



Rainwater Basin Joint Venture Landcover Accuracy Assessment Report

Prepared by the Rainwater Basin Joint Venture (RWBJV), Grand Island, NE in conjunction with the U. S. Fish & Wildlife Service – Habitat & Population Evaluation Team (HAPET), Hartford, KS, the Playa Lakes Joint Venture, Louisville, CO, and the Nebraska Game and Parks Commission, Lincoln, NE

Overview:

Spatially explicit landcover datasets are critical for effective and efficient landscape level conservation planning. When integrated into a decision support tool, landcover datasets enable users to make informed management decisions that aid land managers in prioritizing and initiating habitat management. In addition, such datasets enable users to inventory habitats, identify species-habitat relationships, and create species distribution models over broad spatial scales. Given the conservation benefits of such datasets, the Rainwater Basin Joint Venture and partners regularly conduct spatial habitat analysis to assess the habitat composition and configuration available to birds and other species of concern throughout Nebraska. However, in the past spatially-explicit datasets for Nebraska have been limited in quantity and resolution. To counteract constraints in the use of state-wide spatial data, the Rainwater Basin Joint Venture made it a priority to create a seamless landcover dataset for Nebraska in 2004, with the most recent version revised in 2010 (RWBJV Landcover version 10).

The Rainwater Basin Joint Venture landcover dataset is composed of multiple data sources, which therefore increases the potential for uncertainty in performance given an already complex habitat classification procedure. While it is widely acknowledged that landcover datasets are snap-shots in time representing habitat composition throughout broad geographical regions, there is a strong necessity to quantify uncertainty and evaluate the performance of landcover-type datasets. Traditionally, the accuracy of photo-interpreted datasets has been assumed to be correct without performing any formal analysis. Recognizing the need for accurate landcover data, the Rainwater Basin Joint venture coordinated with various partners to conduct a series of accuracy assessments throughout multiple regions of Nebraska and compare performance of the landcover with other datasets available for the state.

Landcover Development:

In developing the RWBJV landcover dataset, the best available spatial data layers were acquired, processed, and produced using a geographic information system (GIS) to create a state-wide landcover. In order to integrate the various spatial datasets, a mosaic procedure was utilized (mosaic tool in ERDAS Imagine; ERDAS IMAGINE 11.0, Intergraph Corporation, Huntsville, AL, USA), where datasets are “stacked” on top of other sets of spatial data based on accuracy. Thus, the layers containing higher resolution data are positioned near the top of the “stack” and therefore take precedence over the underlying spatial data layers. Each of the datasets added to the landcover by providing a unique representation of habitats or features relevant to

Nebraska. The resulting habitat conditions were cross-walked to the appropriate habitat associations (coarsest classification) and conditions (finest level of classification). The final landcover represents contemporary conditions to the best extent currently available (Fig. 1).

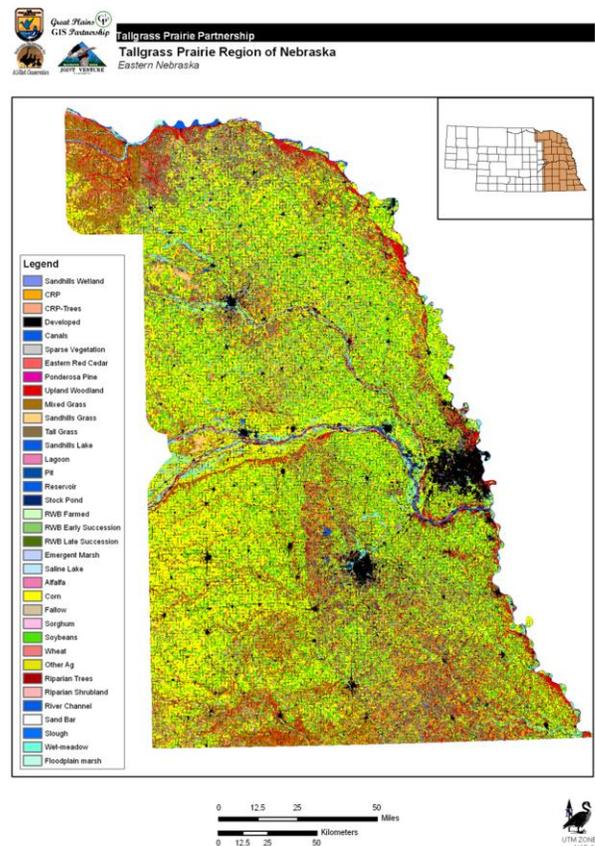


Fig. 1. A map of the Rainwater Basin Joint Venture's landcover dataset containing all of the cover classes for the Tallgrass Prairie Region in Nebraska.

Assessment Methods:

A series of randomly selected land parcels (160 acres) and survey routes were established throughout various regions of Nebraska to evaluate landcover accuracy (Fig. 2). Surveyors identified and recorded the actual landcover present at each survey site. Survey data and the predicted landcover classes were compared using error matrices. The total acres of habitat for each classification category were summarized both across and down for the landcover dataset and field observation respectively. The number of acres of the current conditional habitat state that are correctly classified by the landcover were divided by the total number of acres classified by the landcover and the observed field classifications to obtain the error of

omission (percentage of pixels that should have been assigned to a specific cover class but were not) and commission (pixels that were assigned a particular cover class but actually belonged to another) respectively.

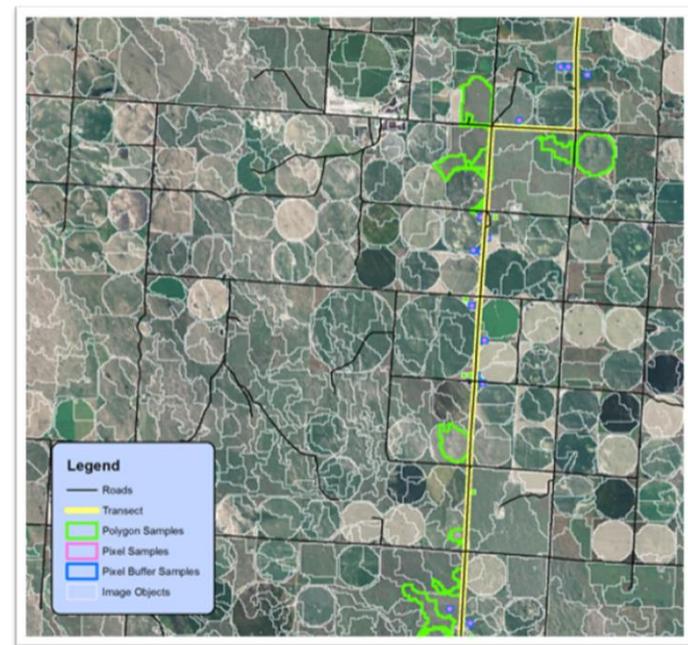


Fig. 2. An example of the sampling design used in collecting field data along a road transect throughout various regions of Nebraska. Individual fields were randomly selected along the route and were evaluated with the landcover to determine accuracy. Field data was collected in cooperation with the Habitat & Population Evaluation Team, Hartford, KS.

Results and Discussion:

Overall the Rainwater Basin Joint Venture Landcover adequately predicted the correct habitat cover classes throughout the state, and performed especially well when the cover classes were further generalized (i.e., corn and soybeans were generalized to row crop; tall grass, mixed grass, and short grass were generalized to grass, etc.).

Within Nebraska's Tallgrass Prairie Region, the Rainwater Basin Joint Venture landcover had an overall accuracy of 95.1%. Out of the fields visited that were classified as agriculture, 99.3% of them were correctly classified by the landcover (producer's accuracy). Areas categorized as developed by the landcover had classification accuracy similar to agricultural land, with an error of commission of 92.4%. Woodland was correctly classified by the landcover 99% of the time and grassland had a classification accuracy of 98.7%. Of the field sites visited that were grass, there was an 87.8% chance that those field sites were correctly classified as grassland by the landcover.

The overall accuracy estimate for the western and central portions of Nebraska (within the Playa Lakes Joint Venture administrative area) was high (70%). However, the per class estimates (both user's and producer's) varied markedly (from 0%

- 100%) indicating that the landcover map is more reliable for some landcover classes than others. For example, several classes had high user's accuracy (UA) including: rainwater basins (78%), CRP (94%), developed areas (100%), ponderosa pine (89%), stock ponds (88%) and river channels (100%). Specifically, cover classes with high user's accuracy were rarely confused with other classes on the ground. Likewise, several classes with high producer's accuracy (PA), including: playas (95%), rainwater basins (96%), CRP (87%), shortgrass prairie (90%), sandsage shrubland (87%), and stock ponds (94%) were rarely omitted from the landcover map. The estimator of KAPPA (KS) was 65%, meaning the map classification was 65% better than would be expected from random classification.

The third and final accuracy assessment, which was conducted throughout the Rainwater Basin Joint Venture's administrative area, determined that the landcover had an accuracy of 76% overall. The results demonstrated that the Rainwater Basin Joint Venture Landcover was an improvement over the National Land Cover Database, which had an overall accuracy of 52.52% for the same region.

The results from the landcover accuracy assessment have implications for several priority habitats in Nebraska, including playas, shortgrass and mixed-grass prairie, Sandhills grassland, sandsage shrubland, and riverine systems. For instance, we found that playas are reliably mapped in the Nebraska, but in some cases, may have been impacted by recent cropping practices. Thus, mapped playas include both currently functioning playas as well as fossil or highly modified playas. Furthermore, the landcover reliably mapped grassland as a landcover type, yet there was less certainty as to the association (mixed-grass, shortgrass, or sandhills grassland). Overall, users of the RWBJV's landcover dataset can be confident when assessing the majority of the cover types at the habitat type level (i.e., grassland) but should use caution when examining individual cover class associations (i.e., mixed-grass, shortgrass, tallgrass). Understanding the limitations of each landcover dataset can help inform users as to which landcover dataset is most appropriate for their region and habitat assessment goal. For example, the open water cover class in the RWBJV's landcover performed poorly, yet the overall accuracy of the landcover was quite well. Therefore a user specifically interested in quantifying open water should exercise caution when using the RWBJV's landcover, and perhaps would consider venturing out to a different dataset such as the NLCD. However, if a user wanted a generally good performing landcover for all cover classes in Nebraska, the Rainwater Basin Joint Venture's landcover dataset is a viable solution.

