Wiscland-2 Quarterly Project Update 5

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Executive Summary

The objective of the Wiscland-2 project is to update the Wisconsin statewide land cover map. During this quarter (January-March 2016), the Project Team has been primarily involved in producing the Level 2 and 3 statewide maps. In the upcoming quarter, planned tasks are largely focused on continuing the classification process by producing the Level 4 map, as well as creation of the final products for delivery in June.

Introduction

The purpose of this document is to update the Wiscland-2 Land Cover Guidance Team on the progress of the project in the previous quarter. Since issuing the previous quarterly report in December 2015, the tasks outlined in the "Current Tasks" section have been completed/are in progress as follows:

- Updated the Level 1 interim product based on DNR feedback
- Created Level 2 and 3 map classifications for each footprint and statewide.
- Continuing to revise the accuracy assessment methodology.
- Responding to DNR Evaluation Team feedback on the interim with each product delivery.

Results

Results related to Level 1 map updates:

Based on feedback from the DNR Evaluation team, we were able to make the following improvements to the Level 1 map:

1) Reduce confusion between Urban and Barren classes

Initial results for the Level 1 classification showed confusion between the Urban and Barren classes in areas of high urban development (industrial parks, large shopping complexes, etc.). This is due to the spectral similarity between man-made impervious materials such as concrete and barren/non-vegetated soils. A simple post-processing masking procedure was instituted to correct these errors. Using the Census Municipal Civil Division (MCD) boundaries as a baseline for urban extent, barren areas were manually digitized out of the MCDs via photo-interpretation. Then, any pixels within these adjusted MCDs that were classified as Barren were reassigned to the Urban class. This process corrected the majority of confusion between Urban and Barren

within municipal boundaries but did not resolve any confusion there may be outside of these municipal areas.

2) Improve representation of roadways

Many rural roads were only intermittently captured in the map along their route, while major roads like interstates were consistently captured. After discussions with the DNR Guidance Team, it was jointly decided that the small roadway segments should be filtered out while major roads should remain. A refined post-processing filter was applied to the product to selectively remove most of these small roadway segments while leaving many of the major roadways as classified in the final product. The areas of removed roadways were then reassigned a class value based on the surrounding land cover classes.

3) Reduce urban commission error

In certain geographic regions of the state, the extent of developed land was overclassified, primarily affecting farmsteads and suburban developments. Most of the error was due to confusion with grasslands, which were under-sampled in the affected areas. After utilizing information from the crop rotation layer on the locations of hay/pasture fields and re-running the classification urban representation visually improved and accuracy increased by around 1%.

4) Improve classification of waterways

Rivers and streams were intermittently captured in the Level 1 classification in some areas. By incorporating additional water training sites from the Wisconsin Wetlands Inventory (WWI) and developing a new classification, water representation visually improved although accuracy, already in the high-90s for that class, only increased slightly with the changes.

5) Improve wetlands representation

Due to an error in the samples database, whereby polygons in the WWI that had an “upland” land type attribute were misrepresented as “lowland” in a derived data layer, wetlands were overclassified in several northern counties. After correcting for this error and re-running the classification, wetland representation visually improved.

Results related to <u>Level 2 and 3 map creation:</u>

1) Created Level 2 (version 1) interim product and (version 2) revisions

UW delivered the first version of the Level 2 interim product on 2/19/2016. The DNR Evaluation Team provided helpful feedback following the review period, and the Project Team was able to make improvements to Level 2 product. Most notably, revisions to the Level 2 grassland classification have improved under-classification of idle grasses in various parts of the state.

In addition, the project team has provided responses to all comments from the Evaluation Team, presented an overview of the classification methodology to DNR staff, and attended a meeting of

the Evaluation Team to finalize decisions laid out in the Evaluation response document regarding Level II comments.

A few minor adjustments to the Level 2 map remain to be made, and will be delivered to DNR upon completion:

1) Correcting filtering to remove any remaining single pixels or classified areas <2 acres,
2) Further classification adjustment to grasslands in the Vernon-Crawford-Sauk-Richland County area to improve Idle Grass/Forage Grass delineation.

2) Created interim Level 3 product

The initial Level 3 product was delivered to the Evaluation Team on 3/25/2016. The overall results based on the accuracy metrics and visual inspections appear positive and the Project Team is looking forward to feedback from the Evaluation Team in the next several weeks. The per-class accuracy metrics for the Level 3 product have a wide range, with overall accuracy of the Level 3 interim product estimated at 68.2%.

Results related to <u>improvements in methodology</u>:

1) Accuracy assessment

The provided accuracy metrics are based on single-pixel test sites, which is not the optimal unit of analysis for this project. The project team is revising the accuracy assessment procedure to provide new estimates based on more appropriate units, e.g. >2 acre sites of homogeneous land cover. This updated accuracy evaluation will be retroactively provided for all levels of classification once completed.

2) Post-processing filtering

During the Level 1 review period, several comparisons of the results produced with post-classification segmentation and post-classification filtering were made after several issues with the segmentation results were identified by the project team. While the segmentation algorithm performed reasonably well given the size and configuration of Level 1 classes, there was concern that the units were generally too large to represent Level 4 categories. In addition, the resolution mismatch and lack of temporal depth in the segmentation imagery posed problems for this step. Classification results from a simple sieve-and-clump filtering approach produced similar results as the segmentation, and in many areas visually improved. Class accuracy was also similar, with overall accuracy 2% higher for the filtered vs. segmented results. Therefore, the segment results are not being incorporated into the Wiscland 2 product and results are filtered using a morphological filter to remove noise and enforce a two acre minimum mapping unit.

Conclusions

During this quarter, the Project Team has completed tasks related to creating the final Wiscland 2 land cover products, with a focus on the Level 2 and Level 3 products. The overall accuracy of

the Level 2 product is estimated at 83.9%, and the Level 3 product is estimated at 68.2%. The previous level output informs the creation of the higher level maps, so a decrease in accuracy as the complexity of the classification increases is expected. The Level 2 updated and Level 3 initial classifications have been forwarded to the DNR for review while the Project Team progresses toward the initial Level 4 map classification.

Current

The Project Team is currently focusing efforts on:

- Creating Level 4 map classifications for each footprint and a statewide interim product.
- Finalizing the accuracy assessment methodology and producing updated estimates.
- Responding to DNR reviewer feedback on the delivered interim products.

Upcoming

There are several priority tasks currently being worked on for the next quarter:

- Finalizing the statewide products for all 4 levels of classification.
- Developing and producing additional validation metrics and reports for each level of classification.
- Creating draft versions of the User's Guide and documentation that will be included in the final product delivery.
- Continuing outreach and coordination with other land cover mapping projects.