ASSESSING RIVER HABITAT SELECTION BY WATERFOWL WINTERING IN THE SOUTH PLATTE RIVER, COLORADO

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Abstract: We assessed river habitat selection of waterfowl wintering in the South Platte River below the Metro Wastewater Reclamation District treatment plant in Adams County, Colorado to determine potential impacts of proposed river channel modifications. Daily mean number of waterfowl was 711 per km of river over the study area, and 19 species of waterfowl were observed. We describe use of a resource selection model to evaluate whether a habitat type is selected more than expected based on its availability. Habitat selection indices indicated that Canada geese (Branta canadensis) used all habitats in proportion to their availability. Dabbling ducks selected large pools, secondary channels, riffles and sandbars, avoided smaller pools and islands, and used runs in proportion to their availability. Diving ducks selected large pools, small pools, and runs; they avoided secondary channels, riffles, sandbars, and islands. Due to different habitat preferences between diving and dabbling ducks, changes that alter river habitat structure may favor some species and not benefit others. The optimum way to maintain diversity and abundance of waterfowl wintering in the South Platte River is to maintain a variety of habitat types.

Key Words: Colorado, habitat selection, South Platte River, waterfowl, winter

INTRODUCTION

In parts of western and midwestern North America, rivers provide the only open water during winter and often are heavily used by waterfowl. Modifications to river channels may reduce the suitability of these areas for wintering waterfowl. To more fully understand the effects of river channel modifications, information about habitat use by waterfowl is needed. Previously, waterfowl studies focused primarily on use of rivers in relation to other available non-riverine habitats (e.g., Jorde et al. 1984, Ringelman and Szymczak 1989) or examined use of portions of rivers rather than specific habitats within rivers (e.g., Jones and Drobney 1986, Anderson and Ohmart 1988). We are not aware of any previously published studies documenting macrohabitat selection within rivers by wintering waterfowl.

Preliminary censuses conducted by the authors indicated that the South Platte River in Adams County, Colorado downstream from the Metro Wastewater Reclamation District (MWRD) Central Plant is used extensively by wintering waterfowl, especially when other nearby water bodies are frozen. Dissolved oxygen (DO) levels in the river downstream of the treatment plant are frequently below recommended U.S. Environmental Protection Agency (EPA) criteria for streams (U.S. EPA 1986). Several river channel modifications are being considered by the MWRD to potentially increase DO in the South Platte River. Some river channel modifications will result in a significant change in river characteristics, including the possibility of eliminating large pools, reducing channel width, increasing mean depth, reducing number of secondary channels, and changing the riffle:run:pool ratio. Because this portion of the river is used extensively by wintering waterfowl, information was required to assess potential effects of river habitat changes on wintering waterfowl. The purpose of this study was to (1) examine selection of river habitats by waterfowl wintering in the South Platte River and (2) determine potential effects of proposed river channel modifications on waterfowl use of the river.

STUDY AREA

The South Platte River originates in the intermountain region of central Colorado, flows northeasterly through the Denver metropolitan area and northeast Colorado, and continues into Nebraska where it joins the North Platte River. The stretch of river most likely affected by proposed channel modifications and, hence, the portion surveyed for this study is the stretch between the MWRD Central Plant and the Fulton
Figure 1. Study area on the South Platte River, Adams County, Colorado.

Ditch confluence with the South Platte, located approximately 10 km downstream (Figure 1).

Based on measurements made within this 10-km stretch, the main channel width averaged 33.5 m, the channel slope was 0.17 percent, and sinuosity was 1.2 (Camp Dresser & McKee, Denver, Colo., unpubl. data). The river is braided with 45 secondary channels in the surveyed portion. Two large pools also occurred within the surveyed portion. One pool was approximately 335 m long, averaged 107 m in width, and up to 3.4 m in depth. The second pool was 378 m long, averaged 81 m in width, and was as much as 1.8 m deep in portions (Camp Dresser & McKee, Denver, Colo., unpubl. data). Mean water depth in primary channels was 91 cm in pools, 37 cm in riffles, and 49 cm in runs. Mean water depth in secondary channels was 21 cm in pools as well as riffles and 31 cm in runs (Camp Dresser & McKee, Denver, Colo., unpubl. data). Winter monitoring in 1993 indicated that the most common potential waterfowl food items in the river were filamentous algae, oligochaetes, and Chironomidae larvae (T.L. Harris, MWRD, unpubl. data).

Land uses near the river were primarily agriculture and gravel mining. Predominant vegetation types immediately adjacent to the river were riparian areas dominated by eastern cottonwood (*Populus deltoides* Bartr.) and willow (*Salix* spp.), row crops, fallow lands, and wetlands dominated by reed canary grass (*Phalaris arundinacea* L.), smartweed (*Polygonum lapathifolium* L.), dock (*Rumex crispus* L.), cattail (*Typha latifolia* L.), and sandbar willow (*S. exigua* Nuttall). Fifteen gravel-pit ponds were adjacent to the river within the study area. These ponds generally remained frozen during winter; however, open water was present on some following periods of moderating temperatures. Despite air temperatures as low as −19.4 °C, no ice formed on the river during this study due primarily to the temperature of treatment plant discharge water during the study period (11.1–14.4 °C).

**METHODS**

**Waterfowl Use**

Waterfowl surveys (*n* = 12) were conducted approximately once every 3 days from 6 January to 10 February 1993. The river was stratified into large pool habitat and "other habitats" for sampling. Two large pools occurred within the study area, and both of these pools were selected for sampling because proposed channel-modification plans include possible elimination of these pools, and preliminary censuses indicated these pools were used extensively by wintering waterfowl. We censused waterfowl in the large pools by counting all individuals in each pool once each survey day. The remainder of the river was systematically sampled using twenty 100-m intervals, with location of the first interval selected randomly. Interval boundaries were marked with flagging. The same intervals were used in all surveys. The interval order for beginning each survey was randomized at the start, and starting points for each survey were randomly rotated to ensure that each interval was visited during all times of the day. All waterfowl species observed were recorded.

A measure of waterfowl use of the study area, excluding the 2 large pools, was determined by multiplying the mean number of waterfowl per meter of river, determined from counts on the 20 sample intervals, by the length of the river in the study area (9860 m) minus the length of the 2 large pools. Census counts from the 2 large pools were added to this number to estimate total waterfowl use of the study area. Species composition was expressed as a percent of the total estimated number of waterfowl.