North American Waterfowl Management Plan Science Support Team
Technical Report No. 2012-01

Process for Developing the 2012 NAWMP Map – Geographies of Greatest Continental Significance to North American Waterfowl

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ABSTRACT

Improved spatial analysis tools and waterfowl population data for many regions of North America prompted refinement of the 2004 NAWMP map depicting areas most significant to waterfowl at the continental scale. The NSST established an 11-member committee to coordinate map revision via Joint Ventures (JVs) and their conservation partners. The committee was not able to develop universal criteria for area inclusion on the NAWMP map, but JVs were required to support proposals with the best quantitative information available. A total of 41 adjustments proposed by 15 habitat and 2 species JVs were approved by the map committee, but quality and reliability of available population data varied considerably among regions and proposals. Despite data limitations, the revised NAWMP map represented material improvements in depicting areas of continental significance to

waterfowl. However, given the subjectivity in its development and refinement, the NAWMP map has limited ability to inform conservation decisions. The committee advocates a succeeding effort to develop products for guiding conservation at appropriate scales and addressing the 3 fundamental goals of the 2012 NAWMP Revision. Key decision frameworks must be established to assure resulting maps and decision-support tools are rooted in a clearly defined and accepted context.

A product of the Significant Areas Map Committee of the NAWMP Science Support Team

Recommended citation:
Soulliere, G. J., B. M. Kahler, T. A. Bowman, M. G. Brasher, M. A. Johnson, R. S. Holbrook, M. J. Petrie, J. L. Vest, S. M. Slattery. 2012. Process for developing the 2012 NAWMP map -- geographies of greatest continental significance to North American waterfowl. North American Waterfowl Management Plan Science Support Team Technical Report 2012-01. 27pp.

INTRODUCTION AND PURPOSE

The map depicting "areas of continental significance to North American ducks, geese, and swans" in the 2004 update of the North American Waterfowl Management Plan (NAWMP 2004:6) was the result of a substantial effort by the NAWMP community. However, some boundary errors in the 2004 NAWMP map were identified by JVs following its release. In addition, recent JV planning and population inventory in North America has provided a better understanding of waterfowl distribution and abundance in many regions, including shifts in non-breeding waterfowl abundance during the past decade (e.g., populations of geese and ducks wintering at more northern latitudes).

Beyond providing a general overview of the most important waterfowl regions, the NAWMP map has been used to help assess applications for North American Wetlands Conservation Act (NAWCA) grants. The NAWCA provides funding to protect and manage wetlands for migratory birds and other wetland wildlife in Canada, the United States, and Mexico. Wetland conservation achieved through the NAWCA (and matching funds) is an important component of NAWMP delivery. The North American Wetlands Conservation Council (NAWCC), a 9-member body that decides which NAWCA grant proposals to fund, uses the NAWMP map and analogous maps from other continental bird initiatives in this process. Specifically, NAWCA grant applications are allocated additional points when proposed projects are within the boundary of areas designated significant to waterfowl and other wetland bird groups at the continental scale. Thus, the reliability of these maps in identifying continentally significant areas has important implications for effective conservation of waterfowl and waterbird habitats in North America.

Improved spatial analysis tools and waterfowl population data led to an interest by several JVs in revising the NAWMP map. Responding to this interest, the NAWMP Science Support Team (NSST) established an 11-member committee in 2010 to coordinate map revision. Because JVs were established as the vehicle to implement the NAWMP at regional scales, and because the NSST consists of avian biologists representing JVs and the four Flyways, the JV / NSST community was identified as the logical provider of map revision information. Upon developing a protocol for proposing adjustments to the map, the committee delivered to all JV Coordinators, JV Science Coordinators, and NSST members a formal request for such proposals.

Working with their conservation partners, JVs were asked to review the 2004 NAWMP map of geographies with continentally significance to waterfowl and recommend areas to be considered for reconfiguration, addition, or elimination within their respective JV regions (Appendix A). It was furthermore requested that empirically-based justifications accompany such recommendations. Only JVs interested in reconfiguring, adding, or eliminating areas on the 2004 NAWMP map were asked to respond to the request; those satisfied with area boundaries used in the 2004 map were not required to respond. JVs were informed that the updated map would appear in the 2012 NAWMP revision.

CRITERIA AND INFORMATION REQUEST

Only after considerable debate did the committee fully realize the inherent challenges in developing science-based criteria for identifying continentally significant waterfowl areas. Of primary concern was the lack of population data for some JV regions, precluding a quantitative approach for revising the NAWMP map. Nevertheless, JVs were asked to clearly justify proposed map changes. Specifically, the committee requested proposals establish for which periods of the annual cycle an area was most important, what percentage of a species' population was supported by a given area during that annual cycle period, and/or what percentage of the total North American waterfowl population depended upon a given area during some period of the annual cycle. A GIS shape-file depicting proposed adjustments within each JV region was also requested (Appendix A).

In the information provided to JVs, the map committee described how proposed adjustments would be reviewed and acted upon. Specifically, the committee's decision protocol was to accept or reject the recommendation by simple majority vote or request additional information if a proposed area appeared to have potential for inclusion but the submission was incomplete. JVs were informed that a draft revised NAWMP map including all committee supported adjustments would be provided to the full NSST for review and approval.

RESULTS AND DISCUSSION

Proposed map changes and associated population data were submitted by 23 contributors (15 habitat and 2 species JVs, Appendix B), many of whom worked with state and regional waterfowl experts to develop their submissions. Responses were compiled and reviewed by the full committee via e-mail, and determinations to approve individual proposals were made during a dedicated conference call. In most cases, approval or rejection of submissions was by unanimous consent; the committee requested additional information for a few proposals before reaching a decision. Upon completing the initial review and map revision process, the committee circulated a draft 2012 NAWMP map to all NSST members and NAWMP stakeholders who expressed an interest in the effort. The relatively minor adjustments subsequent to their review were approved by the map committee and a final map was produced for the 2012 NAWMP Revision (Figure 1).

Forty-one proposed map changes were approved by the committee (Appendix C). Most proposals addressed minor corrections to the geographic extent and location of "significant areas" as depicted on the 2004 NAWMP map. Some proposals resulted in extensive committee debate, often leading to requests for supplemental material or adjustments to proposed area boundaries. Some map changes were quite substantial, and included the following:

- Expansion of areas on Baffin Island, Newfoundland, and coastal Quebec (key nesting, molting, and wintering areas for sea ducks)
- Removal of sites along coastal Labrador and the Canadian Pacific Coast (new evidence suggests other sites are more important for molting and wintering sea ducks)
- Addition of the Central Rivers and Platte River regions in the central U.S. (key migration areas for ducks and geese using the Mississippi and Central flyways)

- Addition of the Prairie Hardwood Transition (significant breeding, migration, and increasing wintering importance for ducks and Canada geese)
- Addition of Taiga Plain and Shield and expansion of Boreal Plain and Shield in north-central Canada (important breeding areas for several duck species, including sea ducks)
- Addition of high-density duck, goose, and swan breeding areas in interior Alaska
- Reconfiguration of the Playa Wetlands Region to reflect areas of highest wetland density and importance to non-breeding ducks and geese
- Addition of the Eastern Boreal Hardwood Transition (primary black duck breeding range)

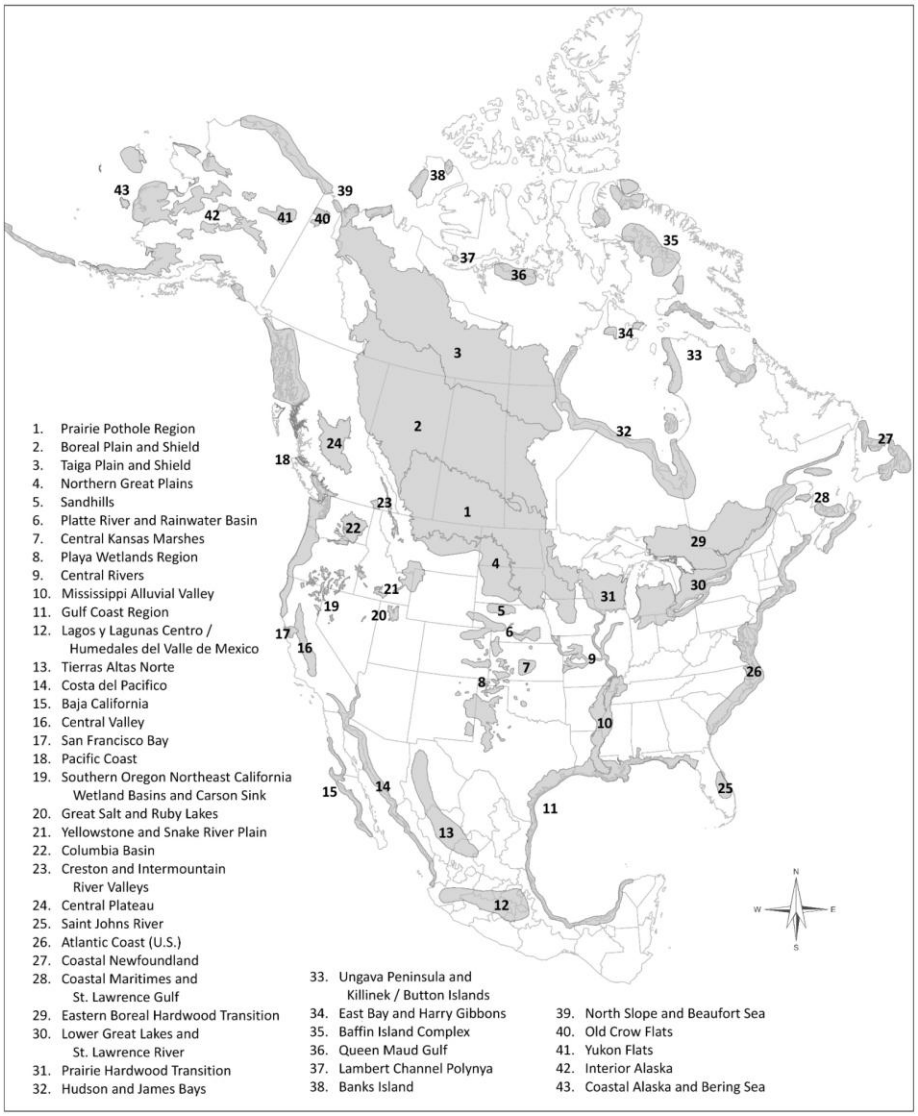

Figure 1. Revised map for the 2012 NAWMP, depicting areas of continental significance to North American ducks, geese, and swans. Shaded regions have highest relative importance to individual species or total continental waterfowl populations during the breeding, migration, and/or wintering periods. Additional areas important to waterfowl are not identified despite being significant at smaller scales.

Lack of quantitative and spatially consistent decision criteria for assessing "significance" to continental waterfowl populations hindered the committee's ability to objectively assess the merit of all proposals. For example, the committee was uncertain how to fairly assess the relative importance of smaller areas with high waterfowl densities vs. large areas with abundant waterfowl but at low densities. These comparisons became increasingly difficult

when made among different periods of the annual cycle. Moreover, the quality and reliability of available population data varied considerably among regions and proposals. In addition, some areas were identified as critical to a single species of high concern while others were deemed important on the basis of total waterfowl use across a great number of species. Finally, certain arid locations provided high value to waterfowl but inconsistently among years because of highly variable environmental conditions (e.g., playa wetlands).

The map committee agreed that despite these limitations and challenges, the revised 2012 NAWMP map represented material improvements in depicting areas of continental importance to North American waterfowl. However, given the degree of subjectivity in the map development and refinement process, the committee urged caution in using this map to inform conservation decisions.

MOVING FORWARD

The NSST map committee identified several concerns in using the NAWMP map as a tool to guide conservation activity. Of particular unease was the practice of awarding points to NAWCA grant applications (local scale projects) when proposed projects fell into "significant area" designations. The NAWMP map – a low resolution depiction of primary ecoregions having greatest relative waterfowl abundance – was never intended to be a tool for quantitatively evaluating local habitat projects. While regional-scale decision support maps serve as a bridge between conservation design and delivery for wetland birds (Thogmartin et al. 2011), the committee believed the NAWMP continental map was too crude for this type of application.

In recognition of imperfections characterizing the map revision approach and apprehension about application of the map to conservation decision making, the committee recommends a succeeding mapping effort that provides a means to target conservation spatially while addressing the 3 fundamental goals of the NAWMP Revision (NAWMP 2012). This work will likely result in a series of maps identifying significant areas for waterfowl populations, conservation of habitats, and human dimensions issues at multiple spatial scales. Although estimates of regional population abundance would be a key measure of area significance, consideration may also be given to distribution and abundance of waterfowl hunters, birders, and potential outdoor recreationists; ability to provide ecological goods and services (e.g., flood abatement); relative abundance of public lands; distribution of waterfowl species of greatest concern; relative risk of habitat loss or conversion; and/or the potential future importance of ecoregions to waterfowl and people as influenced by climate, habitat restoration potential, and land-use changes. Ultimately, a more sophisticated mapping approach will be needed to inform conservation priorities for achieving the fundamental goals of the 2012 NAWMP.

This recommendation was further expanded during a 2012 meeting of the NSST and Tri-Initiative Science Team (TriST), representing scientists from the waterbird, shorebird, and landbird communities. This assembly endorsed a communication to the NAWCC regarding concerns about use of continental-scale maps in NAWCA-proposal scoring formulae. Both the NSST and TriST agreed that continental-initiative maps should be improved iteratively over time

to include new population information or mapping refinements. Moreover, the group conceded the most effective maps are based on explicitly-defined purposes and criteria, and thus maps created explicitly to assist in the scoring of NAWCA grant applications should be developed with direct NAWCC staff collaboration. This partnership might add stringency and comparability of justifications for inclusion of areas; use of objective criteria to the extent possible given data limitations, or at least attempts towards consistent philosophies underpinning subjective decisions; and appropriate levels of resolution in depiction of identified areas.

These perspectives and an invitation by the NSST and TriST to work with the NAWCC regarding a grant-application scoring tool were extended in March 2012, beginning with a conference call between NSST, TriST, and the NAWCC (Appendix D). The call was held on 6 June, and meeting notes were generated by NSST representatives (Appendix E).

Conservation Decision Support Tools

Building an unbiased decision support system to target waterfowl habitat conservation requires objective criteria and reliable, scientific information. Moreover, to effectively address all 3 NAWMP goals, social science components must be added to the traditional population-habitat concentration. For example, provision of areas important to people for recreation and/or flood-water storage may be a highest conservation priority in some regions, building public support for wetland conservation and waterfowl values.

A decision support system to target waterfowl habitat conservation should be scalable. Although the priorities of conservation decision makers may vary at the state, regional, flyway, and continental scales, the process used to generate significant area maps can be the same. A common and easily understood system for prioritizing conservation work, even if priorities vary by scale, can provide mutual terminology and a forum for communication among conservation partners.

Potential Technical Approach. Decision criteria matrices (e.g., Table 1) can provide a starting point for discussing why and how to target conservation resources in a more transparent way. This or similar effort must seek to transfer knowledge and make the decision process understandable, repeatable, and adjustable over time with new information or changing priorities. More than population demography, this particular example accounts for pertinent habitat features plus social values related to NAWMP goal 3 (NAWMP 2012). In addition, the process allows for adding or deleting alternative criteria, depending on the decision context. Conservation issues, objectives, and measurable criteria are identified and weighted by perceived importance. "Weights" represent the relative value decision makers place on different objectives. Thus, adequate stakeholder participation in refining objectives and criteria to prioritize landscape features via weights will be essential and involve expertise and negotiation.

Table 1. Example of conceptual matrix for prioritizing conservation outcomes at various scales. Included are sample issues, objectives, criteria and weights that may be applied to spatial data (e.g., 10 x 10 km grid cells) used in developing decision support maps to focus resources on important landscapes having the greatest influence on waterfowl populations and those who hunt and view waterfowl. A direction (e.g., "maximize") is provided for each objective, recognizing the net influence of conservation effort may result in only slowing a negative influence in a target area.

Conservation issue	Objective	Weighting criteria (current condition)[a]	Weight
Population and species			
Limited by breeding habitat			
Species of concern	Maximize recruitment	Abundance or K	0.10
Total population	Maximize recruitment	Abundance or K	0.10
Limited by migration habitat			
Species of concern	Maximize recruitment (spring, cross-seasonal effect)	Abundance or K	0.03
Total population	Maximize recruitment (spring, cross-seasonal effect)	Abundance or K	0.02
Limited by wintering habitat			
Species of concern	Maximize survival	Abundance or K	0.10
Total population	Maximize survival	Abundance or K	0.05
	Other	Other	
Habitats and landscapes			
Expand value (acquire)	Maximize habitat quantity	Conservation lands (%)	0.10
Convert value (restoration)	Maximize habitat quantity	Hydric soils (%)	0.10
Increase value (enhancement)	Maximize habitat quality	Degraded habitat (%)	0.02
Acquisition effectiveness	Maximize investment return	Cost ($) / unit area	0.10
Other	Other	Other	
Stakeholders and social values			
Resource user opportunity			
Hunters	Maximize use / recruitment	Hunter density (or distance)	0.10
Viewers / recreationists	Maximize use / recruitment	Human density (or distance)	0.05
Education / outreach	Maximize use / recruitment	Human density (or distance)	0.05
Ecological goods and services			
Flood abatement	Minimize flood damage	Flood zone and upstream	0.05
Water quality	Minimize runoff (sediment, nutrient/chemical)	Degraded zone and upstream	0.03
Other	Other	Other	
Total			1.00

[a] Continentally standardized metrics for weighting criteria to be determined by expert committee

Statistical and spatial data representing each criterion can be used to generate information layers to which weights of relative importance may be applied. Indeed, initial efforts to summarize data of this type were made during development of the 2004 NAWMP map. Appendix B of the 2004 NAWMP provides a system for prioritizing landscape ecoregions based on species relative harvest, vulnerability and population trend, and geographic distribution during breeding and non-breeding periods (NAWMP 2004: 55-83). These and other data layers may be used to generate “input maps” for each criteria which may then be combined using agreed-upon formulae to produce one or more “output maps” depicting relative importance based on the combined weighted objectives (e.g., “thunderstorm maps”). However,

development of such conservation decision tools will require significant commitments of staff resources.

Roles and responsibilities. The NSST is a logical lead for developing regional- and continental-scale decision support tools to achieve NAWMP goals. Collaboration with NAWCC staff, Joint Ventures, Flyway Habitat Committee and Human Dimensions representatives, and other key partners will be critical to achieve positive outcomes, including process acceptance by the conservation community. The first step of this effort, gathering stakeholders and experts, will be more feasible if completed soon, building on the relationships established in 2011 when updating the NAWMP map. The NSST should reestablish a NAWMP map committee, contact and collaborate with listed partners, and begin to develop tools to focus resources and meet NAWMP goals following guidance in the 2012 NAWMP Action Plan.

SUMMARY

While revising the NAWMP map of areas having greatest significance to North American waterfowl, the NSST map committee encountered substantial challenges that merit consideration when using the final product. Quality of population estimates, especially during the non-breeding period, was inconsistent across regions, which resulted in rather subjective submissions and decisions about proposed changes. Furthermore, the committee encountered ambiguity around the definition of "significance" to waterfowl, an issue whose resolution was beyond the scope of our mandate and available time. For these and other reasons, this map should be considered a general guideline, and not a spatially explicit tool for making decisions at local scales.

The committee also recognized that a map of continentally significant waterfowl areas, no matter how well constructed, should not be confused with a map (or maps) of NAWMP continental priority areas. The latter requires consideration of other factors such as risk of habitat loss, opportunities for conservation, and the ability of NAWMP to influence those opportunities. To that end, we recommend a series of maps be developed depicting the spatial distribution of factors important to decision-making under the revised NAWMP. Such maps will be equally, if not more fraught with data limitation than the current map. Thus, collective application will require a structured approach for addressing uncertainty and learning. Finally, key decision frameworks must be established in advance to assure these maps, and any decision-support tools arising from them, are rooted in a clearly defined and accepted decision context.

ACKNOWLEDGEMENTS

We thank Rex Johnson, a founding member of this committee, for valuable insights and institutional knowledge regarding processes used and challenges encountered in developing earlier versions of the NAMWP map. We also thank Jorge Coppen, Jim Dubovsky, Seth Mott, map-revision contributors (Appendix B), and members of the NSST and Tri-Initiative Science Team for their input and assistance, which greatly improved the quality of this map and report.

LITERATURE CITED

NAWMP. 2004. North American Waterfowl Management Plan: strengthening the biological foundation (Implementation Framework). U.S. Department of Interior, Fish and Wildlife Service, and Environment Canada, Canadian Wildlife Service.

NAWMP. 2012. North American Waterfowl Management Plan 2012: people conserving waterfowl and wetlands. Canadian Wildlife Service, U.S. Fish and Wildlife Service, Secretaria de Medio Amiente y Recursos Naturales.

Thogmartin, W. E., B. A. Potter, and G. J. Soulliere. 2011. Bridging the conservation design and delivery gap for wetland bird habitat conservation in the Midwestern United States. Journal of Conservation Planning 7:1-12.

Appendix A

NAWMP Areas of Continental Significance Map - Review and Refinement *(April 2011)*

NSST Map Committee: Greg Soulliere (UMRGLJV), Josh Vest (IWJV), Mike Brasher (GCJV), Rob Holbrook (EGCJV), Rex Johnson (HAPET-East), Mark Petrie (PCJV), Mark Gloutney (EHJV), Tim Bowman (SDJV), Mike Johnson (NDGF), Tim Jones (ACJV), and Tim Moser (AGJV)

Purpose

Review and refine the 2004 NAWMP map identifying areas of continental significance to ducks, geese, and swans of North America (see page 6 of NAWMP 2004 Implementation Framework). This request is in response to JV staff that identified a need to reconfigure, add, or eliminate shaded areas of the 2004 map within their respective JV regions. The updated map depicting areas of continental significance to waterfowl will appear in the 2012 NAWMP revision.

Background

Substantial effort developing the 2004 NAWMP map resulted in a valuable tool to identify areas of greatest importance for waterfowl in North America. The current NAWMP Map Committee envisions a 2012 priority areas map with a very similar appearance to the 2004 version. However, recent JV planning and population inventory in some regions has provided a much better understanding of bird distribution during breeding and non-breeding periods. Thus some of the shaded areas in the 2004 map may be reconfigured or removed based on new information and there may be new areas of significance at the continental scale to be included on the map.

General Criteria for New/Reconfigured Priority Areas

After considerable debate, the committee realized the challenge of developing purely science-based criteria for identification of "areas of continental significance to waterfowl." The relatively short turn-around time for this effort, coupled with lack of population surveys in some JV regions, would not allow strict adherence to a quantitative approach for a 2012 map revision. Instead, we are asking NSST members (and/or JV Coordinators) to provide recommendations for potential adjustments to the 2004 map, and a brief justification for the recommendation(s). Proposed map adjustments will be reviewed collectively by the NAWMP map committee who may accept or reject the recommendation (by simple majority vote) or request additional evidence that a proposed area has continental significance to waterfowl. A draft map which includes all committee supported adjustments will be provided to the full NSST for review and request for approval.

NSST Member Assignment

1) Please review the 2004 NAWMP map with areas of continental significance to North American ducks, geese, and swans.
2) If shaded portions of the 2004 map do not accurately portray areas of continental significance to waterfowl in your JV region of interest, please complete the attached spreadsheet and provide a revised map with priority areas for your JV region.

a. *For new or reconfigured areas* – Using the attached spreadsheet, identify the JV, ecological region (e.g., small BCR, BCR sub-region, or restricted area), and criteria used for designation, including annual-cycle period of greatest importance for that priority eco-region (see examples). Also develop a map shape file (or hand drawing) of the new or reconfigured priority area.
b. *For areas no longer considered of continental significance to waterfowl* – Provide the name or the area from the 2004 map with a brief explanation for removing it from the list of priority areas.

3) Please return completed spreadsheet, map shape files / drawings, and associated information to Greg Soulliere (Greg_Soulliere@fws.gov) by 1 June 2011.

Please remember: 1) the areas depicted for your JV region in the 2004 NAWMP map may require no adjustment, 2) any additions to the map must be considered **areas of continental significance** (not regional significance) to waterfowl, 3) this process should not take a lot of your time, but should be based on the best available information for your region, and 4) we understand this is not a completely objective process but we hope our work captures areas of greatest continental significance to waterfowl as well as documentation of the effort used to identify those areas for the 2012 NAWMP.

Thank you,

NAWMP Significant Areas Map Committee

Appendix B
List of Information contributors and affiliations for the 2012 NAWMP significant geographies map revision.

Name, organization	Affiliation
Anne Bartuszevige, ABC	Playa Lakes Joint Venture
Carol Beardmore, USFWS	Sonoran Joint Venture
Andy Bishop, USFWS	Rainwater Basin Joint Venture
Tim Bowman, USFWS	Sea Duck Joint Venture
Mike Brasher, DU Inc.	Gulf Coast Joint Venture
Andre Breault	Canadian Intermountain and Pacific Coast Joint Venture
Steve Brock, USFWS	Lower Mississippi Valley Joint Venture
John Coluccy, DU Inc.	Upper Mississippi River and Great Lakes Joint Venture
Jorge Coppen, USFWS	Division of Bird Habitat Conservation
Pat Devers, USFWS	Black Duck Joint Venture
Jim Giocomo, TPWD	Oaks and Prairies Joint Venture
Mark Gloutney, DU Canada	Eastern Habitat Joint Venture
Mary Gustafson, ABC	Rio Grande Joint Venture
Rob Holbrook, USFWS	East Gulf Coastal Plain Joint Venture
Keith McKnight, USFWS	Lower Mississippi Valley Joint Venture
Mark Petrie, DU Inc.	Pacific Coast Joint Venture
Mike Rabe, AGFD	Pacific Flyway (multiple Joint Ventures)
Tasha Sargent, EC	Canadian Intermountain and Pacific Coast Joint Venture
Stuart Slattery, DU Canada	Prairie Habitat Joint Venture
Brian Smith, ABC	Appalachian Mountains Joint Venture
Greg Soulliere, USFWS	Upper Mississippi River and Great Lakes Joint Venture
John Tirpak, USFWS	Lower Mississippi Valley Joint Venture
Josh Vest, USFWS	Intermountain West Joint Venture

Appendix C

Joint Venture and NAWMP Science Support Team responses to map boundary and data request (source citations provided when included by submitting party).

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Canadian Intermountain				
10	BC Central Interior	(B) Barrow's Goldeneye (15%), Mallard (1%), Hooded Merganser (3%), Bufflehead (4-5%), Ring-necked Duck (4%)	Breault et al. 2010	Adjustment to 2004 polygon based on improved waterfowl information from the USFWS-Pac. Flyway-DUC and CWS Annual May Breeding Survey.
10	BC Creston Valley	(B) Ducks and geese ?, (M) Ducks and geese (35,000)?		No change from 2004 boundaries.
Black Duck and Eastern Habitat				
12	Eastern Boreal Hardwood Transition	(B) American Black Duck (>33/100 km2 in localized areas; 12-33 breeding pairs throughout most of area). (M) American Black Duck	USFWS/CWS eastern waterfowl breeding survey	Highest densities of breeding black duck pairs throughout breeding range. Highest estimated densities of all breeding waterfowl in southwest corner of BCR 12.
13	Lower Great Lakes and St. Lawrence River	(B) American Black Duck (>33/100 km2 in localized areas; 12-33 breeding pairs throughout most of area). (M) American Black Duck (est. 35-45%), (W) American Black Duck (est. 10%)	Canadian Wildlife Breeding Waterfowl Survey (Bordage et al. in prep). Canadian Mid-Winter Survey;	Highest densities of breeding American Black Duck pairs throughout breeding range.
East Gulf Coastal Plain				
27	Northwest Florida			No expansion but rather a “correction" to capture bays, sounds, near-shore, and offshore habitats of 2004 map #12 (East Gulf Coast) that are primary wintering habitats for Redheads and both species of scaup. Exclusion of these habitats was probably unintentional and likely resulted from a lack of precision when delineating the original map.
27	West Tennessee and Kentucky	(B) Wood Duck	Bellrose 1980	Area supports some of the highest concentrations of breeding wood ducks in Mississippi Flyway.
		(M) Ducks and geese (>5%, 4 million)	Bellrose 1980	Important migration corridor for dabbling ducks, particularly Mallards, Gadwall, Northern Pintail, American Widgeon, and American Black Duck.

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
East Gulf Coastal Plain (cont.)				
27	West Tennessee and Kentucky (cont.)	(W) Mallards (4-7%)	MWI data	Recent high of 540K mallards (2006) represents 7% of NAWMP objective; 2001-2010 AVG of 294K mallards represents 4% of NAWMP objective.
		(W) Ducks	MWI data	Recent high of 672K ducks (2006) represents 1% of NAWMP objective of 75 million; 2001-2010 AVG of 372K is a 13% increase over previous decade.
		(W) Geese	MWI data	2001-2010 AVG of 103K total geese is a 58% increase over previous decade.
37	Gulf Coastal Prairie	(W) Scaup	Kinney 2004, F. Roetker, FWS, Pers. comm.	Experimental survey revealed 420,000 - 860,000 scaup in off-shore waters of Louisiana during winters 2000-2002. Although not formally surveyed, large concentrations of scaup also regularly observed in TX off-shore waters. Smaller numbers regularly observed in coastal waters of MS and AL.
		(W) Redhead	USFWS, Gulf of Mex. Midwinter REDH survey, unpublished data	1981-2010 average mid-winter abundance of 498,000 REDH in bays, lagoons, and off-shore waters of LA and TX (98% of these in TX). Smaller numbers observed in coastal waters of MS and AL
Intermountain West				
9	Carson Sink	(M) Tundra Swan, principal migration corridor between Great Salt Lake and Central Valley of California. Up to 30% of the western population may migrate through the Carson Sink region. Peak migration count of 12,700 (16% Western population); does not account for turnover.	Ely unpublished data; NWR & NDOW surveys	Redraw of 2004 map boundary (#25) to more accurately reflect wetland complexes within the Carson Sink region used by waterfowl. The original 2004 boundary appeared to be drawn arbitrarily. The attached boundary reflects the geophysical extent of the Carson Sink wetland complexes. Shapefile attached. Further Explanation and narrative attached.
		(B) Regionally important breeding area for Cinnamon Teal, Redhead, and Gadwall (15,000 ducklings)	Kadlec and Smith 1989, Baldassarre and Bolen 2006, Pacific Flyway data book	
		(B) Cinnamon Teal (11% Pacific Flyway Population including Alaska), (M) ducks (>330,000 peak count) , (W) Tundra Swans ≥7% western population; Canvasback ≥ 50% Pacific Flyway population	NDOW survey data	

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Intermountain West (cont.)				
9	Columbia Basin	(M) Migration region for Northern Pintails, Tundra Swans, other waterfowl. Lacking survey data (W) Mallards (1,000,000; 8% continental)	Miller et al. 2005, 2010; Ely unpublished data Pacific Flyway Midwinter Surveys; Ball et al. 1989	Redraw of Columbia Basin 2004 map boundary (#29) to more accurately reflect geographic extent of waterfowl habitats in this landscape. Shapefile attached. Further explanation and narrative attached.
9	Great Salt Lake	(M) Canada Goose (30% RMP) (M) Tundra Swan (75% Western pop; 33% Continental pop.) (M) Ducks, geese, swans (est. ≥3%, ≥2.2 million), Northern Pintail (est. 13-20%) (B) Cinnamon Teal (16-50%); 37% Pacific Flyway population including Alaska	Aldrich and Paul 2002 Aldrich and Paul 2002; UDWR surveys; Ely unpublished data-attached Bellrose 1980, Aldrich and Paul 2002; IWJV in prep. Bellrose 1980, Aldrich and Paul 2002; Pacific Flyway data book	Redrawing of Great Salt Lake boundary (#27 in 2004 map) to accurately reflect extent of GSL habitats. Half of the #27 boundary was comprised of the Wasatch Mountains. Shapefile attached.
9	Ruby Valley	(B) Southern breeding extent of Canvasbacks; high density (5.2/km^2) and productivity (< 3,500 ducklings) (B) Rocky Mountain Trumpeter Swan Translocation and breeding site (22 birds or 1% of the Rocky Mountain Population)	Bouffard 1982, Kruse et al. 2003 Olson 2009	2004 map location (#26) drawn in an incorrect location. Attached map reflects accurate boundary for the Ruby Valley.
9	Southern Oregon-Northeastern California	(M) Ducks, geese, swans (>2%, >1.8 million) (B) Cinnamon Teal (>23% Continentalb,c;55% Pacific Flyway population, Mallard (30% Pacific Flyway States, 18% including Alaska), Redhead (18% Pacific Flyway States including Alaska) (M) Northern Pintail (> 28%)[a], Greater White-fronted Goose (>50% Pacific population) (M) Tundra Swan (82% Western pop.; 37% Continental pop.)	Bellrose 1980, Fleskes and Yee 2007 CAFG, ODFW BPOP survey data, Pacific Flyway data book Fleskes and Yee 2007 Fleskes and Yee 2007; Ely unpublished data-attached	Expansion of the Klamath Basin and Malheur Basin portions of 2004 map #'s 23 and 24, respectively. Expansion represents distribution of waterfowl migration (primarily spring) and breeding habitat in the southern Oregon-northeastern California (SONEC) region. The SONEC region provides critical linkage between continentally significant wintering habitat in the Central Valley of California and continentally significant breeding habitat in Canada and the U.S. Shape file attached. Further explanation and narrative attached.

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Intermountain West (cont.)				
9, 10	Yellowstone-Intermountain Wetlands	(M) Tundra Swan (migration/staging area for western population linking front range of Alberta & Montana with Great Salt Lake; ≥ 20% of Western population)	Bellrose 1980; Ely et al. 1997; Ely unpublished data	Redraw of Yellowstone-Intermountain Wetlands 2004 boundary (#28) to reflect the Core Tri-State Area boundary as described in the 2008 Pacific Flyway Trumpeter Swan Management Plan.
		(B) Trumpeter Swan (>50% of U.S. RMP Breeding Segment)	Olson 2010	
		(W) Trumpeter Swans (80% of Rocky Mountain Population; 19% of total continental population	Subcommittee on Rocky Mountain Trumpeter Swans 2008	
10	Bitterroot-Intermountain	(M) Tundra Swans 15% Western population	MTFWP Survey data; Ely unpublished data	Redraw of the Bitterroot -Intermountain 2004 map boundary (#30) to reflect Flathead, Mission, and Blackfoot Valleys. Bitterroot Valley removed from boundary because it provides limited waterfowl value. Shapefile attached. Further explanation and narrative attached.
		(M) Northern Pintail ≥2% Continental population during spring migration	MTFWP Survey data; Miller et al. 2005, 2010	
		(B) Trumpeter Swans trans-located into Flathead and Blackfoot Valleys to establish breeding populations (180 birds).		
Pacific Coast (Canada)				
5	Georgia Basin	(W) Wrangel Island Snow Geese (?%)	Andre to Revise/add	Adjust 2004 polygon - Retain Georgia Basin only (shape file attached) Primary wintering, some migrating for Snow Geese, Trumpeter Swan, dabbling duck (Mallard, Northern Pintail, American Wigeon, Green-winged Teal) and sea duck (Surf Scoter)
		(W) Pacific Coast Trumpeter Swan (25%-35%)	Caithamer 2001 and Breault 2003.	
		(M) Pacific Black Brant (est. 50%)	McKelvey et al. 1992	
		(W) West High Arctic Brant (3-18%)	Pacific Flyway Council 2002.	
		(W) Mallard, Northern Pintail, American Wigeon (200K)	WDFW 2005 (95% Confidence Interval)	
5	Haida Gwaii	(W) Long-tailed Duck	Bellrose 1978 shows less than 1%, consider excluding LTDU?	Reduce 2004 polygon - Retain eastern coastal area. Primary wintering, some migrating for sea ducks
		(W) White-winged Scoter, Black Scoter	There is limited survey information to provide estimates, however these species are the key species of interest based on JV knowledge.	
5	North & Central Coast	(W) Red-breasted Mergansers (2%)	Bellrose 1978	Reduce 2004 polygon - Retain coastal area. Primary wintering, some migrating for sea ducks
		(W) Barrow's Goldeneye, Harlequin Duck, Surf Scoters	There is limited survey information to provide estimates, however these species are the key species of interest based on JV knowledge.	

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Pacific Coast (U.S.)				
5	Pacific Coast	(M) Mid-Winter Diving Duck Population = 43,000, (W) Mid-Winter Dabbling Duck Objective = 283,000	Koneff 2003	
Prairie Habitat				
4	Old Crow Flats	(B) 0.6 % of total duck (BPOP) population, 141.2 ducks/mi2 (long term average, 1960-2006)		
6	Taiga Plain	(B) 9.4 % of total duck (BPOP) population, 18.2 ducks/mi2 (long term average, 1960-2006)		
7	Boreal Shield	(B) 6.1 % of total duck (BPOP) population, 9.1ducks/mi2 (long term average, 1960-2006)		
7	Taiga Shield	(B) 3.5 % of total duck (BPOP) population, 18.7 ducks/mi2 (long term average, 1960-2006)		
Playa Lakes				
18, 19	Short and mixed-grass prairie, respectively	(M) Northern Pintail (est. 30% of Central Flyway Population)	Bellrose 1980	Playa Lakes Complex which includes all polygons from The Platte River in NE to Southern Texas. This represents a wetland surface area density of 1.5%. Shape files are attached.
		(M) Northern Pintail (27% of MRGV, 67% of PLR birds and 80% of GC NOPI migrated through the playa lakes complex region)	Haukos et al. 2006	
		(M) Mallard (1.1 million), Gadwall (71,000), American Wigeon (109,000), Green-winged Teal (162,000), Northern Shoveler (32,000), Wood Duck (25,000), Redhead (81,000), Canvasback (11,000), Scaup (33,000), Ring-necked Duck (7,000), Ruddy Duck (3,000)	Koneff 1970s	
		(W) All Species (~2.8 million ducks)	Smith 2003	
Rainwater Basin				
19	Rainwater Basin and Central Platte River	(M) Ducks and geese (12.1 million)		Expansion of 2004 map with accepted boundary approved by management board
		(M) Northern Pintail (est. 30%)	Bellrose 1980	
		(M) Mallard (est. 50%)	Bishop and Vrtiska 2008	

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Sea Duck				
3	Belcher Islands (NEW AREA)	(B) Molting scoters (all 3 species) and Common Eider, (W) Hudson Bay Common Eider	pers. com. Grant Gilchrist (EC)	[I've been unable to get more detailed information about this area - those knowledgeable are in the field. If more info needed, check back with me]
3	Killinek/Button Islands	(W) King Eiders	Christine Lepage and Scott Gilliland, unpubl. data	20,000 birds, or at least 5% of wintering King Eider population
3	South Coast Baffin / Hudson Strait	(B) Northern Common Eiders	pers. com. Grant Gilchrist (EC)	Breeding and molting northern common eiders
3, 4	Old Crow Flats - Anderson River Delta - Bathurst Polynya	(B) Variety of species breeding and molting	T. Bowman, pers. comm.	Old Crow Flats was not drawn on 2004 map. Tuktokoyuk Peninsula (part of #56) is a molting area for many tens of thousands of SUSC, WWSC, scaup, and LTDU
3, 6, 7	Western Boreal Forest	(B) Core breeding area for >50% Pacific Surf and White-winged Scoters	De La Cruz et al. 2009	Expand north end of polygon to include core breeding areas for SUSC and WWSC as determined by satellite telemetry in AK, CA, WA, and BC
4	Yukon Flats			Incorrectly drawn on 2004 map. See map for revised boundaries.
4, 6, 7, 8	Central Canada Taiga Shield (NEW AREA)	(B) core breeding area for about 90% of eastern Black Scoter	Based on extensive satellite telemetry; Scott Gilliland, unpubl. data.	
7	South Labrador Coast			REMOVE. I have checked with sea duck and goose folks and can find no good justification for including this area in the priorities map. I'm not sure what the original justification for this area was, but it may have been based on a preliminary assessment of sea duck use, which we now have a better handle on.

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Sea Duck (cont.)				
7	North Labrador Coast			REMOVE. I have checked with sea duck and goose folks and can find no good justification for including this area in the priorities map. I'm not sure what the original justification for this area was, but it may have been based on a preliminary assessment of sea duck use, which we now have a better handle on.
7	James Bay Lowlands	(B) Molting scoters (all 3 species; >90% of BLSC)		Expand eastern end of polygon to eastern mouth of James Bay to be more inclusive of key molting areas. Also, I suggest renaming this area as James Bay Lowlands and Coast
7, 8, 12	Area not defined - Quebec			Questions for mapping committee: If the southern half of Québec accounts for more than 50% of breeding American Black Duck should it be considered as an "area of continental importance"? And if the northern half of Québec account for more than 60% of breeding Eastern Harlequin Duck?
8	Anticosti / Mingan Islands	(W) 45,000 birds or >25% Canadian wintering population of Northern Common Eider	CWS, unpubl. data	
8	Coastal Newfoundland	(W) Northern Common Eiders	Pers. com. Scott Gilliland (CWS)	REMOVE southwest coastal section; extent eastern section northward to northern tip of Newfoundland (>50% Canadian wintering population of Northern Common Eider)
8	Gulf of St. Lawrence			Extend polygon northeast as noted on hardcopy map.
8	Quebec Eastern Boreal Forest (NEW AREA)	(B) 100% of Eastern Barrow's Goldeneye	Environment Canada. 2010. Management Plan for the Barrow's Goldeneye (Bucephala islandica), Eastern Population, in Canada [Draft])	100% of breeding area for eastern Barrow's Goldeneye

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Sonoran				
32, 33	Southern California and Lower Colorado River			Expansion of Lower Colorado River area in AZ and CA that extends through the Colorado River wetlands and delta in Mexico and on into the west coast of Mexico (2004 map)
		(M) total waterfowl migrating through this area is probably much more than the 1M in winter, considering the # of waterfowl on the Mexican coasts during winter; 1.3% of total 75M, (W) ~1,000,000 waterfowl	MWI, refuge counts, Shufford 2000, Barnum 2004	Summed maximum MWI counts from San Jacinto, Salton Sea and the Lower Colorado River for winter column; then added mid-winter counts from northern Mexico for the migration period, as these birds are moving through the LCR/SS/SJ area on the way to the coasts of Mexico; we think this is a conservative number.
		(M) 2.7% of Green-winged Teal, 1.5% of American Wigeon, 19.7% of the Pacific Flyway/Rocky Mountain Canada Geese, 1.4% of Cinnamon Teal, 4.15 of Northern Pintail, 11.8% of Northern Shoveler, 2.85 of Redhead, 6.6% of Ruddy Duck, 1.2% scaup, 1.5% buffleheads, 31% Western Arctic Lesser Snow Goose, 0.3% of Gadwall	MWI, and refuge counts, compared to the 2004 implementation framework populations	used the above counts by species and divided by the 2004 Framework population estimates.
		(W) 0.5% of Green-winged Teal, 0.6% of American Wigeon, 19.7% of the Pacific Flyway/Rocky Mountain Canada Geese, 0.03% of Cinnamon Teal, 1.0 of Northern Pintail, 1.8% of Northern Shoveler, 0.2 of Redhead, 4.7% of Ruddy Duck, 0.09% scaup, 0.3% buffleheads, 30% western Arctic Lesser Snow Goose, 0.2% of Gadwall	MWI, and refuge counts, compared to the 2004 implementation framework populations	used the above counts by species and divided by the 2004 Framework population estimates.
Upper Mississippi River and Great Lakes				
23	Prairie Hardwood Transition	(M) Southern James Bay Population Canada Goose (>50%), Mississippi Valley Population Canada Goose (>50%)	Bellrose 1980	Expansion of 2004 area #41 (Saginaw Bay) to BCR 23. Use BCR 23 boundary.
		(M) Canvasback (>50%)	Coordinated Can Survey	
		(B) Mississippi Flyway Giant Canada Goose (30%)	Luukkonen and Phelps 2010	
		(B) Ducks and geese (est. 3%, 2 million), 14.4 ducks/mi2; (M), Ring-necked Duck (est. 30%), Common Goldeneye (est. 30%), Tundra swan (>30%)	Soulliere et al. 2007	Second highest BCR for breeding duck density in the lower 48 U.S.
			UMRGLR JV 2007	Extensive high predicted value for breeding waterfowl. Localized high predicted value for non-breeding waterfowl.

Joint Venture BCR	Area label for map	Percent (%) of continental population occurring in area by life-cycle period (species or total birds) Breeding (B), Migrating (M), and Wintering (W)	Data/estimate source	Notes (include reference to 2004 map)
Upper Mississippi River and Great Lakes (cont.)				
22, 24	Central Rivers	(M) Ducks and geese (>5%, 4 million)	Bellrose 1980, Soulliere 2007	Expansion of 2004 area #9 (Cent Miss and Illinois River) to include Missouri River. Shape file attached.
		(W) 30-70% Eastern Prairie Population Canada Geese	MDOC analysis	
			UMRGLR JV 2007	Localized high predicted value for breeding and non-breeding waterfowl.

[a] Continental BPOP for survey years used instead of NAWMP 2004 Continental estimate to calculate % continental contribution. Years of regional population estimates coincide with lowest continental pintail BPOP on record which is >60% lower than NAWMP estimate.

[b] IWJV lies outside of Continental Breeding Survey Areas. Breeding populations in IWJV contribute primarily to Pacific Flyway populations.

[c] Most of the continental population of Cinnamon Teal do not breed in Traditional Continental Breeding Survey Areas; Bellrose 1980, Gammonley 1996

[d] Utah and Nevada not included in Pacific Flyway Breeding population estimates

LITERATURE CITED

Aldrich, T. W., and D. S. Paul. 2002. Avian ecology of Great Salt Lake. Pages 343–374 in J. W. Gwynn, editor. Great Salt Lake: an overview of change. Utah Department of Natural Resources and Utah

Baldassarre, G. A., and E. G. Bolen. 2006. Waterfowl Ecology and Management. Second edition. Krueger Publishing Company, Malabar, Florida, USA.

Ball, I. J., R. D. Bauer, K. Vermeer, M. J. Rabenberg. 1989. Northwest riverine and pacific coast. Pages 429-449 in L. M. Smith, R. L. Pederson, and R. M. Kaminski, editors. Habitat management for migrating and wintering waterfowl in North America. Texas Tech University Press, Lubbock, Texas, USA.

Barnum 2004 (full citation not provided with data submission)

Bellrose, F. C. 1980. Ducks, geese and swans of North America. Stackpole Books, Harrisburg, Pennsylvania, USA.

Bishop, A. A, and M. V. Vrtiska. 2008. Effects of the Wetland Reserve Program on Waterfowl Carrying Capacity in the Rainwater Basin Region of South-Central Nebraska. Final report. Conservation Effects Assessment Project. Natural Resources Conservation Service. Washington DC. USA.

Bordage, et al. (in prep, full citation not provided with data submission)

Bouffard, S. H. 1982. Wildlife values versus human recreation: Ruby Lake National Wildlife Refuge. Transactions of the North American Wildlife and Natural Resources Conference 47:553–558.

Breault, A. 2003. Migratory Gamebird Populations in British Columbia: Surveys and Trends. Draft Report. Canadian Wildlife Service, Delta, BC

Breault, A., Harrison, B., Kroeker, K, and Watts, P. 2010. Waterfowl Breeding Population Survey of the Central Interior Plateau of British Columbia. May 2010. 9p

Caithamer, D.H. 2001. Trumpeter Swan Population Status 2000. USFWS. 14 pp.

Coordinated Fall Canvasback Survey, Minnesota Department of Natural Resources, unpublished annual report.

De La Cruz, S.E.W., J.Y. Takekawa, D.R. Nysewander, J.R. Evenson, D. Esler, W.S. Boyd, and D.H Ward. 2009. Spring migration routes and chronology of surf scoters (*Melanitta perspicillata*): a synthesis of Pacific coast studies. Can, J. Zool. 87: 1069-1086.

Ely, C. R., D. C. Douglas, A. C. Fowler, C. A. Babcock, D. V. Derksen, and J. Y. Takekawa. 1997. Migration behavior of Tundra Swans from the Yukon-Kuskokwim Delta, Alaska. Wilson Bulletin 109:679–692

Ely, C. R., unpublished data. Track Tundra Swan movements. Available online at: http://alaska.usgs.gov/science/biology/avian_influenza/TUSW/index.php
Fleskes, J. P., and J. Y. Yee. 2007. Waterfowl distribution and abundance during spring migration in southern Oregon and northeastern California. Western North American Naturalist 67:409–428.
Gammonley, J. H. 1996. Cinnamon Teal (*Anas cyanoptera*). In The Birds of North America, NO. 209, (A. Poole and F. Gill, eds.) The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.
Geological Survey Special Publication, Salt Lake City, Utah, USA.
Haukos, D. A., M. R. Miller, D. L. Orthmeyer, J. Y. Takeawa, J. P. Fleskes, M. L. Casazza, W. M. Perry, and J. A. Moon. 2006. Spring Migration of Northern Pintails from Texas and New Mexico, USA. Waterbirds 29:127-136.
Kadlec, J. A., and L. M. Smith. 1989. The Great Basin marshes. Pages 451–474 in L. M. Smith, R. L. Pederson, and R. M. Kaminski, editors. Habitat management for migrating and wintering waterfowl in North America. Texas Tech University Press, Lubbock, Texas, USA.
Kinney, S. D. 2004. Estimating the population of greater and lesser scaup during winter in off-shore Louisiana. Thesis, Louisiana State University, Baton Rouge, Louisiana, USA.
Koneff 1970s (full citation not provided with data submission)
Koneff 2003 (full citation not provided with data submission)
Kruse, K. L., J. Lovvorn, J. Y. Takekawa, and J. Mackay. 2003. Long-term productivity of canvasbacks (*Aythya valisineria*) in a snowpack-driven desert marsh. Auk 120:107-119.
Luukkonen, D. R. and A. Phelps. 2010. Status of Mississippi Flyway giant Canada geese. Mississippi Flyway Council Meeting Minutes, July, 2010, Mobile, Alabama, USA.
McKelvey et al. 1992. Unpublished CWS Report
Miller, M. R., J. Y. Takekawa, D. S. Battaglia, R. T. Golightly, and W. M. Perry. 2010. Spring migration and summer destinations of northern pintails from the coast of southern California. Southwestern Naturalist 55:501–509.
Miller, M. R., J. Y. Takekawa, J. P. Fleskes, D. L. Orthmeyer, M. L. Casazza, and W. M. Perry. 2005. Spring migration of northern pintails from California's Central Valley wintering area tracked with satellite telemetry: routes,
Olson, D. 2009. Trumpeter Swan survey of the Rocky Mountain population, U.S. breeding segment: Fall 2009. USFWS, Lakewood, CO, unpublished report.
Olson, D. 2010. Trumpeter Swan survey of the Rocky Mountain population, U.S. breeding segment: Fall 2010. USFWS, Lakewood, CO, unpublished report.
Pacific Flyway Council. 2002. Pacific Flyway management plan for Pacific brant. Pacific Flyway Study Comm. Portland, OR Unpubl. rept., 40 pp. + appendices
Shuford 2000 (full citation not provided with data submission)
Smith 2003 (full citation not provided with data submission)
Soulliere, G. J., B. A. Potter, J. M. Coluccy, R. C. Gatti., C. L. Roy, D. R. Luukkonen, P. W. Brown, and M. W. Eichholz. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Waterfowl Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, Minnesota, USA.
Subcommittee on Rocky Mountain Trumpeter Swans. 2008. Pacific Flyway management plan for the Rocky Mountain Population of Trumpeter Swans, Pacific Flyway Study Committee. USFWS, Portland, Oregon. Unpublished Report.
U.S. Fish and Wildlife Service. Gulf of Mexico Midwinter Redhead Survey, 1981 - 2010. Unpublished data.
UMRGLR JV. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Implementation Plan (compiled by G.J. Soulliere and B.A. Potter). U.S. Fish and Wildlife Service, Fort Snelling, MN, USA.
Washington Department of Fish and Wildlife, 2005. Unpublished report. Summary of winter aerial surveys on Boundary Bay and Fraser River Delta, Winters 2002-2003, 2003-2004, 2004-2005\

Appendix D
Letter from coordinators of North American bird initiatives to North American Wetland Conservation Act (NAWCA) staff.

Rob Deblinger
Chair, NAWCA Council Staff

15 March 2012

Dear Dr. Deblinger,

We are writing on behalf of NAWMP Science Support Team (NSST) and Tri-Initiative Science Team (TriST) regarding the revised 2012 maps of greatest continental significance for all four bird initiatives; North American Waterfowl Management Plan, North American Waterbird Conservation Plan, Partners in Flight and the U.S. Shorebird Conservation Plan. The mapping efforts were completed by committees associated with each initiative and with input from the Joint Ventures (JV). In February 2012, the NSST and TriST met in Charleston, SC and collectively discussed challenges in development and use of the maps depicting areas of continental significance for each of the bird groups, including use in the scoring of NAWCA grant applications. Nearly all NSST and TriST members serve on or work directly with regional bird conservation Joint Ventures (JV) charged with implementing regional bird habitat conservation.

Both groups think the new significant areas maps were clearly an improvement over the previous maps, thanks to improved spatial data, new population survey data, and/or use of biological models to predict relative abundance during various life-cycle periods. However, map makers struggled with conflicting questions when assessing the relative importance of areas at the continental scale priorities:

- Objective decision criteria for assessing “significance” to continental wetland bird populations were difficult to establish. For example, comparing the relative importance of smaller areas with high densities to larger areas with abundant numbers but low densities was problematic. These comparisons became increasingly difficult when made among different periods of the annual cycle.

- The quantity and reliability of population survey data varied among regions and proposed areas for map inclusion.

- Some areas were identified as critical to a single species of high concern whereas others were deemed important because they were used by numerous species.

- Certain arid locations provide high value wetlands only intermittently because of a highly variable environment (e.g., playa wetlands).

Both the NSST and TriST agreed that maps should be improved iteratively over time to include additional field information or mapping refinements. Moreover, it is conceded that the most effective maps are based on explicitly-defined purposes and criteria, and thus maps created explicitly to assist in the scoring of NAWCA grant applications would ideally be developed with direct NAWCA staff collaboration, a partnership the next map committees will seek. This partnership could undertake additional deliberation and decisions about stringency and comparability of justifications for inclusion of areas; use of objective criteria to the extent possible given data limitations or at least attempts towards consistent philosophies underpinning subjective decisions; and appropriate levels of resolution in depiction of identified areas. Additionally, the partnership could explore alternative or multiple versions of maps (e.g., beyond abundance and distribution, focusing on wetland bird species of greatest concern, landscapes most limiting populations, and / or areas expected to become significant with climate change impacts.)

We understand that NAWCA staff had some specific questions about the current maps. We acknowledge and accept the invitation to discuss these at the next Council Staff meeting, May 3, 2012, and hope you will consider discussion about future improvements.

In the meantime, we urge NAWCA staff to use the existing maps with their limitations in mind.

Sincerely,

Brad Andres, National Coordinator U.S. Shorebird Conservation Plan
Jorge Coppen, National Coordinator, North American Waterfowl Management Plan
Terry Rich, Partners in Flight National Coordinator
Jennifer Wheeler, Waterbird Coordinator

cc: NAWMP Plan Committee Co-Chairs
PIF Council, Co-Chairs
Waterbird Council Chair
Shorebird Council Chair
Sarah Mott, Chief, FWS-DBHC Grants Branch
Mike Brasher, Chair, NAWMP Science Support Team
Tim Jones, Chair, Tri-Initiative Science Team

Appendix E

Summary of issues recorded during 7 June 2012 conference call with North American Wetlands Conservation Council (NAWCC) and representatives of the NSST (North American Waterfowl Management Plan Science Support Team) and TriST (Tri-initiative Science Support Team – Waterbirds, Shorebirds, and Partners in Flight).

The call was established to discuss use of the NAWMP map (and other continental bird initiative maps) for scoring NAWCA grant applications. NSST representatives participating on the call included Greg Soulliere (Upper Mississippi River and Great Lakes Region JV) and Todd Jones-Farrand (Central hardwoods JV). Only information associated to the NAWMP map and NSST is included below. *Note: This call was originally planned to occur 3 May but was postponed.*

Points made early in the call by NSST:

1. Some NSST members have expressed concern regarding use of the NAWMP significant areas map for scoring NAWCA grant applications.
2. The map is somewhat subjective due in large part to lack of waterfowl population data in areas of the continent.
3. Many small-scale areas used heavily by waterfowl are not depicted on the NAWMP map and they, collectively, may be very important.
4. The NAWMP map is meant to be only a general map of the most important waterfowl regions of North America.
5. Map developers could not identify “significant areas” in a standardized way to represent total waterfowl abundance, species of concern, and or areas important to provide social values for users (NAWMP goal 3).
6. No single map can possibly depict all priority wetland conservation opportunity while accounting for risk to waterfowl populations.

Points made by NAWCC and staff:

1. The new (2012) NAWMP map was a great improvement, accounting for concerns expressed by some JVs regarding the 2004 map.
2. New maps from the other 3 continental bird initiative were also much improved, and use of the 4 maps together should help achieve the goal of the NAWCA.
3. Of the 100 potential points a NAWCA grant application may receive, 9 are based on the maps from the 4 continental bird initiatives, so slightly more than 2% of each application score is based on whether a proposed project falls in a "significant area" depicted on the NAWMP map.
4. If an application project area is "close to" an area labeled significant, that will be considered in scoring; NAWCC members are fairly "liberal" with applying points to close areas, especially when coupled with strong grant application text describing and area's value to waterfowl.
5. Of the 100 points a NAWCA grant application may receive, 6 are based on value at the regional scale, typically information provided by the JVs. The NAWCC thought this JV feedback was helpful at identifying the smaller scale areas of significant value.

Group discussion regarding NAWMP map:

1. NAWCC will use any map or other easily implemented tool the NAWMP community would like to provide for grant application scoring.
2. If the NSST would like to revise the NAWMP map and provide a new version, the NAWCC will use it -- even if the map is revised annually.
3. The NAWCC has 2-3 weeks to review grant applications and work together at making final decisions; this is a work burden beyond their normal jobs, which must be an NSST consideration when suggesting use of alternate grant scoring tools.
4. The NSST committee who developed the 2012 NAWMP map found the effort a significant challenge, they expressed the map was not completely science based, and the NAWCC would likely not be receiving an annual update for application scoring purposes.

Closing thoughts following the conference call:

1. The NAWMP map, or any similar NAWMP effort used to "better target" NAWCA dollars, accounts for a maximum of about 2% of the total NAWCA grant application score using their current point allocation system.
2. Regional information from JVs, supporting material in the application text, and "proximity" of proposed projects to NAWMP significant area boundaries, are part of the NAWCC discussion when allocating points for NAWCA grant applications.
3. There are potentially significant social / political considerations for the NSST if a new map for NAWCA scoring is developed and provided to the NAWCC. Like the 2012 NAWMP map, this NAWCA-focused effort will require review (and likely adjustment) by the broader waterfowl management community.
4. There will be a considerable time commitment for those NSST members (and others) to develop a refined “NAWCA map,” hence the net impact of this expenditure must be weighed against the net landscape change and associated waterfowl population influence from the effort (vs. use of the current NAWMP map by NAWCC).
5. The NSST could concentrate on developing conservation targeting tools to achieve the 3 fundamental goals of the 2012 NAWMP. The process can result in a suite of decision-support tools completed before the next NAWMP revision, including a map developed for the NAWCC that targets conservation priority areas (vs. simply areas with greatest current population abundance).
6. Based on the 6 June conference call discussion, the NAWCC is willing to use NSST / NAWMP maps or similar tools for scoring NAWCA grant applications as long as the NSST does not add substantially to the overall burden of the application scoring process.