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CALCULATING HABITAT AREA REQUIRED FOR PRIORITY SHOREBIRDS IN THE GULF COAST JOINT VENTURE REGION

WILLIAM G. VERMILLION[1,3] AND BRENT J. ORTEGO[2]

[1]*Gulf Coast Joint Venture, 700 Cajundome Boulevard, Lafayette, Louisiana 70506, USA; and*
[2]*Texas Parks and Wildlife Department, 2608 North Navarro, Suite 600 B, Victoria, Texas 77901, USA*

Abstract. In 2004, the Gulf Coast Joint Venture (GCJV) Management Board formally resolved to move towards development and implementation of population and habitat objectives for priority species of non-waterfowl birds in the GCJV region. The GCJV Management Board directed joint venture staff to develop lists of six to eight priority landbird, waterbird and shorebird species, respectively, for conservation planning. The GCJV organizational structure provides for a Monitoring, Evaluation and Research Team, consisting of four Working Groups: Waterfowl, Landbirds, Shorebirds and Waterbirds. Working Groups consist of biologists and researchers from GCJV partner agencies and organizations, and from regional academia. The Working Groups use the best available scientific information to formulate conservation targets for individual GCJV Initiative Areas. This paper provides details on the Shorebird Working Group's species prioritization process, and related conservation planning that has resulted from that process.

Key Words: Joint Venture, shorebird, Stilt Sandpiper.

ÁREA CALCULADORA DEL HABITAT REQUERIDA PARA LAS AVES COSTERAS DE LA PRIORIDAD EN LA REGIÓN DE LA EMPRESA CONJUNTA DE LA COSTA DEL GOLFO

Resumen. En 2004, la Junta directiva de Empresa conjunta de Costa de Golfo se resolvió formalmente mover hacia el desarrollo y la implementación de objetivos de población y hábitat para la especie de la prioridad de landbirds, shorebirds, y waterbirds en la región de Empresa conjunta de Costa de Golfo. La Junta directiva de la Empresa conjunta de Costa de Golfo dirigió empresa conjunta el personal a desarrollar las listas de seis a ocho landbird de la prioridad, a waterbird, y a la especie de shorebird, respectivamente, para la planificación de la conservación. La Empresa conjunta de Costa de Golfo la estructura que de la organización preve una Vigilancia, la Evaluación, y el Equipo de investigación, consistiendo en cuatro Grupos de trabajo: los patos, los gansos, y los cisnes; landbirds; shorebirds; y waterbirds. Los Grupos de trabajo consisten en biólogos e investigadores de agencias de socio de Empresa conjunta de Costa de Golfo y organizaciones, y de la academia regional. Los Grupos de trabajo utilizan la mejor información científica disponible para formular los objetivos de la conservación para Areas individuales de Iniciativa de Empresa conjunta de Costa de Golfo. Esta presentación proporcionará detalles en el Shorebird que Trabaja los Grupo's el proceso de la priorización de la especie, y la planificación relacionada de la conservación que ha resultado de ese proceso de la priorización.

INTRODUCTION

In 1986, due to significant loss of wetland habitats and declining waterfowl populations, the North American Waterfowl Management Plan was written and signed by the governments of the United States and Canada. The plan outlined steps needed to restore North American waterfowl populations to 1970's levels, and identified the joint venture concept to serve as the plan's implementing mechanism.

North American Waterfowl Management Plan joint ventures are composed of individuals, corporations, small businesses, sportsmen's groups, conservation organizations, and local, state, provincial and federal agencies concerned with conserving migratory birds and their habitats in a particular physiographic region. The Gulf Coast Joint Venture (GCJV) was one of the original habitat joint ventures identified in the plan. The GCJV region encompasses coastal marshes, prairies, bottomland hardwoods and pine flatwoods from the Texas-Mexico border to the Alabama-Florida border. From its inception until early 2004, the GCJV has focused on strategic planning for

[3] E-mail: william_vermillion@fws.gov

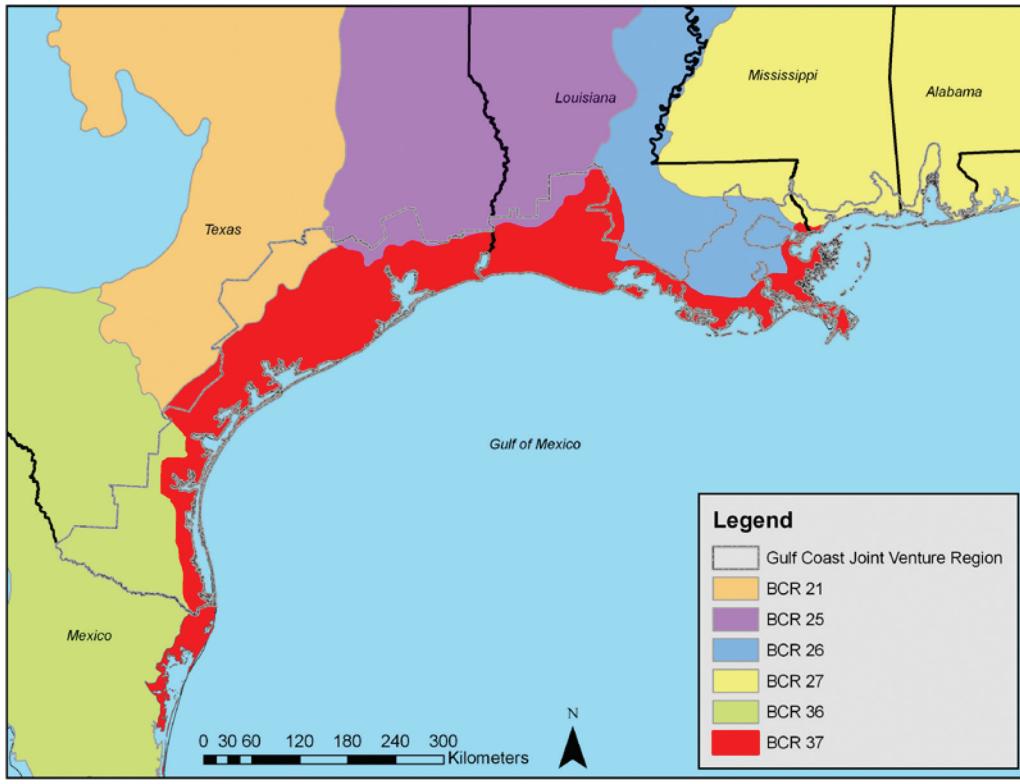

FIGURE 1. Bird conservation regions in the Gulf Coast Joint Venture Region.

waterfowl and wetland habitat conservation in the region.

In 2004, the GCJV Management Board formally endorsed expansion of the joint venture's conservation planning efforts to include non-waterfowl and non-wetland bird species. The Management Board directed joint venture staff to establish landbird, shorebird and non-waterfowl waterbird technical advisory working groups to direct conservation planning. Those working groups are comprised of biologists and researchers from state and federal agencies, non-governmental conservation organizations and universities. The three non-waterfowl working groups were tasked with assembling lists of species of conservation concern for each respective group of birds, and prioritizing those lists to derive a list of six to eight species in each group for focused conservation planning.

METHODS

Working groups began with lists of priority species specific to Bird Conservation Region (BCR) 37 (Fig. 1), which comprises the bulk of the GCJV region. Species on the lists were ranked according to the Partners in Flight species assessment methodology (Panjabi et al. 2005). As noted above, working groups were directed to select six to eight bird species for priority conservation action. Working groups were instructed to select species that regularly occurred in the GCJV Region, were identified as species of concern in the appropriate national or continental bird conservation plan, and whose population trends could be positively impacted by management actions in the GCJV region. The remainder of this discussion focuses on the process taken by the GCJV Shorebird Working Group to select priority species and the conservation planning focusing on those selected species.

The list of priority shorebird species used by the Shorebird Working Group contains 41 species; six designated as "Highly Imperiled," and 15 designated as "High Concern" in the United States Shorebird Conservation Plan (Brown et al. 2001). The Shorebird Working Group gradually reduced the list of 41 species down to eight priority species. Initial prioritization steps were relatively straightforward and required little discussion. Species were excluded from consideration due to:

(1) extreme rarity, as is the case with Eskimo Curlew *(Numenius borealis)*;

(2) apparent habitat abundance, as in the use of bare agricultural fields in BCR 37 by Mountain Plover *(Charadrius montanus)*;

(3) the relative importance of BCR 37 to the species compared with other BCRs, as is the case with American Woodcock *(Scolopax minor)*, and;

(4) relatively low conservation concern.

The four exclusion steps outlined above enabled the Shorebird Working Group to narrow the list of 41 species to 19.

It was next suggested that each working group member independently select eight species from the subset of 19. After this exercise, five species were unanimously chosen as priorities for conservation—Snowy Plover *(Charadrius alexandrinus)*, Wilson's Plover *(Charadrius wilsonia)*, Long-billed Curlew *(Numenius americanus)*, Hudsonian Godwit *(Limosa haemastica)*, and Buff-breasted Sandpiper *(Tryngites subruficollis)*.

Selecting three species from the remaining 14 required fairly extensive discussion and some compromise. Some species, such as American Golden-Plover *(Pluvialis dominica)*, were removed from consideration because their habitat needs were considered significantly similar to those of species already selected. After this process, the final three species chosen were Western Sandpiper *(Calidris mauri)*, Stilt Sandpiper *(Calidris himantopus)*, and Short-billed Dowitcher *(Limnodromus griseus)*.

RESULTS

To facilitate implementation of conservation actions recommended through staff and technical working groups, the GCJV region is currently divided into five Initiative Areas. Each Initiative Area has a team responsible for planning and implementing projects that contribute to the joint venture's stated species population and habitat objectives.

For priority shorebirds, joint venture staff has developed population and habitat objectives for the subset of the eight species above that use managed and/or inland habitat in BCR 37 during southbound migration - Long-billed Curlew, Western Sandpiper, Stilt Sandpiper, Buff-breasted Sandpiper, and Short-billed Dowitcher. This exercise is based on the assumption that suitable mudflat, shallow water and grassland habitat is limited during the fall migration period, and that this habitat can be provided through various management techniques.

The Shorebird Working Group used population estimates from Morrison et al. (2006), in some instances modified through expert opinion, to derive estimates of the percent of priority species' populations that would be expected to use inland and/or managed habitats during fall migration. Using those estimates, population objectives were derived.

Following the methodology employed by Twedt et al. (1999) for the Mississippi alluvial valley, GCJV staff used chironomid larvae as a representative prey item, and calculated the amount of chironomid-derived energy needed to support priority species population objectives. Those energy needs were translated into habitat objectives using information on invertebrate density in moist-soil impoundments (Lyons and Collazo 2006). The Shorebird Working Group assumed an average turnover time of 10 days for transient priority shorebirds during fall (Lehnen and Krementz 2005). Some priority species, such as Western Sandpiper, have portions of their populations that overwinter in BCR 37. The Shorebird Working Group estimated the proportion of transient versus overwintering individuals that would be expected to use inland and/or managed habitats.

To calculate habitat needs for the overwintering proportion of priority shorebird populations, the working group used a 114-day length of stay in BCR 37 during the fall migration period (July 15 to November 5), as defined by International Shorebird Survey protocols. Habitat needs beyond November 5 were not calculated, the assumption being that normal precipitation levels and agricultural practices provide sufficient inland and/or managed habitat during the winter period (November 5 to March 5).

Stilt Sandpiper Example

Shown below is an example of the calculations for one priority shorebird species, Stilt Sandpiper (STSA), first to accommodate the fall transient population and second to accommodate the overwintering population.

North American STSA population estimate: 820 000 (Morrison et al. 2006).

Maximum proportion of North American STSA population passing through BCR 37 during fall: 60% or 492 000 individuals (from unpublished document by Hunter et al. with revisions per GCJV Shorebird Working Group, based on unpublished research and surveys and expert opinion).

Proportion of BCR 37 STSA population using managed/inland wetlands, agriculture, and grasslands: 80% or 393 600 individuals (from unpublished document by Hunter et al. with revisions per

GCJV Shorebird Working Group, based on unpublished research and surveys and expert opinion).

BCR 37 STSA fall population objective (adults plus 2 juveniles), managed/inland wetlands, agriculture, and grasslands: 787 000 individuals.

Estimated number of STSA that over-winter in BCR 37, managed/inland wetlands, agriculture, and grasslands: 5000 individuals (Lockwood and Freeman 2004, National Audubon Society 2002).

Estimated number of STSA, from population objective, that transit through BCR 37 during fall migration but do not over-winter: 782 000 individuals.

Estimated length of stay during fall migration, BCR 37: 10 days (Lehnen and Krementz 2005).

Maximum length of stay for over-wintering shorebirds from arrival in fall to beginning of winter period, BCR 37: 114 days (from International Shorebird Survey protocol, fall period defined as July 15 to November 5).

Grams of chironomid larva (used as representative shorebird food item) required to maintain STSA existence metabolic rate (EMR = 912 (Body Mass (kg))$^{0.074}$) and to sustain migration (EMR + 2 g): 9.243 g (Cummins and Wuycheck 1971, Kersten and Piersma 1987, Castro et al. 1989).

Grams of chironomid larva per square meter of managed habitat: 2.4 g (Lyons and Collazo 2006).

Habitat Needed, Transient STSA, x = (STSA-Use-Days)(EMR + 2 g per STSA per day)(Chironomid Larva Density), and thus:

x = [(782 000 STSA)(10 days)](9.243 g per STSA per day)(1m^2 per 2.4 g), or

x = 30 116 775 m^2, and in summary,

x = 3011.68 ha habitat required for fall transient STSA in BCR 37

Habitat Needed, Over-Wintering STSA, x = (STSA-Use-Days)(EMR + 2 g per STSA per day) (Chironomid Larva Density).

x = [(5000 STSA)(114 days)](9.243 g per STSA per day)(1m^2 per 2.4 g), or

x = 2 195 212.5 m^2 = 219.52 ha, and in summary,

x = 219.52 ha habitat required for over-wintering STSA in BCR 37 from arrival to start of winter period. It is assumed that sufficient inland/managed habitat will be available during the winter period (November 5 to March 5) through normal precipitation patterns and agricultural practices.

Thus, in summing calculations for these two periods, we estimate that the total area in, managed/inland wetlands, agriculture, and grasslands required for Stilt Sandpipers to meet our population objective in BCR 37 is about 3231 ha.

The Shorebird Working Group also identified non-priority shorebird species whose habitat requirements coincided with those of priority shorebirds and calculated the amount of additional habitat that would be required to support those species. Listed below are the transient and overwintering species whose needs coincide with Stilt Sandpiper, and the amount of additional habitat required to support them:

(a) Black-necked Stilt *(Himantopus mexicanus)* = 555 ha
(b) Greater Yellowlegs *(Tringa melanoleuca)* = 278 ha
(c) Lesser Yellowlegs *(Tringa flavipes)* = 277 ha
(d) Dunlin *(Calidris alpina)* = 1510 ha
(e) Pectoral Sandpiper *(Calidris melanotos)* = 464 ha
(f) Semipalmated Sandpiper *(Calidris pusilla)* = 161 ha
(g) Least Sandpiper *(Calidris minutilla)* = 145 ha
(h) Long-billed Dowitcher *(Limnodromus scolopaceus)* = 1271 ha
(i) Wilson's Phalarope *(Phalaropus tricolor)* = 144 ha

Total = 4805 ha

Thus, the total area required to support the Stilt Sandpiper and these other species is approximately 8036 ha (3231 ha for STSA + 4805 ha for other shorebird species).

GCJV staff used Skagen et al. (1999) shorebird migration data to step down priority shorebird species' habitat objectives from the BCR 37 level to the GCJV Initiative Area level. Using the Stilt Sandpiper habitat objectives above, we estimate that 30% (2412 ha) of the objectives should be provided in the Laguna Madre Initiative Area, 30% in the Texas Mid-Coast Initiative Area, 30% in the Chenier Plain Initiative Area and 10% (804 ha) in the Mississippi River Coastal Wetlands Initiative Area.

DISCUSSION

Despite limitations on the number of priority shorebird species selected by the Shorebird Working Group, the species selected appear to represent the most important shorebird habitat types in the GCJV region—beaches, wash-over areas, barrier islands, mudflats and shallow wetlands, and grasslands. Priority species represent year-round residents, transients, and winter residents.

Our preliminary assumption is that only 50% of the inland and/or managed habitat objectives are currently available in GCJV Initiative Areas. We propose to use a combination of remote sensing and field observations to validate and refine our estimates of inland and/or managed shorebird habitat availability, both among and within years.

We have acquired satellite imagery for the nine scene footprints that comprise the core of the BCR 37 inland shorebird habitat zones for October 1999, August 2002 and September 2004. To assess within-year variability, we also acquired additional imagery for a single scene during August, September and October 2002, and for another scene during August, September, and November 2004. We hope to be able to quantify inland and/or managed shorebird habitat availability by deriving a "correction factor" from habitat data collected through ground-truthing that would enable us to estimate the proportion of shallowly-flooded (≤15 cm) versus deeply-flooded (≥15 cm) habitat on the landscape.

Other evaluation priorities will be to validate assumptions concerning availability of invertebrates under differing management regimes, and assessing the response of priority shorebirds to targeted management provision through measurements of abundance, density and vital rates. Targeted monitoring and evaluation will lead to further refinement of our inland and/or managed fall shorebird habitat model and increase efficiency and effectiveness of priority shorebird habitat delivery in the GCJV region.

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