

IWMM Surveys on Cold Springs NWR

Winter 2017-18

By
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INTRODUCTION

The Memorial Marsh Unit on Cold Springs National Wildlife Refuge (Refuge) is managed to provide seasonal wetlands for migratory waterfowl and wading birds. Management actions, consisting primarily of water management and vegetation treatments, are conducted to encourage moist-soil vegetation and discourage undesirable plants. Desirable and/or native moist-soil annual plants include smartweeds (*Polygonum* spp.), barnyard grass (also known as millet) (*Echinochloa crus-gali*), and swamp timothy (*Crypsis schoenoides*), while undesirable or invasive plants include cocklebur (*Xanthium strumarium*) and common reed (*Phragmites australis*).

The Refuge is located within the Columbia River Basin near Hermiston, Oregon where annual waterfowl populations peak in winter and early spring. Compared with wintering populations, breeding waterfowl populations are relatively small, so Refuge wetlands are managed for wintering and migrating waterfowl. Ponds in Memorial Marsh are typically flooded in fall and drained mid-summer. The resulting growth of moist-soil vegetation provides crucial carbohydrates and structure for invertebrate proteins for waterfowl the following winter and spring. Vegetation treatments occur during the summer growing season and typically consist of mechanical mowing of dike edges and emergent plants, and herbicide treatments of invasive species that reduce overall moist-soil quality (e.g. jointgrass).

Refuge management objectives for Memorial Marsh are described in terms of vegetation. Objective 2.1 (draft CCP) states “*Enhance and annually maintain 138 acres of managed, seasonal wetlands for migratory waterfowl, including 40 acres of moist-soil vegetation annually...*”. Desirable characteristics of seasonal wetlands are further defined as

- >60% cover of desirable and/or native wetland plants, including moist-soil annuals
- <20% cover of native emergent species that are >5 feet tall (e.g., cattail, hardstem bulrush)
- <40% cover of undesirable/invasive plants.

There are 6 ponds in the marsh unit, and 5 are managed for moist-soil habitats, including Cottonwood (CW), Middle (MI), Upper A (UA), Upper B (UB) and Kosmos (KO) (Figure 1). Upper A and Upper B are hydrologically connected, but defined by a peninsula jutting into the pond from the north. Upper A was separated from Upper B due to different plant communities’ characteristic of the 2 ponds. Upper A is filled with overflow from Upper B. Moe’s Pond is not included in the survey due to its small size, lack of bird use, and lower priority for management. Pond sizes range from 3.8 to 36 acres, with Kosmos being the smallest and Middle the largest (Figure 1).

The Refuge has conducted winter waterbird surveys since winter 2012-13 and started using the Integrated Waterbird Monitoring and Management (IWMM) protocol in 2016. Waterfowl surveys alone did not provide information on vegetation conditions in the wetlands or vegetation/bird response to management actions. Vegetation, Unit Condition, and Management Action aspects of the IWMM protocol should provide better information on which to base management decisions. The objectives of the survey are to 1) document and track changes in vegetation condition in individual ponds over time;

2) track waterbird use over time; and 3) compare waterbird use and vegetation condition between ponds.

METHODS

Waterbird and Unit Condition

Field methods followed the Waterbird and Unit Condition Survey from IWMM protocol (Loges et al. 2014). Whole area counts conducted from the ground were used to survey waterbirds in each pond. Observers approached each pond and conducted a quick scan to determine relative numbers and species present. Birds that flushed were counted first and their flight direction noted. Observers tried not to double count birds by paying attention to flock movements and directions when birds flushed. Birds that remained on the water were counted next. Observers attempted to count each bird individually, as bird movement and numbers allowed. As flock sizes and species diversity increased throughout the season, observers began counting in increments of 10 to 100 birds, depending on flock size and observer discretion. Waterfowl was the primary guild of management interest, but all waterbirds present were counted during surveys.

Unit condition data were collected after bird counts were completed. Water depth classes were estimated using staff gauge readings and a bathymetric model for all units except Kosmos, which lacked a staff gauge at the time bathymetric data were collected. Water depth on Kosmos was estimated ocularly. Six depth classes were used by IWMM to account for foraging preferences of various waterbird guilds. Ducks were the primary focus of our study so we combined water depth to 3 classes: 0 cm (dry and saturated); <20 cm; and >20 cm. Twenty centimeters represents a cut-off between foraging habitat of dabbling ducks, which require shallow water, and diving ducks, which require deeper water (Ma et al. 2010).

Vegetation

IWMM vegetation protocols produce a rapid assessment of plant community composition and seed production. Plant community composition was estimated by walking through the unit, listing all plants observed and estimating cover of species contributing >5% of the emergent cover. Only current year's growth was considered and canopy cover was estimated as percentage of emergent vegetation NOT a percentage of the total the unit. Total cover could exceed 100% due to layers of canopy with species of different heights and growth forms.

Size and density of seed heads of important waterfowl food species were estimated by measuring several seed heads of each species and estimating the average size of seed heads in a pond as small, average, or large. Seed head density was estimated based on density of stems for a species and proportion of stems with seed heads. IWMM provides seed head assessment guides for common waterfowl foods in the east, but most species in the guide are not found in our wetlands. Barnyard grass was the only species at Memorial Marsh covered in the guide, seed head density and size was compared between individual ponds. This represents a current limitation in applying the IWMM to western Refuges. *Crypsis schoenoides* and *Panicum capillare* are important waterfowl foods in the west and we will be working with IWMM to include these species in the guides.

Data Analysis

Bird Use Days (BUD) were calculated and downloaded from the IWMM database. BUD were estimated for each pond using the standard trapezoid method (Hilborn et al. 1999, IWMM 2018) for the survey period and are presented for total BUD (raw) and BUD per hectare. Waterfowl were grouped into the dabbling and diving duck guilds for reporting. Bird migration curves for the 4 most common dabbling and diving duck species were generated within the IWMM reporting portal and were presented as absolute bird numbers.

The vegetation survey report was downloaded from IWMM data portal, including total number of plant taxa in each pond (>5% cover), plant diversity index (Shannon's index), and percent cover of all taxa identified as annual and perennial plants, totaled by unit. Seed production index (SPI) was calculated for species included in the IWMM photographic seed head assessment guide, based on seed head size, density, and area covered. However, the seed head assessment guide was developed for eastern wetlands, and barnyard grass was the only plant in our wetlands included in the guide.

Since many western plant species were not included in the IWMM seed assessment guide, we also summarized vegetation data by categories defined in the Refuge CCP; desirable, tall, and undesirable. Value of plant species as waterfowl food was estimated based on literature search and assigned to all desirable plants. Canopy cover was summed within each refuge category for each pond.

RESULTS

Weekly counts were conducted between Nov 3, 2017 and March 30, 2018. Vegetation was surveyed on September 22, 2017

Kosmos and Upper A had the highest species richness, plant diversity, and number of waterfowl food plants, but Upper B had the highest seed production index (Table 1). Upper B had high cover of barnyard grass but low species richness and diversity. Cottonwood had relatively low diversity and low seed production index, and very low cover of desirable plant species. Cottonwood also had the highest cover of tall and undesirable species. *Phragmites* spp. was present in Kosmos Pond and cocklebur was present in all ponds except Middle. Cover of tall species was relatively low in all units except Cottonwood.

Middle and Upper B had highest overall use by dabbling ducks, but when adjusted for area, Upper A and Kosmos had highest BUD per hectare (Figure 2).

Overall, Upper B received the most use by diving ducks, followed by Middle and Cottonwood (Figure 3). Diving duck use of Upper A and Kosmos was minimal. When corrected for area, Upper B received twice as much use by diving ducks as Cottonwood or Middle. Diving duck use is likely a factor of water depth, as Upper B and Middle had the deepest water throughout the survey season (Figure 4). Water depths >20 cm generally provide foraging habitat for diving ducks while excluding dabblers.

Upper A and Kosmos were dominated by shallower water depths and provide good dabbling duck habitat, but all ponds provided some dabbling duck habitat at the end of the season. Upper Pond was predominately dry through December and Kosmos was mostly dry through January, but dabbling duck numbers peaked in Memorial Marsh in February and both ponds received significant use by dabbling ducks (Figure 5).

DISCUSSION

Waterfowl numbers peak in the Cold Springs area in late winter/early spring, and Memorial Marsh provides important habitat at the time. A range of water depths in all ponds provides habitat for both dabbling and diving ducks.

Unit condition data and vegetation data help provide context and explain patterns of waterfowl use in Memorial Marsh Unit. Kosmos and Upper A are shallow and provide a diversity of food resources, but they are small and support low numbers overall. Upper B has low plant diversity but supports a robust stand of barnyard grass. Diving duck use is high in Upper B (both total numbers and BUD per hectare), but dabbling duck use is significant too. As would be expected, observers find dabbling ducks along the shallow margins of the large, deep ponds: Cottonwood, Middle, and Upper B. Cottonwood Pond provides the fewest food resources, measured as plant diversity and seed production, and has the lowest BUD by hectare during winter. However, refuge staff holds water in Cottonwood Pond as long as possible and it receives heavy use by adults and broods. It also supports a robust stand of pondweed (*Stuckenia* spp) and may be more appropriately managed for brood habitat (F. Healy, pers. comm.).

Vegetation data collected in 2017 also provide a baseline against which to measure change. In future years, vegetation treatments and water manipulations can be scheduled in individual ponds based on trends seen from the vegetation assessment.

LITERATURE CITED

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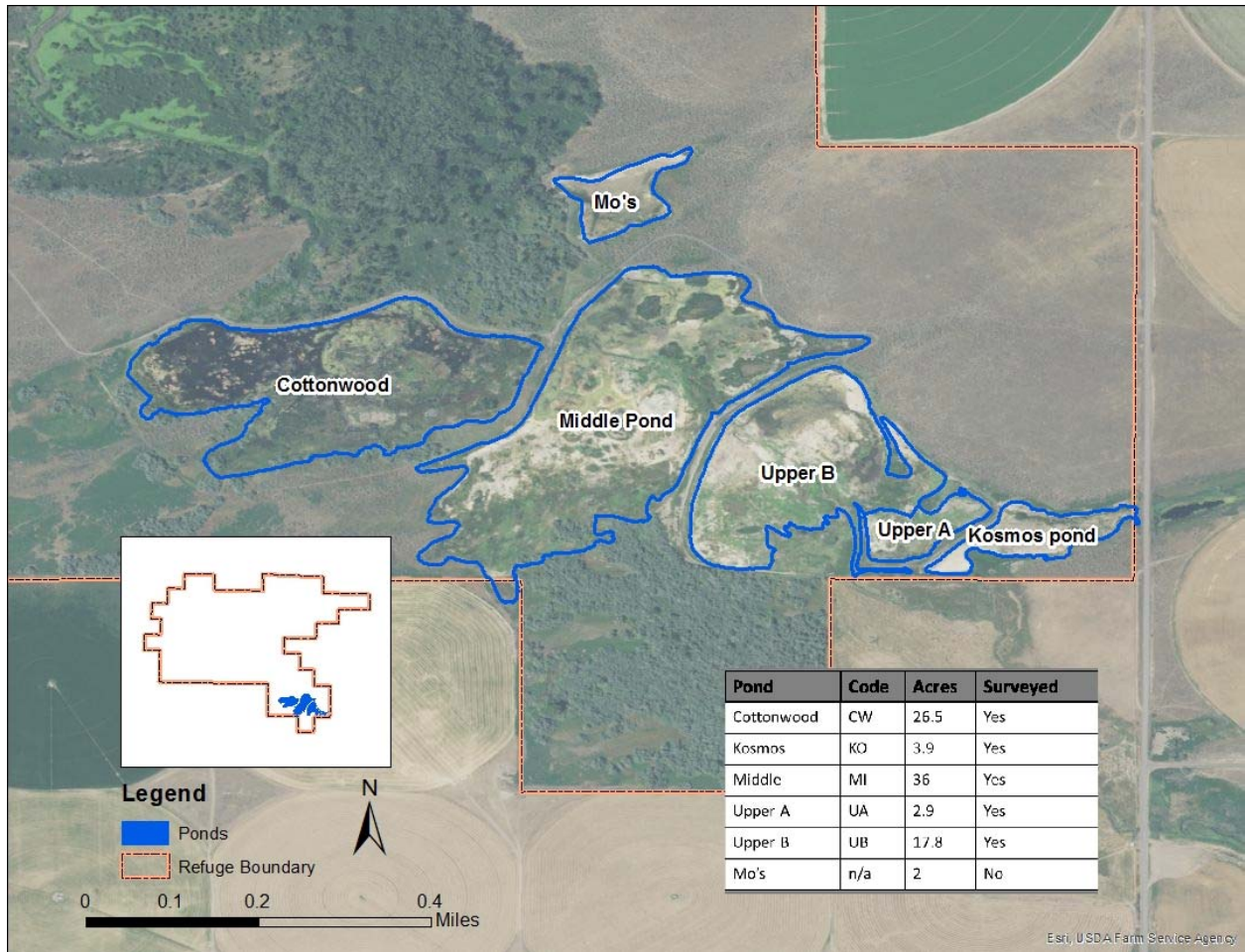


Figure 1. Managed ponds in the Memorial Marsh Unit, Cold Springs National Wildlife Refuge.

Table 1. Vegetation summaries from IWMM reports for ponds in Memorial Marsh Unit, Cold Springs NWR, September 2017.

Pond	Total Plant Species	Diversity Index	Annual/Perennial Percent Cover	Seed Production Index ¹⁾	Food Species ²⁾
Cottonwood	5	3.44	A:22/P:45	1	2
Kosmos	11	10.88	A:76/P:40	6	4
Middle	9	8.63	A:71/P:38	3	3
Upper A	8	8.81	A:75/P:40	3	4
Upper B	3	2.16	A:105/P:0	12	2

¹⁾Calculated by IWMM, barnyard grass only.

²⁾Desirable plants identified as waterfowl food by refuge staff.

Table 2. Cover of wetland plants in Ponds on Memorial Marsh Unit, Cold Springs NWR, September 2017. Plant were grouped as desirable, tall, or undesirable based on CCP objectives.

Scientific Name	Common Name	Food Value ¹⁾	Pond				
			CW	KO	MI	UA	UB
Desirable							
<i>Bolboschoenus maritimus</i>	Cosmopolitan bulrush	Med		6	6	15	
<i>Chenopodium album</i>	lambsquarters	Med	6	30	6	25	
<i>Crypsis schoenoides</i>	swamp pricklegrass	High		6	20	15	
<i>Echinochloa crus-galli</i>	barnyard grass	High	10	20	10	10	75
<i>Eleocharis palustris</i>	common spikerush	High		6		10	
<i>Panicum capillare</i>	witchgrass	High	6	10	15	15	20
<i>Schoenoplectus pungens</i>	common threesquare	Med		6	20	15	
TOTAL			22	84	77	105	95
Tall							
<i>Schoenoplectus acutus</i>	hardstem bulrush		25	6	6		
<i>Typha latifolia</i>	broadleaf cattail		20	10			
TOTAL			25	6	6	0	0
Undesirable							
<i>Paspalum distichum</i>	Jointgrass				6		
<i>Phragmites australis</i>	common reed			6			
<i>Xanthium</i> spp.	cocklebur		25	10		10	10
TOTAL			25	16	6	10	10

¹⁾Determined by Refuge staff through literature search and professional opinion.

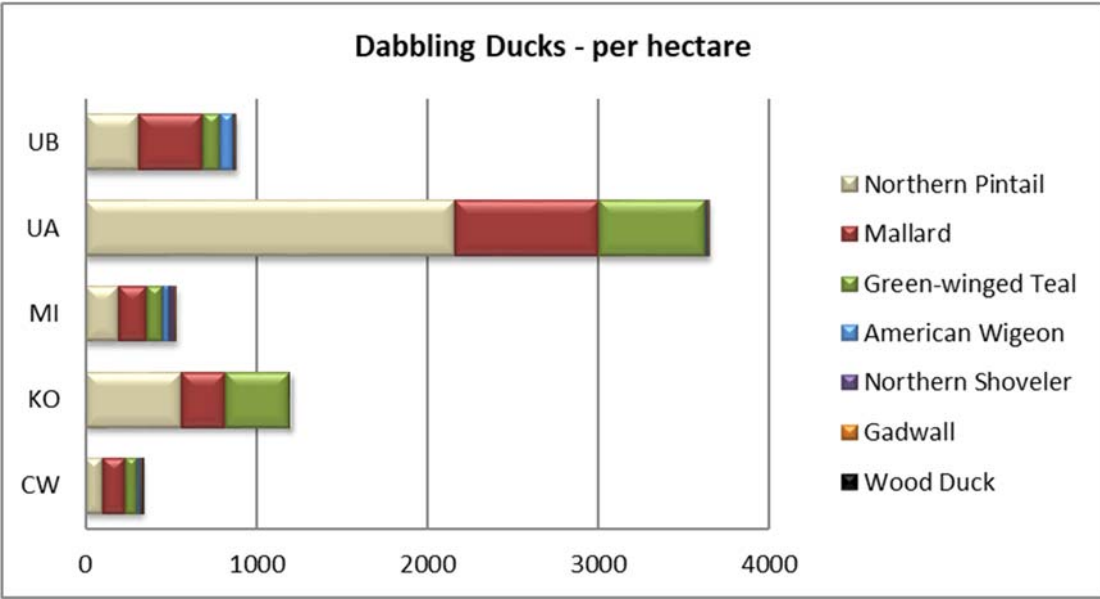
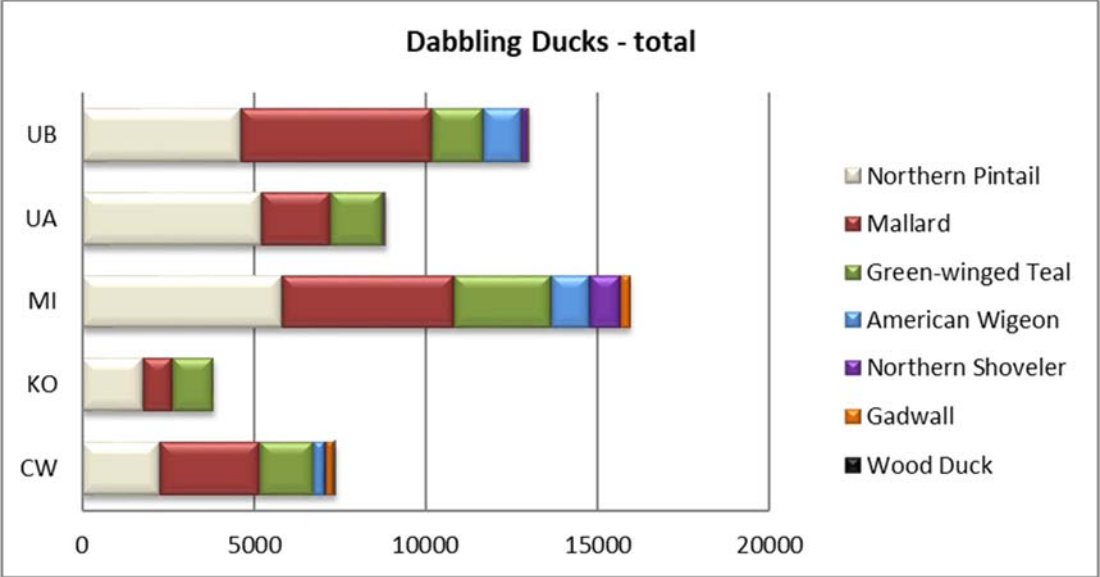


Figure 2. Bird Use Days (BUD) for Dabbling Ducks on Memorial Marsh Unit, Cold Springs NWR, winter 2017-18. The upper chart shows total BUD while the low chart shows BUD per hectare, by pond. UB = Upper B; UA = Upper A; MI = Middle; KO = Kosmos; CW = Cottonwood.

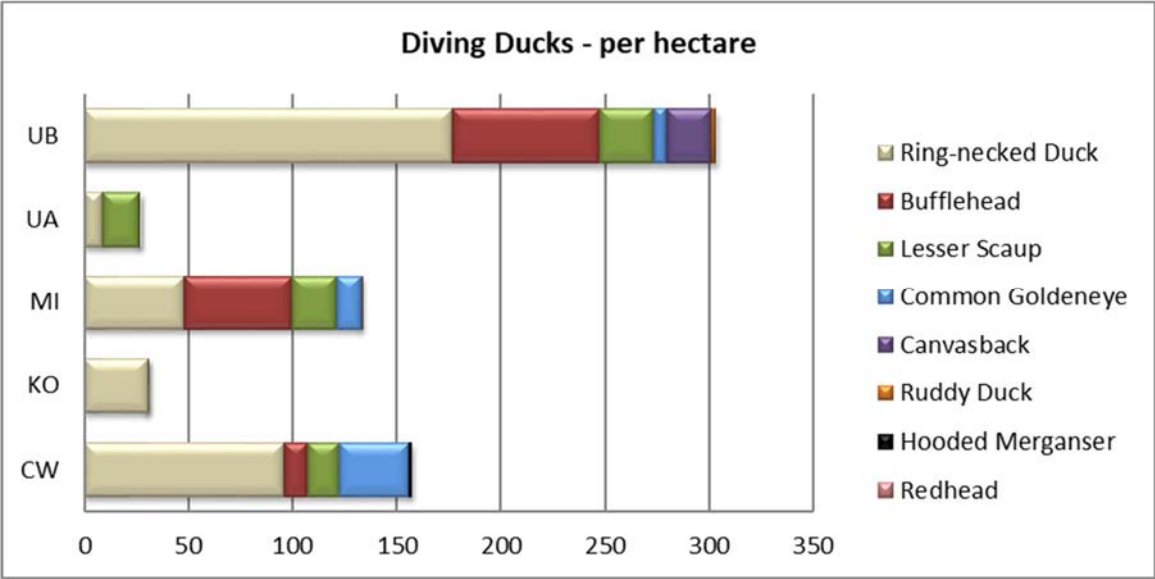
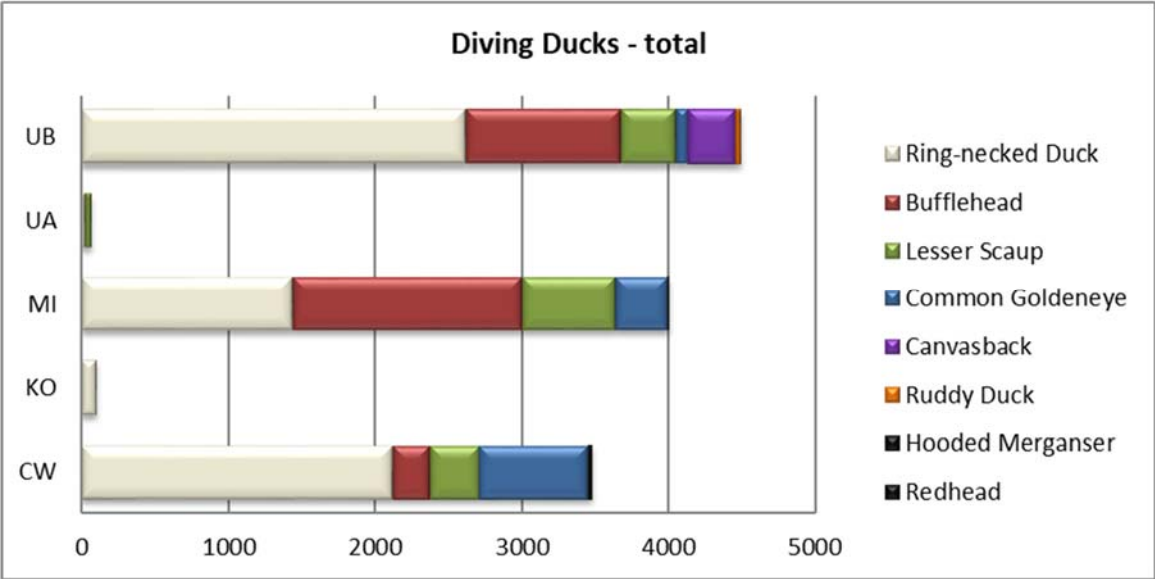


Figure 3. Bird Use Days (BUD) by Diving Ducks on Memorial Marsh Unit, Cold Springs NWR, winter 2017-18. The upper chart show total BUD while the low chart shows BUD per hectare, by pond. UB = Upper B; UA = Upper A; MI = Middle, KO = Kosmos; CW = Cottonwood.

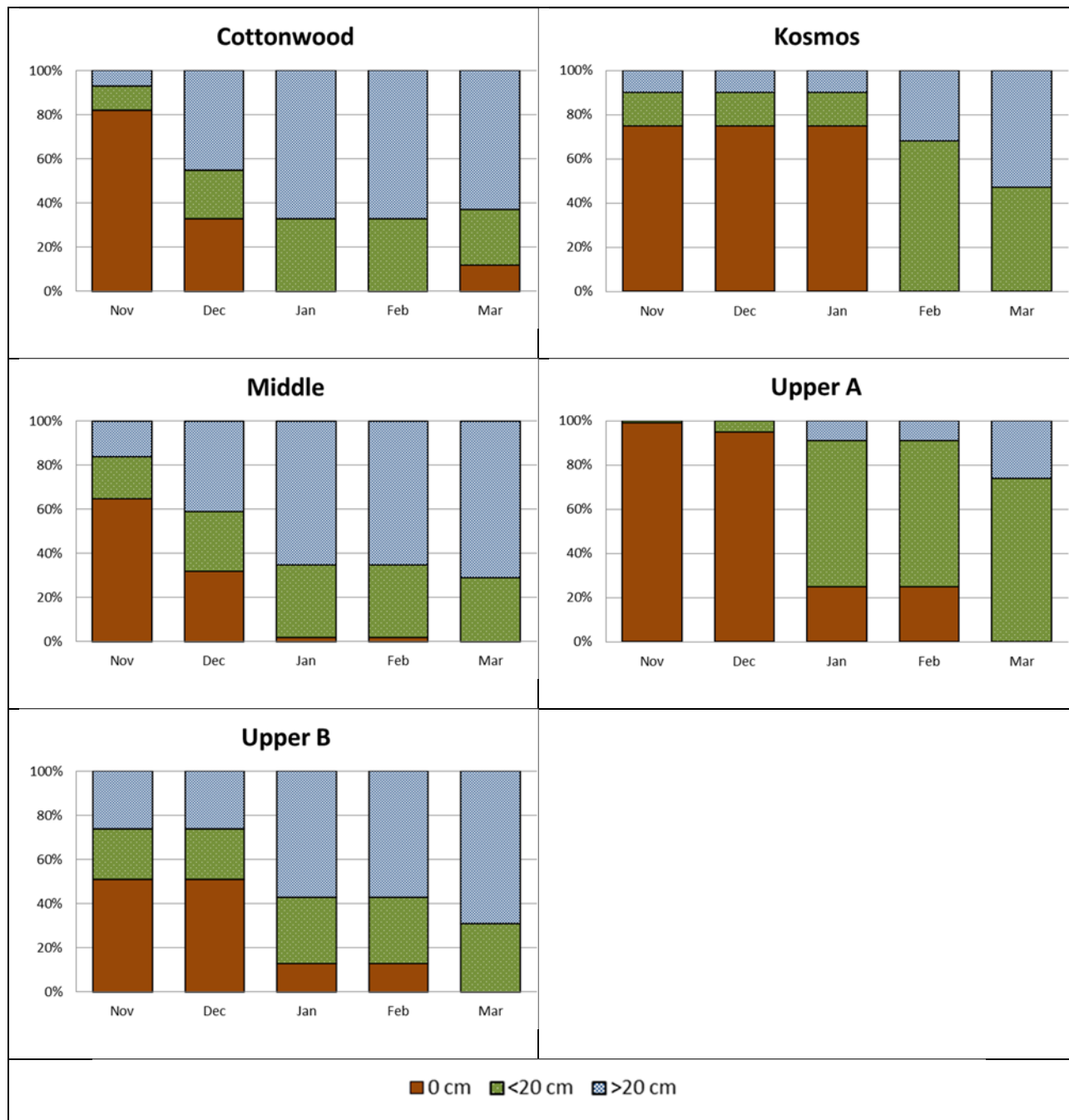


Figure 4. Water depth on the first survey day of the month, Memorial Marsh Unit, Cold Springs NWR, winter 2017-18. Depth classes are based on IWMM and represent water depths used primarily by diving ducks (>20 cm) and dabbling ducks (<20 cm).

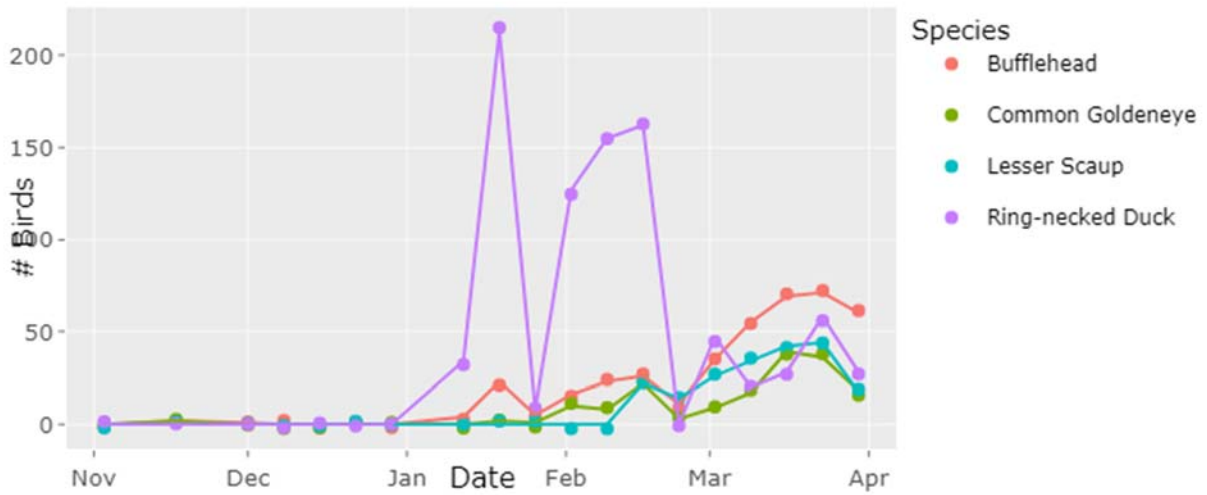
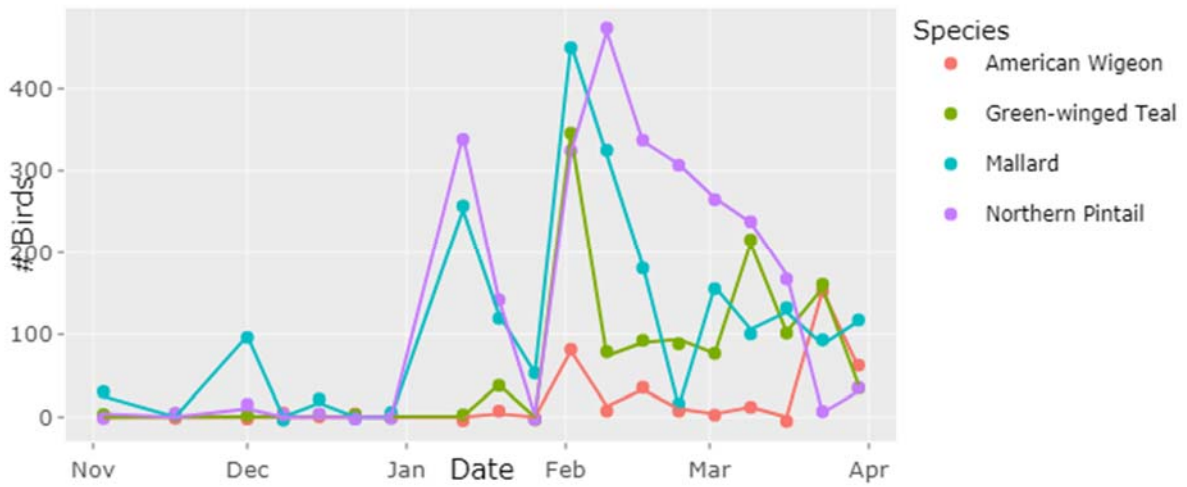


Figure 5. Migration curves for 4 common dabbling duck and 4 common diving duck species on Memorial Marsh Unit, Cold Springs NWR, Winter 2017-2018.