

Willamette Valley Oregon White Oak and Ponderosa Pine Inventory: Accuracy Assessment for Southern Portion of Valley

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Introduction

The Northwest Habitat Institute has constructed a detailed map of Oregon white oak and ponderosa pine stands within the Willamette valley of Oregon. The project has spanned nearly ten years. Stands have been visually identified in the field and classified as to: vegetation class, canopy, tree size and structural conditions. The minimum mapping unit is around one hectare. More than 6,000 polygons have been identified.

The initial mapping effort in the southern portion of the valley used Landsat satellite imagery as the base map for stand identification. The project shifted away from using the course satellite imagery with the 2005 release of the National Agriculture Imagery Program (NAIP) one-meter aerial imagery. The central and northern portions of the valley were mapped using NAIP imagery as the base layer, and as of 2008, the southern Landsat based areas have been remapped using NAIP. This report is an accuracy assessment of the remapped area in the southern valley.

Methods

Twenty-one full and partial USGS quadrangles remapped in 2008 using NAIP imagery as the base layer were compared to data encompassing the same area previously mapped with Landsat imagery as the base layer. This analysis was done using ESRI ArcGIS 9.3 software. The NAIP based polygons were intersected with the Landsat based polygons to yield an intersecting polygon layer for accuracy assessment comparative analysis.

Intersecting polygons generated from GIS analysis were then individually examined to make sure both the Landsat and NAIP polygons were representative of the same stand. This yielded 857 polygons for comparative analysis. The attribute table of the intersecting polygons was then exported to Microsoft Excel for statistical data comparison.

Due to the generalized categories (e.g. 25-50% canopy closure, 50-75% oak, etc.), polygons created from the intersection and the attributes of the two different mapping efforts were carefully analyzed against the NAIP imagery to determine whether it would be reasonable to accept values within one classification of each other. In most cases attributes were accepted within a range of one classification of each other. The accuracy assessment tables presented in the results are reflective of these values. The raw data is contained in the matrices included at the end of the report.

Results

The overall accuracy for all of the attributes is approximately 85%.

Overall Accuracy

	Observed	Total
Vegetation Class	720	857
Canopy	814	857
Tree Size	718	857
Structural Conditions	661	857
Total	2913	3428

Total Observed Accuracy 84.98%

The following tables depict accuracy for each attribute, including accuracies of the individual classes:

Vegetation Class

	Observed	Total	Accuracy
1. Oak (>75% oak)	209	232	90.09%
2. Oak/Douglas-fir (50-75% oak)	59	70	84.29%
3. Douglas-fir/Oak (25-50% oak)	33	39	84.62%
4. Douglas-fir/Oak (<25% oak)	16	17	94.12%
5. Oak Open/Scattered (<25% canopy closure)	9	14	64.29%
6. Oak/Hardwood Riparian (50-75% oak)	30	36	83.33%
7. Hardwood/Oak Riparian (25-50% oak)	50	57	87.72%
8. Hardwood/Oak Riparian (<25% oak)	93	107	86.92%
9. Madrone/Oak (>50% madrone)	0	0	NA
10. Oak/Madrone (<50% madrone)	1	1	100.00%
11. Ponderosa Pine (>75% p-pine)	3	3	100.00%
12. Ponderosa Pine/Douglas-fir (50-75% p-pine)	2	3	66.67%
13. Douglas-fir/Ponderosa Pine (25-50% p-pine)	2	2	100.00%
14. Douglas-fir/Ponderosa Pine (<25% p-pine)	2	2	100.00%
15. Oak/Hardwood (50-75% oak)	33	41	80.49%
16. Hardwood/Oak (25-50% oak)	17	24	70.83%
17. Hardwood/Oak (<25% oak)	15	19	78.95%
18. Hardwood/Oak/Douglas-fir (<25% oak)	40	57	70.18%
19. Hardwood/Oak/Douglas-fir (25-50% oak)	41	51	80.39%
20. Hardwood/Oak/Douglas-fir (>50% oak)	58	71	81.69%
21. Oak/Ponderosa Pine (50-75% oak)	0	2	0.00%
22. Ponderosa Pine/Oak (25-50% oak)	3	4	75.00%
23. Ponderosa Pine/Oak (<25% oak)	3	4	75.00%
24. Mixed Hardwood	1	1	100.00%
Total	720	857	

Total Observed Accuracy 84.01%

Canopy

	Observed	Total	Accuracy
1. >75% Canopy	389	417	93.29%
2. 50-75% Canopy	320	322	99.38%
3. 25-50% Canopy	81	84	96.43%
4. <25% Canopy	24	34	70.59%
Total	814	857	

Total Observed Accuracy 94.98%

Size Class

	Observed	Total	Accuracy
1. Shrub/Seedling (<1inch)	0	0	
2. Sapling/Pole (1-9 inches)	2	2	100.00%
3. Small (10-14 inches)	112	112	100.00%
4. Medium (15-19 inches)	447	482	92.74%
5. Large (20-29 inches)	155	256	60.55%
6. Giant (>=30 inches)	2	5	40.00%
Total	718	857	

Total Observed Accuracy 83.78%

Structural Conditions

	Observed	Total	Accuracy
1. Single Story	192	266	72.18%
2. Multi-story	469	591	79.36%
Total	661	857	

Total Observed Accuracy 77.13%

Discussion

Human error is always an element of data inaccuracy, but is especially a concern when dealing with generalized categories of identification such as these. One field crew's interpretation of 48% of a species occurrence within a stand might coincide with another crew's interpretation of 51%, thereby recording two different categorical values for the

same stand. This is why most categorical values within one of each other were accepted as accurate.

Due to the difference in the base maps used for the two mapping efforts, it is assumed that added error has been incurred. Although the mapping techniques were the same, initial review of the Landsat based mapping indicated mapping differences that may be attributed to thematic bands which were brought into older orthophoto quad maps resulting in different stand delineation in the field and during digitization. This, along with the desire for consistency, is what led us to remap the Landsat based areas using the NAIP imagery in the first place. Because the Landsat mapping effort did provide a subsample of stands that were also delineated in the NAIP imagery, we elected to use this as a double sampling technique to inform the validity of the map. Therefore, we were left with a subsample of polygons once we went through a screening process of intersecting polygons. Additionally, we assume that the NAIP based data is more spatially accurate because it is newer than the orthophoto quads (some of these quads were more than 20 years old) and a finer level of resolution. For example, when comparing the riparian areas that were delineated in the Landsat imagery to those found in the NAIP, the NAIP based mapping produced much more detailed stand delineation. Therefore there were an abundance of polygons identified as riparian in the NAIP based mapping that were not identified as riparian within the Landsat based data.

Despite all of this, 85% overall accuracy is very encouraging considering the amount and richness of spatial information contained in this map. We would expect the NAIP data in the remaining portions of the valley to be at this level of confidence or higher.

Appendix: Validation Matrices

NAIP	Landsat																								
	1. Oak (>75% oak)	2. Oak/Douglas-fir (50-75% oak)	3. Douglas-fir/Oak (25-50% oak)	4. Douglas-fir/Oak (<25% oak)	5. Oak Open/Scattered (<25% canopy closure)	6. Oak/Hardwood Riparian (50-75% oak)	7. Hardwood/Oak Riparian (25-50% oak)	8. Hardwood/Oak Riparian (<25% oak)	9. Madrone/Oak (>50% madrone)	10. Oak/Madrone (<50% madrone)	11. Ponderosa Pine (>75% p-pine)	12. Ponderosa Pine/Douglas-fir (50-75% p-pine)	13. Douglas-fir/Ponderosa Pine (25-50% p-pine)	14. Douglas-fir/Ponderosa Pine (<25% p-pine)	15. Oak/Hardwood (50-75% oak)	16. Hardwood/Oak (25-50% oak)	17. Hardwood/Oak (<25% oak)	18. Hardwood/Oak/Douglas-fir (<25% oak)	19. Hardwood/Oak/Douglas-fir (25-50% oak)	20. Hardwood/Oak/Douglas-fir (>50% oak)	21. Oak/Ponderosa Pine (50-75% oak)	22. Ponderosa Pine/Oak (25-50% oak)	23. Ponderosa Pine/Oak (<25% oak)	24. Mixed Hardwood	
1. Oak (>75% oak)	170	11	5	5	2	2	2																		
2. Oak/Douglas-fir (50-75% oak)	4	30	21	5						2															
3. Douglas-fir/Oak (25-50% oak)	4	5	24	2						1															
4. Douglas-fir/Oak (<25% oak)			3	12						1															
5. Oak Open/Scattered (<25% canopy closure)	3	1			6		1								1		2								
6. Oak/Hardwood Riparian (50-75% oak)	6	1	2			8	4	1							2		5	1		4	2				
7. Hardwood/Oak Riparian (25-50% oak)	4	1	2		1	5	34	6		1						1	1			1					
8. Hardwood/Oak Riparian (<25% oak)	4	1	5	2	1	5	16	63									3	1		3	3				
9. Madrone/Oak (>50% madrone)																									
10. Oak/Madrone (<50% madrone)										1															
11. Ponderosa Pine (>75% p-pine)											2	1													
12. Ponderosa Pine/Douglas-fir (50-75% p-pine)												2								1					
13. Douglas-fir/Ponderosa Pine (25-50% p-pine)													2												
14. Douglas-fir/Ponderosa Pine (<25% p-pine)														2											
15. Oak/Hardwood (50-75% oak)	3		2	1	1	1	1	2		1						17	9	2					1		
16. Hardwood/Oak (25-50% oak)	2	2		2		1	1	1									14						1		
17. Hardwood/Oak (<25% oak)		1						2										1	12				1		
18. Hardwood/Oak/Douglas-fir (<25% oak)	2	3	4	7	1			1		1					1	1	4	1	25	2	3	1			
19. Hardwood/Oak/Douglas-fir (25-50% oak)	1	2	5	2	2		1	1					2							2	26	7			
20. Hardwood/Oak/Douglas-fir (>50% oak)	8	6	11	4	2	1	2			2	1	1			1	2	2					8	19	1	
21. Oak/Ponderosa Pine (50-75% oak)			1																						
22. Ponderosa Pine/Oak (25-50% oak)				1																			1	2	
23. Ponderosa Pine/Oak (<25% oak)																							2	1	
24. Mixed Hardwood								1																	

NAIP	Landsat			
	1. >75% Canopy	2. 50-75% Canopy	3. 25-50% Canopy	4. <25% Canopy
1. >75% Canopy	232	158	26	1
2. 50-75% Canopy	23	249	48	2
3. 25-50% Canopy	3	23	55	3
4. <25% Canopy	3	7	7	17

		Landsat					
NAIP	1. Shrub/Seedling (<1inch)						
	2. Sapling/Pole (1-9 inches)		2				
	3. Small (10-14 inches)		28	80	18		
	4. Medium (15-19 inches)		33	174	269	6	
	5. Large (20-29 inches)		13	86	39	117	1
	6. Giant (>=30 inches)			1	2		2

	Landsat	
NAIP	1. Single Story	2. Multi Story
1. Single Story	192	74
2. Multi-story	122	469

Vegetation Class: