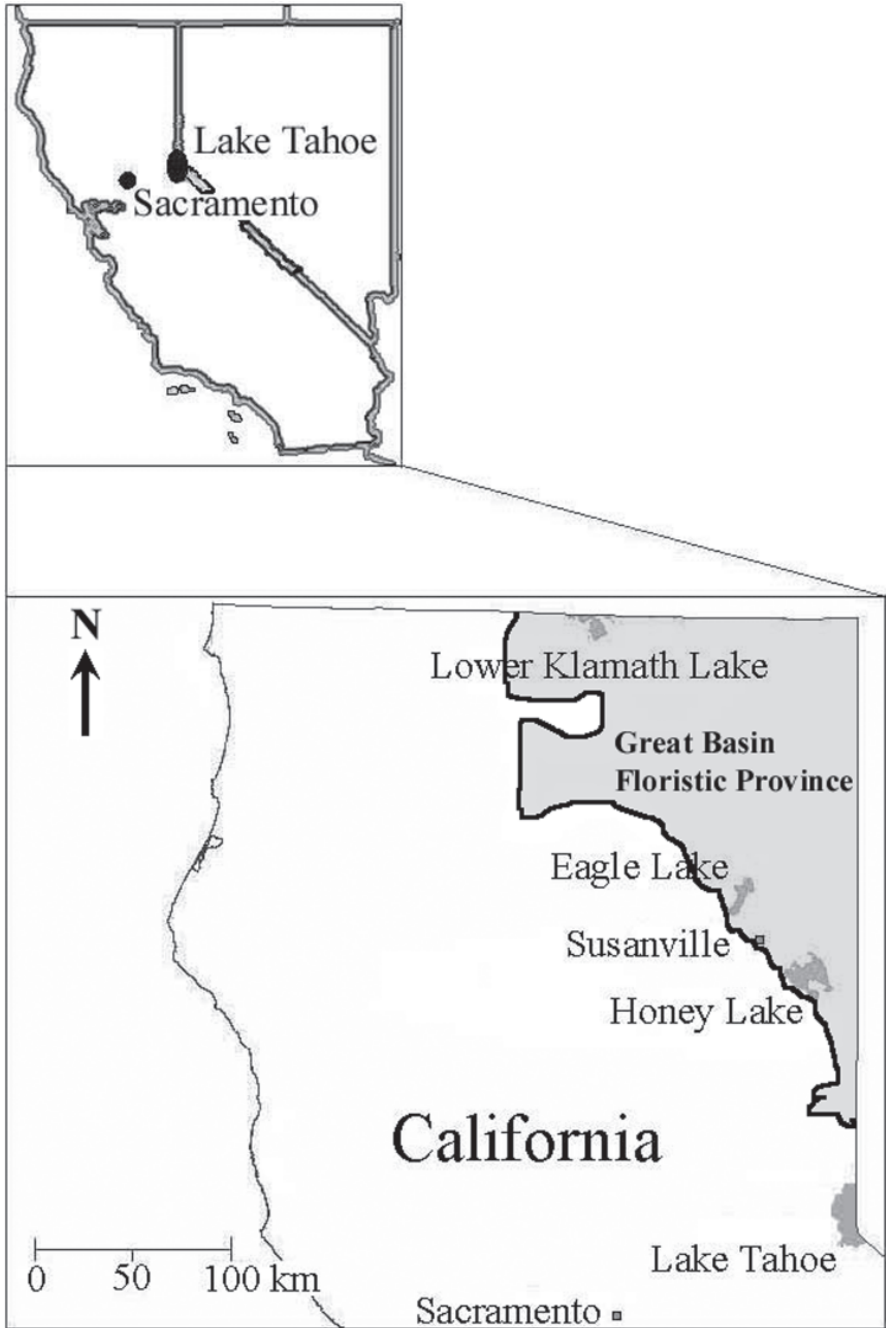


Fig. 1. Location of Honey Lake in northern California, USA. The shaded region delineates the Great Basin Floristic Province in northern California (Hickman and Roberts 1993).

respect to habitat, which we compared with Hunt and Naylor (1955). We estimated relative abundance (i.e., proportion of the total count represented by each species) for 1951 and 1953 using total number of duck nests and proportions of species among habitats and years (Tables 1, 3, and 4 of Hunt and Naylor 1955). Across our two study sites, we searched marsh, islands, and uncultivated land. Marsh habitat largely consisted of pond margins. Agricultural land included irrigated, grazed pastures, whereas Hunt and Naylor also searched cereal crops. Uncultivated land included uplands planted with bunchgrass, plots cleared of most shrubs and left idle, and shrubs. Each year we searched a combined area of ca. 173 ha across both sites. We searched 7 plots of marsh with a combined area of 7 hectares, 7 plots of agricultural land with a combined area of 36 hectares, 15 plots of uncultivated land with a combined area of 130 hectares, and 52 islands ranging in size between 13 and 1321 m². We began searching for nests in early May and stopped monitoring nests in late July 2002, and early August 2003, when fates of all nests were determined. We searched habitat for duck nests starting at 0700-1000 and ending at 1800-2000, so that sufficiently large areas could be sampled on foot. Our method for finding nests was similar to that described in Hunt and Naylor (1955). Except for islands, we searched areas by walking plots and flushing hens off nests using a 20-meter long hand-drag rope with attached cans containing stones. Upon finding active nests, we recorded duck species, based on hen identification, egg size and coloration, and breast feathers found in the nest bowl (Klett et al. 1986).

Additionally, we counted individuals of every duck species visible in wetlands at JDW from a vehicle, weekly, beginning at 0700. Surveys were conducted between 25 April and 28 June in 2002 and 17 May and 26 June in 2003. We calculated relative abundance of each species as the mean $\pm$ SE proportion of the total count represented by each species between beginning and ending dates surveys were performed.

RESULTS AND DISCUSSION

Our results based on nesting data indicated that relative abundance of breeding ducks differed strongly between Hunt's and Naylor's (1955) study at Honey Lake and this study. In their study (data recorded for 1951 and 1953), primary species of nesting ducks were 36% mallard, 23% cinnamon teal, 18% pintail, and 6% gadwall. In our study, species composition was 56% gadwall, 17% mallard, 12% cinnamon teal, *A. cyanoptera*, and 7% pintail. These differences might have been influenced by our study having a later beginning nest searching date than the former study and, therefore, possibly causing a disproportionate number of pintail and mallard nests to be missed. The pattern of nest initiation dates for mallards (Fig. 1), however, suggests that we missed relatively few mallard or pintail nests. This explanation cannot, therefore, account for the relatively lower proportion of mallard and pintail nests compared to gadwall nests that we found during the modal period of the mallard nesting season (25 May) in our study. Nor does it account for gadwall nests outnumbering cinnamon teal nests, both of which were sampled over most of the extent of the season that they nested. Difference in habitats searched and climatic differences between the two studies may partially explain differences in duck species composition. Hunt and Naylor (1955) likely

searched a much larger proportion of emergent wetland vegetation and their study year of 1953 was a wet year (Hunt and Naylor 1955). Though, in considering in our analysis differences between studies in habitats that were searched, species composition within habitats differed between studies (Tables 1 and 2). In Hunt and Naylor (1955), gadwall was among the least abundant of dominant species nesting in habitats. In their study, mallard, pintail, and cinnamon teal nests were substantially more abundant than gadwall nests in “marsh” habitat, especially in 1953 when wetland vegetation was denser (Table 1). Contrastingly, in our study gadwall nests were more abundant than other dominant species across all habitat-year combinations (including “marsh” and “wetland vegetation” sites), but two (Tables 1 and 2). Moreover in our study, gadwall nests were 3 to 20 times more abundant in “uncultivated land”, 4 to > 9 times more abundant in sites dominated by forbs, and 1.4 to 9 times more abundant in tall grasses than other ducks (Tables 1 and 2). For habitats where gadwall were not the dominant species, there were 1.8% more mallard than gadwall nests on islands in 2002 and mallard, cinnamon teal, and gadwall nests were equally abundant in agriculture (i.e., pastures) in 2003 (Table 1). Though, both 2002 and 2003 were relatively dry years, the small increase in precipitation in 2003 relative to 2002 appeared to have little effect on species composition within habitats (Tables 1 and 2). We suspect that an even greater increase in precipitation would not reduce gadwall abundance below abundances of other species for most habitats. These results suggest that unrelated to study design nesting gadwall have increased over time across habitats that were similar between studies.

In 2002, gadwall represented $43 \pm 2\%$ of breeding ducks counted on ground surveys, followed by mallards and cinnamon teal ($14 \pm 1\%$ each), and northern pintails ($7 \pm <1\%$). Proportions of each species were similar in 2003: $42 \pm 1\%$ gadwall, $19 \pm 2\%$ mallards, $14 \pm 1\%$ cinnamon teal, and $10 \pm 1\%$ northern pintails. Overall, survey data were generally consistent with our nesting data. In contrast, breeding pair surveys in Honey Lake Valley in 1951-53 (Hunt and Naylor 1955) indicated that numbers of pairs of gadwall in the area were lower than pairs of mallards, but greater than northern pintails or cinnamon teal in all 3 years. Thus, in the 1950s, there was some disagreement between surveys and species composition of nests found.

Comparison of our study with that of Hunt and Naylor (1955) clearly indicates that gadwall increased relative to other ducks in the Honey Lake Valley between the 1950s and the present. It is possible that over time, changes in water management during the waterfowl breeding season have affected the production of wetland vegetation, and consequently, mallard and cinnamon teal abundance in the region. Even so, we found far more gadwall nests ($n=106$) than did Hunt and Naylor ($n=31$), despite having found fewer total nests. Thus, the relative increase in nesting gadwall at Honey Lake may be related to a locally increasing gadwall population as well as decreasing populations of other species. This pattern is generally consistent with dynamics at the continental scale (U. S. Fish and Wildlife Service 2005²). In addition to gadwall having increased continentally, gadwall abundance has remained greater than the long-term average across most of its range in recent years (U. S. Fish and Wildlife Service 2005²). The generally lower contribution of northern pintails to the current duck breeding community in the Honey lake Valley, relative to the 1950s, is also consistent with patterns occurring

at the continental scale (U. S. Fish and Wildlife Service 2005²). Mallard and cinnamon teal abundances may be influenced by changes in water management and habitat at Honey Lake in addition to factors (e.g., habitat loss) at larger spatial scales.

Table 1. Relative abundance of duck nests of four dominant species (percentage of each species relative to the total duck population) among type of nest location during 1951 (n= 202 nests), 1953 (n= 359 nests), 2002 (n= 107 nests), and 2003 (n= 83 nests). We estimated relative abundance for 1951 and 1953 using data in Hunt and Naylor (1955) and for 2002 and 2003 using data from active nests in the present study.

Nest location by study-year	Mallard	Northern pintail	Cinnamon teal	Gadwall
Island				
1951	0.5	1.0	1.0	0.0
1953	0.0	0.0	0.0	0.0
2002	12.1	3.7	3.7	10.3
2003	4.7	5.6	0.9	7.5
Marsh				
1951	7.4	1.0	1.0	0.0
1953	25.0	5.6	31.2	0.8
2002	0.0	0.0	0.9	4.7
2003	0.0	0.0	2.8	3.7
Uncultivated land				
1951	5.9	4.9	2.0	2.5
1953	6.1	5.0	2.8	2.5
2002	6.5	0.9	9.3	29.9
2003	1.9	4.7	1.9	38.3
Agriculture				
1951	5.0	9.4	0.5	2.5
1953	11.2	0.8	0.3	0.0
2002	0.9	0.9	0.0	3.7
2003	0.9	0.0	0.9	0.9

Table 2. Relative abundance of duck nests of four dominant species (percentage of each species relative to the total duck population) among type of nest cover during 1951 (n= 202 nests), 1953 (n= 359 nests), 2002 (n= 107 nests), and 2003 (n= 83 nests). Relative abundance for 1951 and 1953 was estimated using data in Hunt and Naylor (1955) and for 2002 and 2003 from data on active nests.

Nest cover by study-year ^a	Mallard	Northern pintail	Cinnamon teal	Gadwall
BRHB/wetland vegetation				
1951	9.4	3.4	1.0	0.5
1953	26.7	8.6	33.7	2.5
2002	0.0	0.0	0.0	2.8
2003	0.0	0.0	0.0	2.4
“Sagebrush-rye”/shrubs				
1951	2.4	1.0	0.5	0.0
1953	3.3	1.9	0.3	0.8
2002	0.9	0.0	2.8	3.7
2003	1.2	0.0	0.0	15.7
“Bassia”/upland forbs				
1951	8.0	4.0	0.5	2.0
1953	3.1	1.7	0.0	0.0
2002	0.0	0.0	0.9	9.3
2003	2.4	0.0	1.2	9.6
“Rye”/tall grasses				
1951	7.4	7.4	6.0	3.4
1953	3.1	0.8	0.0	0.3
2002	17.8	5.6	7.5	25.2
2003	6.0	6.0	3.6	32.5
Saltgrass/short grasses				
1951	1.0	3.0	2.0	0.5
1953	1.1	0.0	0.6	0.0
2002	0.9	0.0	2.8	7.5
2003	3.6	3.6	3.6	4.8

^aNest cover was classified similarly for 2002 and 2003 (after forward slash) as 1951 and 1953 from Hunt and Naylor (1955). BRHB is an abbreviation for Baltic rush and hardstem bulrush.

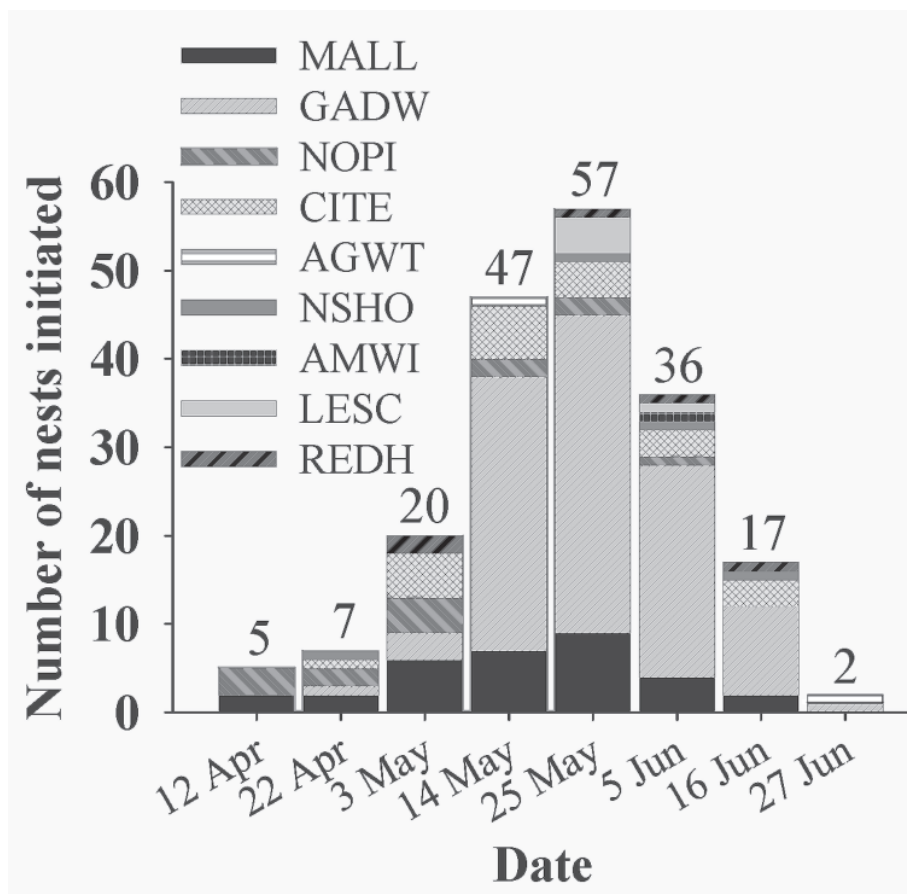


Fig. 2. Species composition and chronology of nesting ducks in Honey Lake Valley, California, USA in 2002-03. Abbreviations are AGWT (American green-winged teal), AMWI (American wigeon), CITE (cinnamon teal), GADW (gadwall), LESC (lesser scaup), MALL (mallard), NOPI (northern pintail), NSHO (northern shoveler), and REDH (redhead).

ACKNOWLEDGMENTS

Our project would not have been possible without the help of Y. Irie and C. Snow, who assisted with field work; we are greatly indebted to them. We also thank M. Ngo, S. Cechi, D. Lemke, P. Graff, and R. Young, who volunteered with field work. We thank colleagues at California Waterfowl Association for their ideas, suggestions, and training for collecting nest data. C. and B. Lee and D. Kennedy provided logistical support at JDW during the field season. Refuge manager P. Cherny and California Department of Fish and Game personnel allowed me to conduct research at Honey Lake State Wildlife Area and provided supplemental information and logistical support. L. Oring, R. Qualls, and M. Peacock provided comments on earlier drafts. Funding

provided by the Nevada Agricultural Experiment Station, publication number xxxxxxxx, and the Department of Natural Resources and Environmental Science, University of Nevada, Reno.

LITERATURE CITED

- Bogiatto, R. J. 1998. Nesting ecology of ducks at Eagle Lake, Lassen County, California. *California Fish and Game* 84:61-73.
- Hickman, J. C., and W. Roberts. 1993. Geographic subdivisions of California. Pages 38-45 *in* J. C. Hickman, editor. *The Jepson Manual*. University of California Press, Berkeley and Los Angeles, California, USA.
- Hunt, E. G., and A. E. Naylor. 1955. Nesting studies of ducks and coots in Honey Lake Valley. *California Fish and Game* 41:295-314.
- Jarvis, R. L., and S. W. Harris. 1971. Land-use patterns and duck production at Malheur National Wildlife Refuge. *Journal of Wildlife Management* 35:767-773.
- Klett, A. T., H. F. Duebbert, C. A. Faanes, and K. F. Higgins. 1986. Techniques for studying nest success of ducks in upland habitats in the Prairie Pothole Region. U.S. Fish and Wildlife Service Resource Publication 158.
- Rienecker, W. C., and W. Anderson. 1960. A waterfowl nesting study on Tule Lake and Lower Klamath National Wildlife Refuges, 1957. *California Fish and Game* 46:481-506.
- University of California. 2007. Statewide Integrated Pest Management Program. <<http://www.ipm.ucdavis.edu/calludt.cgi/WXSTATIONDATA?MAP=&STN=BUNTNGVL.A>>. Accessed 5 March 2007.

Received: 26 August 2006

Accepted: 24 January 2007