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A cautionary tale regarding use of the National Land Cover Dataset 1992
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Objective

Digital land cover maps are in wide use in wildlife research for assessing the regional influence of land use and land cover on ecological properties and systems. Despite the wide use of these products, there is too little caution used by biologists when using them for studying habitat assessments. The scrutiny biologists apply to the data they collect does not usually occur with land cover data they may use for assessing habitat associations. Increased scrutiny of common 'base layer' data is warranted. We draw attention to the United States Geological Survey 1992 National Land Cover Dataset, or NLCD 92 (available on the internet at http://landcover.usgs.gov/natllandcover.html), in particular the portion occurring in the upper midwestern US described as the Prairie-hardwood Transition Ecoregion. Our attention to the NLCD 92 is not because these data are more problematic than other, remotely-derived digital land cover data, but because it is arguably the most widely-used and current national digital representation of the United States. The NLCD 92 project evolved from an effort to use TM data to develop "a generalized, consistent, seamless, and reasonably accurate land cover data layer" for the country. These data are not, however, without problems. The NLCD 92 classification for the mapping unit that encompassed the Prairie-Hardwood Transition had an overall accuracy of 60%. However, land cover-specific accuracy is more germane to most habitat applications, so we were interested in how well individual classes were mapped. We used the NLCD 92 classification to derive landscape composition at scales consistent with our species-habitat assessment models.

Methods

We created a regular lattice over the Prairie-Hardwood Transition in a geographic information system (GIS), ArcView 3.3 (ESRI, Redlands, CA). For every lattice cell (800 ha) in the Prairie-Hardwood Transition (Fig. 1), we calculated the proportion of each of the 21 land cover classes of the NLCD 92 classification. We generated maps for the resultant proportions and assessed these maps relative to GIS coverages of Thematic Mapper paths (Fig. 2a,b), state boundaries, and NLCD 92 regional classification units (Fig. 2b,c).

Results

We identified patterns in grassland/herbaceous, emergent herbaceous wetlands, and small grain land covers appearing to be influenced by inconsistencies in the classification of Landsat TM imagery (Fig. 3). We observed obvious classification seams in the emergent herbaceous wetlands and grassland/herbaceous land covers that are coincident with the TM paths. For instance, no grassland/herbaceous land cover was mapped west of TM path 27 and east of TM path 22 in the Prairie-Hardwood Transition. Grassland/ herbaceous, emergent herbaceous wetlands, and small grain land covers all exhibit seams along the west edge of TM path 21 (Fig. 3). The inconsistency in mapping was not strictly limited to patterns associated with TM paths as there also appeared to exist additional problems related to differences among states. For instance, the mapped proportion of emergent herbaceous wetlands in Minnesota was **7** times that occurring in the other states in the Prairie-Hardwood Transition (Fig. 4). Grassland/herbaceous and small grain were mapped in the Driftless Area of northeastern Iowa but not in the adjacent Driftless Areas across the state border.

Implications

The patterns and incongruities that we identified in the occurrence of individual land cover classes have the potential to affect regional-scale analyses. Local studies may also be affected if they should occur near boundaries of mapping regions. The problematic TM paths (i.e., 21, 25, and 26) lie along boundaries of mapping regions (Fig. 5) and are probably not only confined to the upper midwest. These discrepancies along TM scene boundaries are likely partly reflected in lower accuracy rates; the grassland/herbaceous cover class had the lowest accuracy rate (97% error of omission and 91% error of commission) of all land cover classes in the upper midwest mapping region. Emergent herbaceous wetlands were assessed as having 59% errors of omission and 44% errors of commission for the upper midwest portion of NLCD 92. Land covers which are difficult to remotely discern in other regions may appeared to be equally effected. We suggest that the NLCD 92 should be used cautiously, and that it is important to learn about characteristics of the data before application. We recommend analyses similar to ours be conducted for other regions when errant patterns in land classification may bias analytical results. Compensatory measures, such as aggregating confused classes, may overcome some data shortcomings. Finally, users of regional land cover assessments should be cognizant of the following disclaimer, that a digital mapped product is "not guaranteed to be correct or complete and conclusions drawn from such information are the responsibility of the user" (http://edc.usgs.gov/disclaimer.html). This is generally true for all interpreted remotely-sensed data.

Figure 1. Lattice used for summarizing landscape composition in the Prairie-hardwood Transition.
0.1-km scale

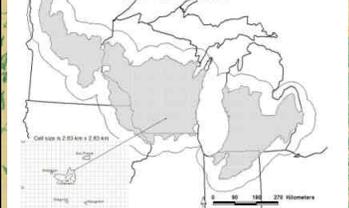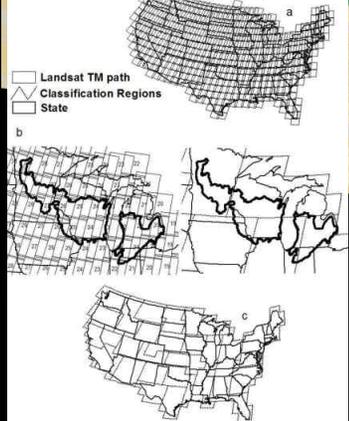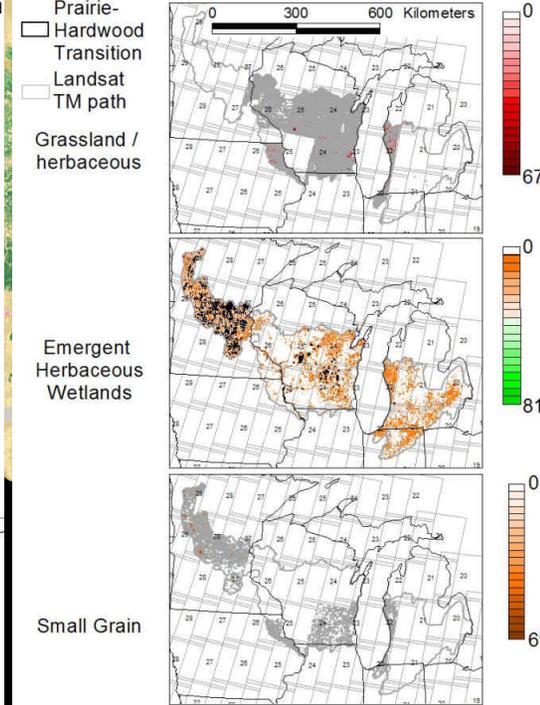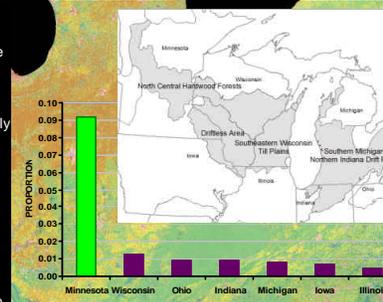**Figure 2**. Thematic Mapper paths and National Landcover '92 mapping regions.

Landsat TM path
Classification Regions
State

Figure 3. Landcover-specific mapping inconsistencies for the upper midwestern U.S.

Prairie-Hardwood Transition
Landsat TM path

Grassland / herbaceous

Emergent Herbaceous Wetlands

Small Grain

Figure 4. Emergent herbaceous wetland mapped at a greater density for Minnesota compared to other states in the region.

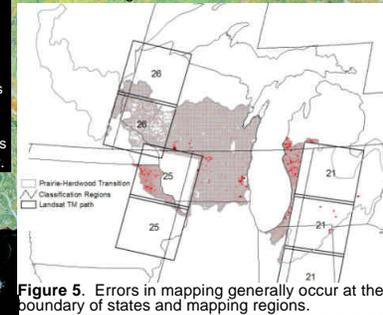**Figure 5**. Errors in mapping generally occur at the boundary of states and mapping regions.