LOWER COLUMBIA RIVER ECOSYSTEM VEGETATION MAPPING PROJECT

DRAFT ACCURACY ASSSESMENT REPORT

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1 Purpose of Accuracy Assessment

The purpose of an accuracy assessment is to provide a quantitative measure of reliability for the vegetation map.

The accuracy of the draft vegetation map was assessed quantitatively by using an error matrix. The error matrix is a square array of numbers set out in rows and columns which express the number of pixels assigned to a particular category in one classification relative to the number of pixels assigned to a particular category in another classification. The columns usually represent this reference data while the rows indicate the classification generated from the remotely sensed data (Congalton and Green 1999).

2 Accuracy Assessment Point Collection

The primary goals of the AA sampling strategy were: 1) to have a broad distribution of points throughout the study area, 2) to ensure AA points were non-coincidental with training points, and 3) to avoid clustering of points for one vegetation class.

The AA was conducted at the scale of image segments. Although the initial field sampling campaign produced a large number of reference samples, a high percentage of samples within each class were contiguous and thus highly spatially auto correlated.

In order to assess the number of non-spatially auto correlated field samples and develop target amounts of AA points per class, contiguous segments labeled as the same vegetation class were dissolved (**Figure 1**). To further reduce spatial autocorrelation, the dissolved sample segments were buffered 15 meters and dissolved into any intersecting segment of the same class.

The buffering and second dissolve process was necessary to eliminate artifacts produced by very small segments that separated large contiguous areas labeled as the same class. For example, adjacent agricultural fields separated by a narrow hedge row that were identified as two sampling polygons after the initial dissolve were combined after the buffer and second dissolve process.

Target numbers for AA segments per class were developed after the first field sampling campaign and dissolving processes were completed. Target AA numbers were based on the number of dissolved samples within each vegetation class. A minimum target of 50 segments was set for each vegetation class (Congalton per comm.). Additional AA segments were selected for vegetation classes with greater than 100 dissolved polygon samples based on the proportion of field samples available, a priori knowledge of the relative distribution of the class across the study area (excluding water), and the spatial distribution of sample polygons. Ultimately, the number of AA segments was limited by the number and spatial distribution of field samples.

Only one AA segment was selected from each buffered and dissolved polygon. If an AA segment was selected from a dissolved polygon, all segments within that polygon were removed from the training data. This process of selecting AA segments served to help

increase the distribution of AA across the study area and reduce the spatial autocorrelation between AA and training sites.

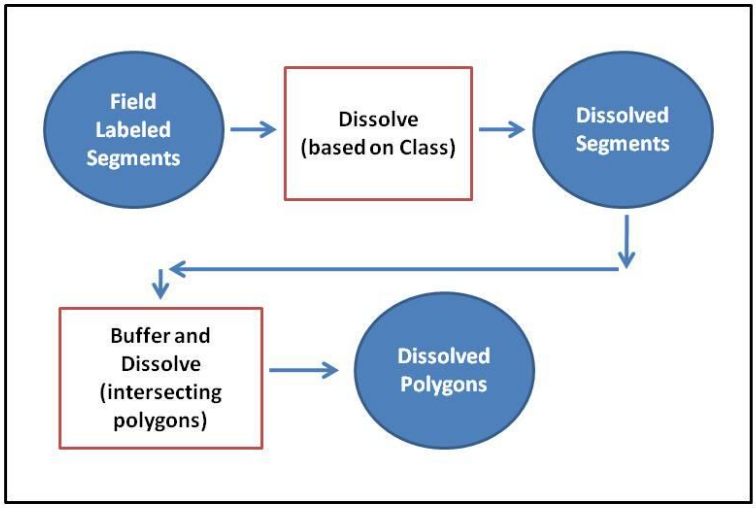

Figure 1. Dissolving and Buffering Process

Table 1. Buffered and dissolved polygons and AA segments collected for each vegetation class.

Name	Total buffered and dissolved Polygons	Total AA Segments selected
Coniferous Upland Forest	105	54
Deciduous Upland Forest	235	54
Coniferous Wetland Forest	103	35
Deciduous Wetland Forest	204	50
Upland Shrub/Scrub	170	50
Wetland Shrub/Scrub	99	52
Upland Herbaceous	231	50
Wetland Herbaceous	352	55
Agriculture	129	55
Tree Farms	72	43
Bare	87	50
Mud	170	50
Sand	135	50
Urban - Impervious	113	50
Water	119	51

Target amounts for AA segments were met for all classes except Coniferous Wetland Forest, Tree Farms, and Sand. Tree Farm AA points were limited by the number of sample polygons and the close spatial distribution of many of the tree farm polygons. Of the 72 distinct polygons that were available to choose Tree Farm AA segments from, many polygons were located within very close proximity to each other. Coniferous Wetland Forest samples were also limited by a small number of distinct sample polygons (the lowest off all naturally occurring vegetation classes). A low number of sample polygons for the Wetland Coniferous Forest Class is not unexpected given the proportionally small and clustered distribution of this vegetation system within the study area.

3 Results of the Accuracy Assessment

Overview

- Overall Accuracy for all assessed classes is 86%
- Kappa statistic is 85%
- Average Accuracy for all natural vegetated systems is 81%

Overall accuracy for the ecological systems is 86%. The Kappa statistic was 85%**,** representing good agreement between the reference data and the map (Congalton and Green, 1999). The Kappa statistic adjusts the estimate of overall accuracy for the accuracy expected from a purely random assignment of map labels and is useful for comparing different matrices.

Most ecological systems fell above 75% per-class accuracies (user's and producer's) and overall accuracy for all natural vegetated systems is 81%. Overall accuracy for all managed and non-vegetated classes is 93% (user's and producer's). In summary, this assessment shows that there is a high degree of agreement between reference data and the land cover map.

Confusion Among Ecological Systems

The majority of confusion for any one forested system is found within among the other forest classes. This pattern is strongest for the two coniferous forest classes. Shrub-Scrub and Herbaceous Classes confusion is dispersed over a larger number of ecological systems compared to the forest classes. The majority of misclassified mud and sand reference points are constrained between these two classes.

The Upland Shrub-Scrub, Wetland Shrub-Scrub, and Upland Herbaceous have the lowest producer's accuracies. The Upland and Wetland Deciduous Forest and Upland Herbaceous classes have the lowest user's accuracies. These classes have user's or producers accuracies below 80%, but most have accuracies above 70%.

Wetland Herbaceous and Agriculture classes have high user's accuracies and compared to their producer's accuracy. This large difference indicates that these systems may be over represented on the map. Additionally, the Agriculture class is most often confused with Upland Herbaceous and Upland Shrub-Scrub. This result is not unexpected give that land use the most important variable for distinguishing these classes and this variable can be difficult to derive from imagery and ancillary data across the study area.

The majority of all naturally vegetated AA segments that were misclassified were confused with the upland or wetland equivalent within each class, or were assigned the correct upland/wetland call in another class. The overall accuracy of the upland and wetland division was assessed by creating an error matrix with the naturally vegetated classes

dissolved together on the upland/wetland attribute. The overall accuracy of the upland/wetland division was found to be 94%.

Table 2. Error Matrix

	Reference Data																
Map Data	Upland Coniferous Forest	Upland Deciduous Forest	Wetland Coniferous Forest	Wetland Deciduous Forest	Upland Shrub-Scrub	Wetland Shrub-Scrub	Upland Herbaceous	Wetland Herbaceous	Agriculture	Tree Plantations	Bare	Mud	Sand	Urban - Impervious	Water	**Total**	**User's Accuracy**
Upland Coniferous Forest	**45**	4	1													50	90%
Upland Deciduous Forest	8	**45**		7	2											62	73%
Wetland Coniferous Forest		1	**30**													31	97%
Wetland Deciduous Forest	1	4	4	**42**		3				2						56	75%
Upland Shrub-Scrub					**33**	5	1		1							40	83%
Wetland Shrub-Scrub				1	4	**38**		3								46	83%
Upland Herbaceous					5		**37**				3					45	82%
Wetland Herbaceous					4	5	3	**52**	2		1	2	1			70	74%
Agriculture					2	1	8		**52**	2	1					66	79%
Tree Plantations										**39**						39	100%
Bare											**45**					45	100%
Mud												**40**	2			42	95%
Sand							1					6	**47**			54	87%
Urban - Impervious														**50**		50	100%
Water												2			**51**	53	96%
Total	**54**	**54**	**35**	**50**	**50**	**52**	**50**	**55**	**55**	**43**	**50**	**50**	**50**	**50**	**51**	**749**	
Producer's Accuracy	83%	83%	86%	84%	66%	73%	74%	95%	95%	91%	90%	80%	94%	100%	100%		
														Overall Accuracy			86%
														KHAT			0.85