

2. METHODS

We designed our literature search to find any information pertaining to the use of nine focal row crops (rice, corn, winter wheat, spring wheat, sorghum, soybean, cotton, peanut, tobacco) by the 216 species identified as focal species for the Waterbirds on Working Lands Project (see INTRODUCTION). In general, we sought after information related to (a) the occurrence and abundance of waterbird species in agricultural land planted to each focal row crop, (b) important crop resources for waterbirds, (c) how waterbirds use fields, and (d) the impacts of crop production practices on waterbirds. We also looked for any documentation of the broader landscape effects of row crop agriculture on waterbird populations, including known or potential impacts of large scale changes in agroindustry. Using predetermined key terms (Tables 2-1 and 2-2), we systematically searched for literature published in 2006 or prior that was directly relevant to these topics. We conducted our systematic search using three online computer databases - ISI Web of Science® (1981-present), Wildlife and Ecology Studies Worldwide (1935-present), and Agricola (1979-present). We first approached this systematic search broadly, using keywords that would find worldwide literature on any waterbird species or group associated with any row crop (e.g., 'waterfowl and agriculture'). We then narrowed down key term searches to find studies on each focal species and each of the nine focal crops (e.g., 'Dunlin and rice'). Tables 2-1 and 2-2 illustrate the key term combinations we used to conduct both broad and narrow searches.

A minority of the references were also found using a more traditional *ad hoc* approach implemented after we had completed our systematic search. Some references were found by searching in the Birds in Agricultural Areas (BIAA) database (<http://www.abcbirds.org/biaa/>) shepherded by the American Bird Conservancy, George Mason University, and the U.S. Environmental Protection Agency. We also found additional references using a number of previous review documents (Batt et al. 1992, Heard et al. 2000, Haufler 2005, Eadie et al. 2006), and from the literature cited sections of those documents found through our systematic search. Next, we comprehensively searched for any missed information related to habitat use and the effects of agricultural practices by reviewing pertinent sections (Habitat, Food Habits, Behavior, Breeding, Demography and Populations, Conservation and Management, and Priorities for Future Research) of the Birds of North America (<http://bna.birds.cornell.edu/BNA/>) species accounts for the 216 focal WWL species. Finally, we sent each chapter to researchers who have been especially active working with each crop to obtain peer-reviews and advice on any articles we may have missed.

Our search resulted in 550 documents (primarily empirical studies), 527 of which pertain to the use of the nine row crops by waterbirds, resources provided by the nine row crops, or the impacts of crop production methods on waterbirds. Of these, 350 were related to work conducted in North America. These records are organized in a searchable Endnote bibliographic database in which all references are indexed by keywords including (a) where (continent, country, focal Bird Conservation Region) and when in the annual cycle (breeding, winter, migration) the study was conducted, (b) the waterbird group (waterfowl, shorebirds, wading birds, other waterbirds, landbirds) and the particular species studied, (c) the crop(s) studied (rice, corn, winter wheat, spring wheat, sorghum, soybean, cotton, peanut, tobacco), and (d) the research topic addressed (e.g., topics related to use, resources and/or impacts of crop production practices).

References

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- Haufler, J.B. (editor). 2005. Fish and wildlife benefits of Farm Bill conservation programs: 2000-2005 update. The Wildlife Society Technical Review 05-2.
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Table 2-1. Key terms used in a systematic search for literature pertaining to waterbird use of agricultural lands. Online databases searched included the ISI Web of Science® (1981-present), Wildlife and Ecology Studies Worldwide (1935-present), and Agricola (1979-present). Search attempts included all permutations of one key term from each group, except where indicated. An asterisk (“*”) after key words indicates a wildcard search for any words beginning with the letters preceding the asterisk.

Group 1	Group 2	Group 3
use	bird ^a	agricultur*
habitat use	waterbird	crop*
habitat selection	shorebird	farm*
habitat	waterfowl	rice*
selection	wad*	corn*
prefer*	landbird	wheat
habitat and use	songbird	sorghum
habitat and selection	wildfowl	soybean
habitat and preference	duck	cotton
[no keyword]	goose	peanut
	geese	tobacco
	tern	
	swan	
	heron	
	egret	
	loon	
	grebe	
	rail	
	gull	
	plover	
	sandpiper	
	blackbird	
	sparrow	
	wren	
	[each WWL landbird species]	

a To narrow the search and result in a manageable outcome, key term ‘bird’ was only used in combination with key term ‘habitat use’ and each crop type key term (e.g., ‘corn’, ‘rice’,... ‘tobacco’).

Table 2-2. Key terms used in a systematic search for literature relating to the effects of crop production methods on waterbirds. Online databases searched included the ISI Web of Science® (1981-present), Wildlife and Ecology Studies Worldwide (1935-present), and Agricola (1979-present). Search attempts included all permutations of one key term from each group, except where indicated. An asterisk (“*”) after key words indicates a wildcard search for any words beginning with the letters preceding the asterisk.

Group 1	Group 2	Group 3
effect	waterbird	rice
affect	shorebird	corn
influence	waterfowl	wheat
till* ^a	landbird	sorghum
disc/disk ^a	songbird	soybean
irrig* ^a	wad*	cotton
sow ^a	wildfowl	peanut
seed ^a	duck	tobacco
harvest ^a		[no keyword] ^a
machinery ^a		

a No key term used for Group 3 to find literature pertaining to general effects (any crop type) of crop production methods on waterbirds.