

# DRAFT TECHNICAL MEMORANDUM



TO: Mr. Jeff Pantier, Hatton Godat Pantier

FROM: Jessica Stone

DATE: October 16, 2013

RE: **OAK HABITAT EVALUATION  
CONWELL SITE  
THURSTON COUNTY, WASHINGTON**

THURSTON COUNTY  
RECEIVED  
OCT 18 2013  
DEVELOPMENT SERVICES

## INTRODUCTION

This technical memorandum was prepared by Landau Associates on behalf of Conwell Investments LLC (client) to document the results of a field investigation and evaluation of Oregon white oak (*Quercus garryana*) habitat (oak habitat) on an approximately 21-acre site (site) located at 2415 Carpenter Road Southeast (SE), Thurston County parcel 11825240000 in Thurston County, Washington (Figure 1). This oak habitat evaluation was conducted by Landau Associates in general accordance with the Washington State Department of Natural Resources (WDNR) Natural Heritage Program (NHP) *Ecological Integrity Assessment: North Pacific Oak Woodland* guidance (Rocchio 2011). The definitions of “oak habitat,” “oak savanna,” and “oak woodlands” are based on Chapter 24 of the Thurston County Code (TCC).

## PROJECT DESCRIPTION

The site is planned to be developed into a new subdivision of single-family homes. The project would include activities such as clearing and grading, paving for streets and sidewalks, installation of utilities, and construction of single-family homes (Figure 2).

## SITE DESCRIPTION

The site is located southeast of Lacey, Washington on Thurston County parcel 11825240000 in Section 25, Township 18 North, Range 01 West (Thurston County Assessor website 2013). The site is approximately 21 acres in size, approximately 16 acres of which are forested with a mix of coniferous and deciduous trees and dense deciduous shrubs. Approximately 5 acres of the site have been cleared of trees (prior to 1990 based on review of historic aerial photographs) and consist of compacted soils, Scotch broom [*Cytisus scoparius*, which is listed as a Class B Noxious Weed by the Washington State Noxious Weed Control Board (NWCBC website 2013)], and pasture grass species. Due to the compacted soils and pasture grass species within the cleared area, it appears this area may have been used for agriculture and livestock grazing. Four vacant buildings in poor condition are located near the western end of the site.

The site slopes upward to the north, and the southern portion of the site (from the cleared area south to the site boundary) is relatively flat.

The area surrounding the site is generally developed with a history of logging and vegetation clearing and residential development. It is assumed that the natural fire regime of this area no longer exists due to the surrounding development. The land adjacent to the north of the site consists of a new suburban housing development. The land adjacent to the east and southeast of the site contain forested conditions consistent with those found on the site. The land adjacent to the south of the site contains a residence and forested area. Marvin Road SE is located adjacent to the west of the site.

## **METHODS**

The WDNR NHP *Ecological Integrity Assessment: North Pacific Oak Woodland* guidance (Rocchio 2011) and *Monitoring Desired Ecological Conditions on Washington State Wildlife Areas Using an Ecological Assessment Framework* (Rocchio and Crawford 2009) outline methods for conducting Ecological Integrity Assessments (EIAs) for native habitats at various levels of review. According to WDNR, the purpose of the EIA is to determine which factors are most important to the ecological integrity of a site and to prioritize sites for conservation. The EIA evaluates three rank factors for each ecosystem: landscape context, condition, and size. The rank factors are evaluated based on key ecological attributes within each rank factor. Because some rank factors contribute more to the ecological integrity of a site, the rank factors are weighted. For north Pacific oak woodland habitats, the rank factors are weighted as follows: landscape context constitutes 33 percent of total EIA score, condition constitutes 45 percent of total EIA score, and size constitutes 22 percent of total EIA score (Rocchio, J., 2013, personal communication). The ecological integrity of each rank factor and the ecosystem as a whole are rated using the EIA as excellent (rank value of A), good (rank value of B), fair (rank value of C), or poor (rank value of D) based on observed features and site characteristics. Landau Associates conducted this EIA in general accordance with the Level 2 EIA described in the WDNR guidance. Methods included a preliminary desktop review of the site, field investigation, and EIA scoring.

## **PRELIMINARY DESKTOP REVIEW**

The preliminary desktop review consisted of reviewing readily available aerial photographs (Google Earth Professional) and existing site plans. In reviewing the historical and current aerial photographs from 1990, the site is developed with a residential home with associated barns and out-buildings. The northern half of the site appears to have been logged or cleared prior to 1990 as the vegetation is not as dense as surrounding areas. A large area has been cleared of all native vegetation through the center of the site, and appears to be dominated by Scotch broom. The southern edge appears

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relatively undisturbed. The site plans identify concentrations of oak trees at the southeastern corner of the site and near the eastern boundary of the site.

## **FIELD INVESTIGATION**

Landau Associates' Project Scientist, Jessica Stone and Staff Biologist, Brittany Hartman, conducted the field investigation on July 25, 2013 to evaluate the oak habitat within the site and observe conditions adjacent to the site. Based on the preliminary desktop review, five circular plots, each 0.1 acre in size, were placed at locations within the site which represent potential oak habitat. Data collected within each plot consisted of tree, shrub, and herbaceous species identification; estimations of percent aerial cover of vegetative strata; investigating soil conditions for evidence of past disturbance; and documenting other general observations. The field documentation forms are presented in Attachment 1. Photographs of the habitat conditions in each plot are presented in Attachment 2.

Four stands: Stand A, Stand B, Stand C, and Stand D, containing Oregon white oaks were identified in the field investigation. These stands and the sample plots within the site are shown on Figure 2 and the full extent of Stand B is shown on Figure 3. The habitat conditions in each stand were documented based on the representative sample plots and observations during the desktop review. The EIA scoring matrices are presented in Attachment 3. Historic aerial photographs are presented on Figures 4A through 4F.

## **STAND A**

Stand A is located on a hillslope in the western portion of the site and is approximately 1.1 acres in size. Stand A is represented by sample plots OH-1 and OH-2 and consists of mixed Douglas-firs (*Pseudotsuga menziesii*), Oregon white oaks, Pacific madrones (*Arbutus menziesii*), and big leaf maples (*Acer macrophyllum*) with native shrub and herbaceous understory.

### ***Sample Plot OH-1***

Sample plot OH-1 is located in Stand A, which is identified as containing the highest density of Oregon white oaks on the site. Sample plot OH-1 is located on a hillslope with approximately 30percent grade and contains undisturbed soil consisting of very gravelly fine sand. At sample plot OH-1, 17 Oregon white oaks and 14 Douglas-firs (conifers) were identified; other trees present include three mature Pacific madrones, Oregon white oaks account for only 30percent of the total canopy cover, while Douglas-firs account for 60percent (Pacific madrones and big leaf maples account for 5 percent and 1 percent, respectively, for a total canopy cover of 96percent). The Douglas-firs overtop the Oregon white oaks, which are characterized by narrow, conical canopies. The average Oregon white oak diameter at

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breast height (DBH) is 8.6 inches and the maximum DBH is 16 inches. Oregon white oaks in sample plot OH-1 appear to represent a single-age class, and no Oregon white oak saplings were observed in sample plot OH-1. Understory vegetation is sparse, and dominated by native shrub species such as hazelnut (*Corylus cornuta*), snowberry (*Symphoricarpos albus*), and trailing blackberry (*Rubus ursinus*).

### ***Sample Plot OH-2***

Sample plot OH-2 is located near the edge of Stand A. Sample plot OH-2 is located on a hillslope with approximately 20percent grade, and the soil is undisturbed very gravelly fine sand with silt. At sample plot OH-2, 10 Oregon white oaks and 5 Douglas-firs were identified with one large dominant big leaf maple. Oregon white oaks account for only 15percent of the total canopy cover, while one large, mature big leaf maple accounts for 75percent (Douglas-firs account for 15percent cover, for a total canopy cover of 105percent due to canopy layering). The Oregon white oaks have been mostly overtopped or crowded by the big leaf maple. Ten Oregon white oaks were identified in sample plot OH-2; the average DBH is 9.2 inches, and the maximum DBH is 12.5 inches. The majority of the Oregon white oaks in sample plot OH-2 appear to represent a single-age class. No Oregon white oak saplings were observed in sample plot OH-2.

### ***Stand A Evaluation***

Based on conditions documented during the field investigation and the desktop review, it is estimated that Stand A contains approximately 20 percent canopy cover of Oregon white oak based on observed cover from sample points OH-1 and OH-2. Chapter 24.03.010 of the TCC defines “Oak woodlands” as “those stands of Oregon white oak (*Quercus garryana*) or Oregon white oak/conifer associations where the crown cover of the Oregon white oak component of the stand is greater than or equal to twenty-five percent.” Due to the density and high level of competition from Douglas-firs and big leaf maples, the Oregon white oak habitat is considered degraded. Stand A received an overall (weighted) estimated ecological integrity score of 2.73 (rank value of C), which is considered “fair,” with the stand’s landscape context and condition being ranked as “fair” and the stand size being ranked as “poor.” The EIA scorecard summary for Stand A is presented on Table 1. Based on the definitions in the TCC, Stand A was identified as “degraded oak woodland habitat” and is anticipated to require protection under TCC 24.25.065.

### **STAND B**

Stand B is dominated by Oregon white oaks and is approximately 59.2 acres in size, 0.5 acre of which is located on the site. The majority of Stand B is located on the adjacent properties to the east and south, with the northwestern edge of Stand B extending onto the southeastern portion of the site.

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Evaluation of Stand B is based on observations made from the site and from desktop review of aerial imagery. Stand B is separated from other forested areas and oak habitat by the cleared area dominated by Scotch broom. Stand B is represented by sample plot OH-3. The entire extent of Stand B (as estimated from aerial photographs and field observations of the site) is shown on Figure 3.

### ***Sample Plot OH-3***

Sample plot OH-3 is located at the edge of Stand B, encompassing part of Stand B and part of the large cleared area on the site. Topography is relatively flat; soils are compacted and consist of very gravelly fine sand with silt. The presence of Oregon white oaks on the site within Stand B is limited; therefore, the northern portion of sample plot OH-3 is located in the cleared portion of the site, which consisted primarily of Scotch broom. At sample plot OH-3, seven Oregon white oaks were identified, accounting for 50percent of the absolute canopy cover within Stand B. Scotch broom accounts for 50percent of cover in OH-3 outside of Stand B with approximately 35percent cover of Scotch broom within the Oregon white oak canopy at OH-3. The understory consists mostly of pasture grasses with a minimal native shrub cover. The average Oregon white oak DBH is 6.9 inches, and the maximum DBH is 12.5 inches. The majority of Oregon white oaks in sample plot OH-3 appear to represent a single-age class.

### ***Stand B Evaluation***

Based on observed conditions, Stand B is an Oregon white oak woodland (consisting of 100percent Oregon white oak canopy) that extends to the south, southwest, and southeast of the site. Stand B received an overall (weighted) estimated ecological integrity score of 3.64 (rank value of B), which is considered “good,” with the stand landscape context and condition being ranked as “fair” and the stand size being ranked as “excellent.” The EIA scorecard summary for Stand B is presented on Table 2. Stand B is considered a high quality “oak woodland” habitat based on the TCC definition and is anticipated to require protection under TCC 24.25.065.

### **STAND C**

Stand C consists of a single large multi-stem Oregon white oak, adjacent conifers, and Scotch broom. Based on canopy and the stem diameters, this Oregon white oak was the largest tree observed on the site and appears to be isolated and not associated with an Oregon white oak stand or savannah. Stand C is approximately 0.9 acre in size and is represented by sample plot OH-4.

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#### ***Sample Plot OH-4***

Sample plot OH-4 is located under the canopy of the large multi-stem Oregon white oak between the large cleared area on the site (dominated by Scotch broom) and several Douglas-firs. Topography at sample plot OH-4 is flat and the soil consists of relatively undisturbed sand with gravel and silt. Sample plot OH-4 contains one multi-stem Oregon white oak with four main stems, which account for approximately 80percent total tree canopy cover in the plot. Several Douglas-firs adjacent to the large Oregon white oak account for approximately 20percent of the total tree canopy cover in the plot. Sample plot OH-4 contains 40percent cover of Scotch broom around the edges of the Oregon white oak canopy. Within the Oregon white oak canopy, the understory is native shrubs (30percent absolute cover) and pasture grass with some Oregon white oak seedlings. The average DBH of the Oregon white oak stems is 19 inches; the maximum DBH is 21.5 inches.

#### ***Stand C Evaluation***

Stand C contains one large, multi-stem Oregon white oak which exhibits the broad crown as typical in oak savannahs (Vesely and Tucker 2004). However, this stand has poor connectivity to other Oregon white oak habitat, is in competition with adjacent conifers, and surrounding understory vegetation diversity is restricted by Scotch broom. As Stand C only contains one large mature Oregon white oak, the stand is not assigned an EIA score; however, as a mature individual Oregon white oak tree less than 1 acre in size located within 0.5 mile of an Oregon white oak habitat stand (Stand B), the large Oregon white oak tree in Stand C is anticipated to require protection under TCC 24.25.065.

#### **STAND D**

Stand D consists of mixed Oregon white oaks and conifers with a very dense native shrub layer within the northern half of the site. Stand D is observed as primarily containing Douglas-firs, with some scattered small Oregon white oaks with very tall, dense, native scrub-shrub understory. As observed during the desktop review, the northern half of the site appears to have been logged or cleared prior to 1990. Stand D is approximately 14.3 acres in size and is represented by sample plot OH-5.

#### ***Sample Plot OH-5***

Sample plot OH-5 is located in the northern forested portion of the site. The topography is relatively flat, and the soil is undisturbed fine sand with gravel and silt. However, at the time of the investigation, recent evidence of a vehicle was observed (faint tire tracks and damaged vegetation). Four Oregon white oaks were identified at sample plot OH-5, accounting for only 10percent of the absolute canopy cover. Six Douglas-firs account for 20percent of the absolute canopy cover, and Hooker's willow (*Salix hookeriana*) accounts for 10percent. There is 100percent cover of very large, dense native shrubs,

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including oceanspray (*Holodiscus discolor*) and beaked hazelnut (*Corylus cornuta*). The average DBH of the Oregon white oak is 11 inches. The maximum DBH is 15.5 inches. The Oregon white oaks in sample plot OH-5 appear to represent a single-age class based on observed size and lack of diversity.

#### ***Stand D Evaluation***

According to the EIA guidance (Rocchio 2011), when the majority of the stand has greater than 50percent cover of conifers, the stand has crossed the threshold into a conifer ecological system. While 50percent conifer cover was not observed at sample point OH-5 during the field investigation, the desktop review indicated that the conifer cover in Stand D is greater than 50percent; therefore, Stand D is considered an oak/conifer ecological system. Additionally, the primary vegetation type consists of a very tall, dense, native shrub layer. Chapter 24.03.010 of the TCC defines “Oak woodlands” as “those stands of Oregon white oak (*Quercus garryana*) or Oregon white oak/conifer associations where the crown cover of the Oregon white oak component of the stand is greater than or equal to twenty-five percent. In degraded habitat, the Oregon white oak component of the stand may be less than twenty-five percent...” Stand D contains only 10percent cover of Oregon white oaks, and therefore, does not meet the definition of “oak woodlands” per the TCC, and due to the density of native shrubs and conifers, is not considered “degraded habitat”. Because Stand D is not considered as Oregon white oak habitat or degraded Oregon white oak habitat, it is not assigned an EIA score.

#### ***Stand D Management Recommendations***

Although Oregon white oaks are present in Stand D, this area does not meet the definition of “oak habitat” in TCC 24.02.010. The Oregon white oaks that are present in Stand D are scattered and are in competition with surrounding Douglas-firs and a dense understory of native shrub vegetation. Stand D is an Oregon white oak/conifer association greater than 1 acre in size and should not require protection under TCC 24.25.065.

#### **CONCLUSIONS**

A summary of areas investigated for Oregon white oak habitat at the site is as follows:

- Stand A contains only 20percent cover of Oregon white oak and does not meet the definition of “oak woodland” in TCC 24.03.010. This area may be considered “degraded oak habitat” and is anticipated to require protection under TCC 24.25.065.
- Stand B has 100percent cover of Oregon white oak and is a large, high quality “oak woodland” per TCC 24.03.010. This area is anticipated to require protection under TCC 24.25.065.
- Stand C contains a single, large, isolated Oregon white oak tree bordered by dense Scotch broom and Douglas-fir mixed forest. This single tree is not part of an Oregon white oak stand and does not meet the definition of “oak woodland” or “oak savannah” per TCC 24.03.010. However, as a

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mature individual Oregon white oak tree less than 1 acre in size located within 0.5 mile of an Oregon white oak habitat stand, the large Oregon white oak tree in Stand C is anticipated to require protection under TCC 24.25.065.

- Stand D has only 10percent cover of Oregon white oak and does not appear to meet the definition of “oak woodland” in TCC 24.03.010. Stand D is an Oregon white oak/conifer association larger than 1 acre in size and is not anticipated to require protection under TCC 24.25.065.

BNG/JCS/SRW/jrc

## REFERENCES

Rocchio, J. 2013. Personal communication (telephone conversation with Brittany Gordon, Staff Biologist, Landau Associates). Joe Rocchio, Ecologist, Washington State Department of Natural Resources, Natural Heritage Program. Re: *Ecological Integrity Assessments*. October 16.

Rocchio, Joe. 2011. *Ecological Integrity Assessment: North Pacific Oak Woodland*. Washington State Department of Natural Resources, Washington Natural Heritage Program. February 25.

Rocchio, J. and Rex Crawford. 2009. *Monitoring Desired Ecological Conditions on Washington State Wildlife Areas Using an Ecological Assessment Framework*. Washington State Department of Fish and Wildlife. October 5.

Thurston County Assessor website. 2013. *Thurston County Office of the Assessor: Parcel Search (A+)*. <http://www.co.thurston.wa.us/assessor/>. Accessed July 23.

Vesely, D. and Gabe Tucker. 2004. *A Landowner's Guide for Restoring and Managing Oregon White Oak Habitats*. U.S. Department of the Interior, Bureau of Land Management, Salem District. Pacific Wildlife Research. October.

NWCB website. 2013. *Noxious Weed Control Board*. <http://www.nwcb.wa.gov/> Washington State Noxious Weed Control Board. Accessed August 1.

## ATTACHMENTS

Figure 1: Vicinity Map

Figure 2: Site Plan with Sample Plots

Figure 3: Woodland Stand B Full Extent

Figure 4A: Aerial Photo June 20, 1990

Figure 4B: Aerial Photo September 11, 2002

Figure 4C: Aerial Photo May 31, 2003

Figure 4D: Aerial Photo March 31, 2006

Figure 4E: Aerial Photo May 15, 2006

Figure 4F: Aerial Photo April 30, 2009

Table 1: Ecological Integrity Assessment Scorecard Summary – Stand A

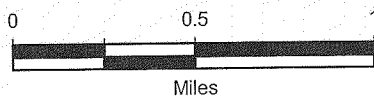
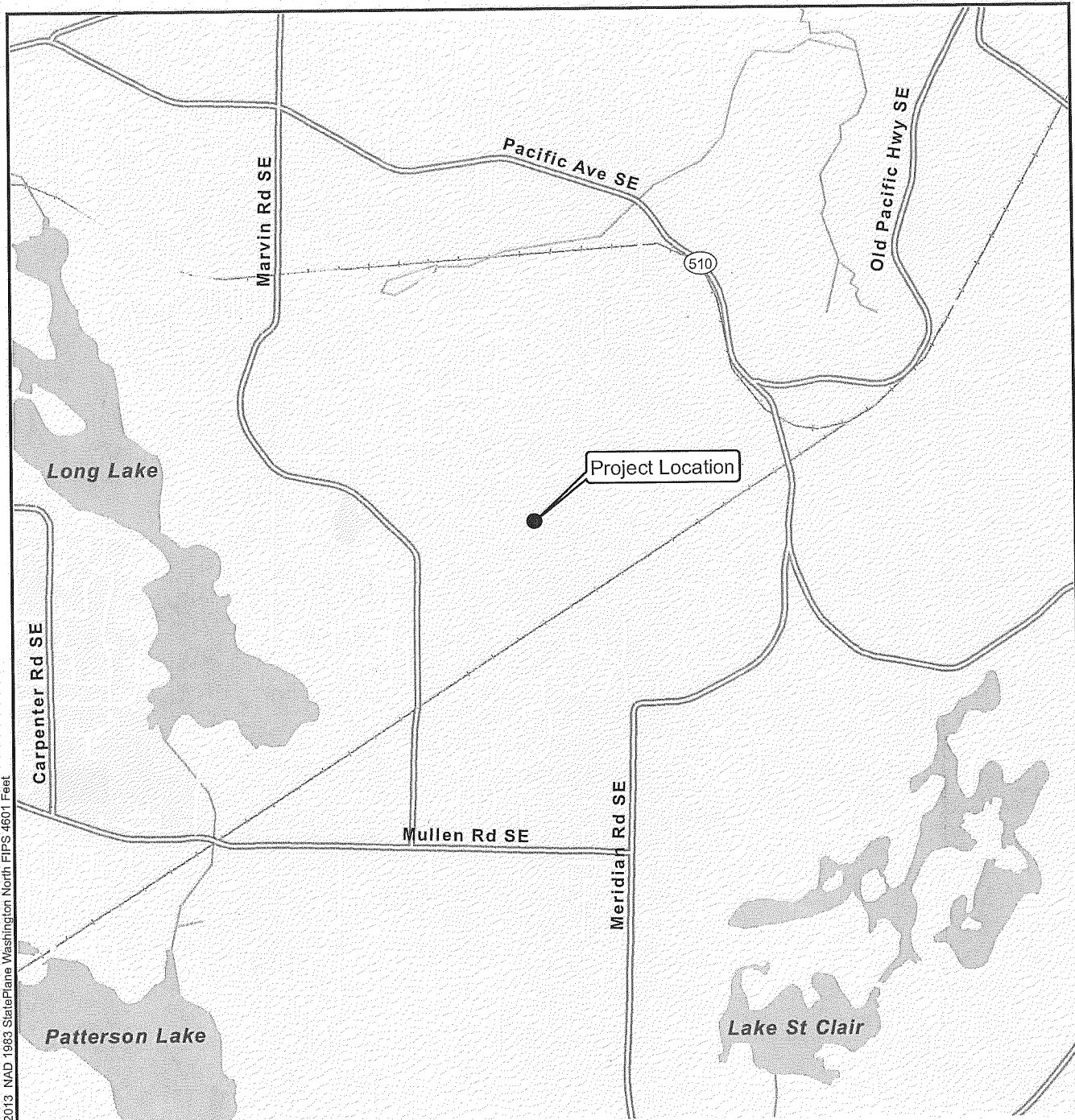
Table 2: Ecological Integrity Assessment Scorecard Summary – Stand B

Attachment 1: Field Forms

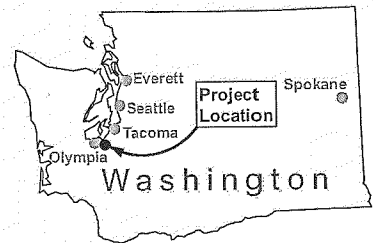
Attachment 2: Site Photographs

Attachment 3: Ecological Integrity Assessment Scorecards

Y:\Projects\138200\10\10\Figure1\VicinityMap.mxd 7/22/2013 NAD 1983 StatePlane Washington North FIPS 4601 Feet

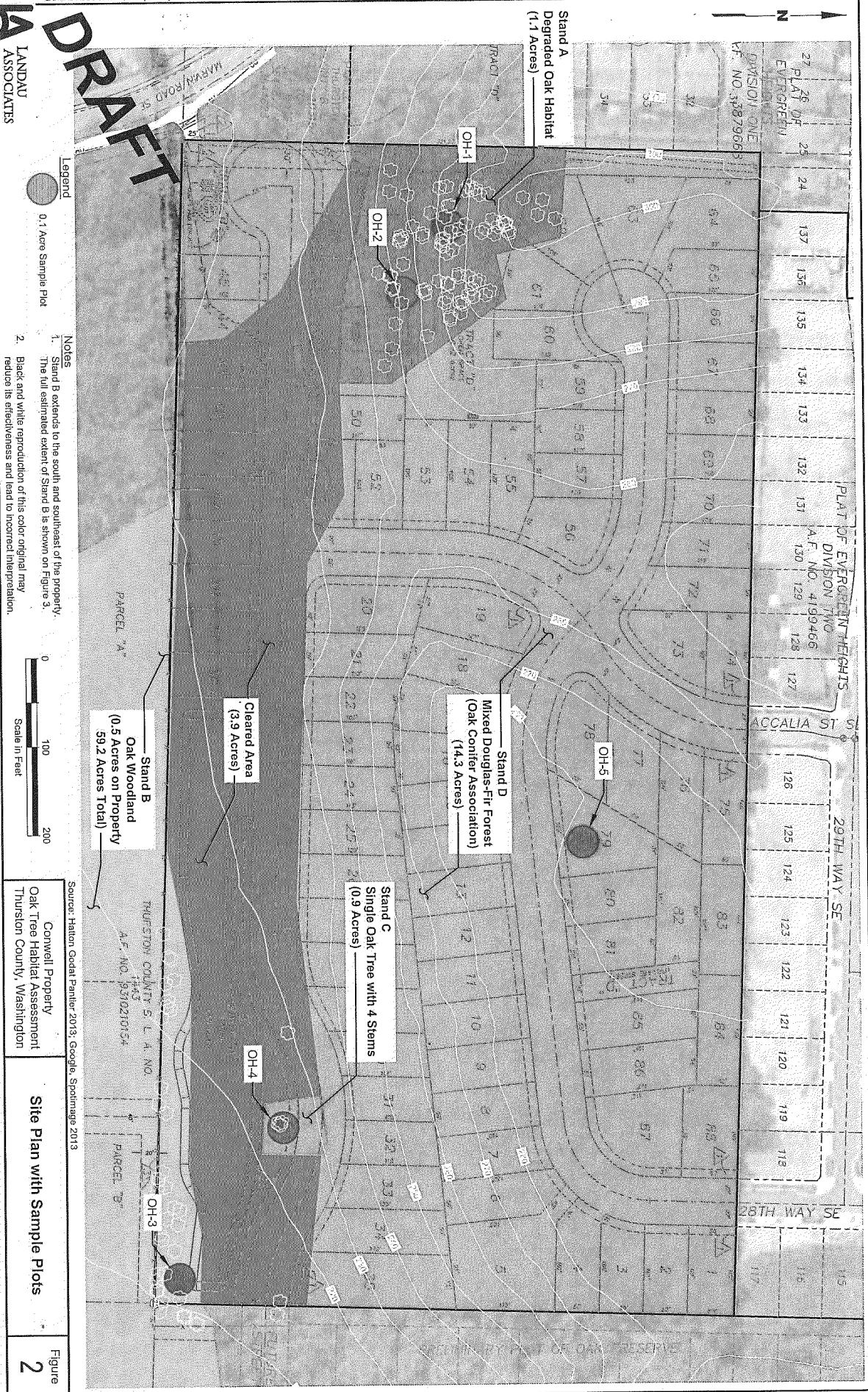


Data Source: Esri 2012



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- Note**
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



Source: Halton Godes, Pantler 2013; Google, SpotImage 2013

Cornwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

**Stand B**  
**Full Extent**

**Figure**  
**3**





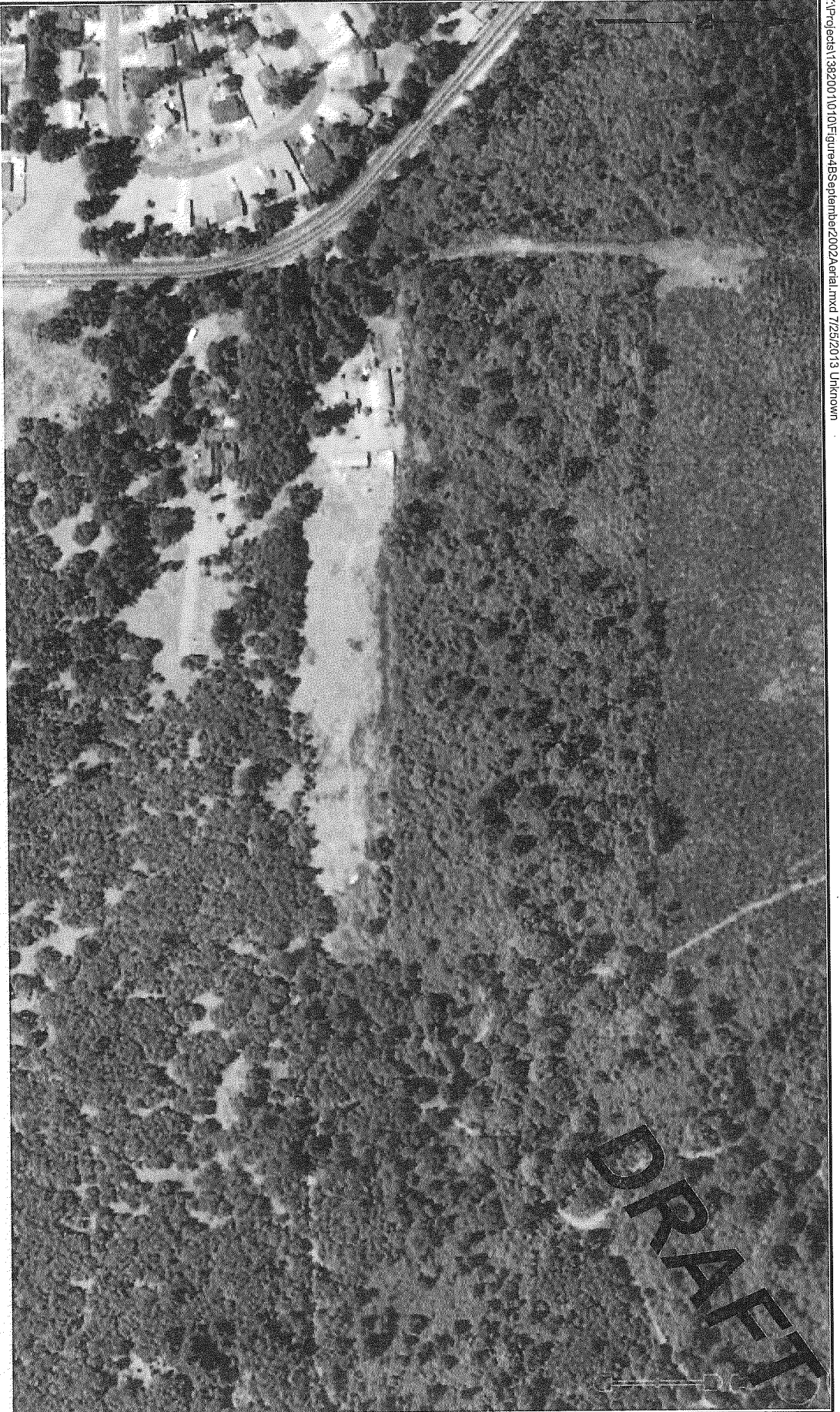
Data Source: Google Earth Pro

Conwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

Aerial Photo  
June 20, 1990

Figure  
4A



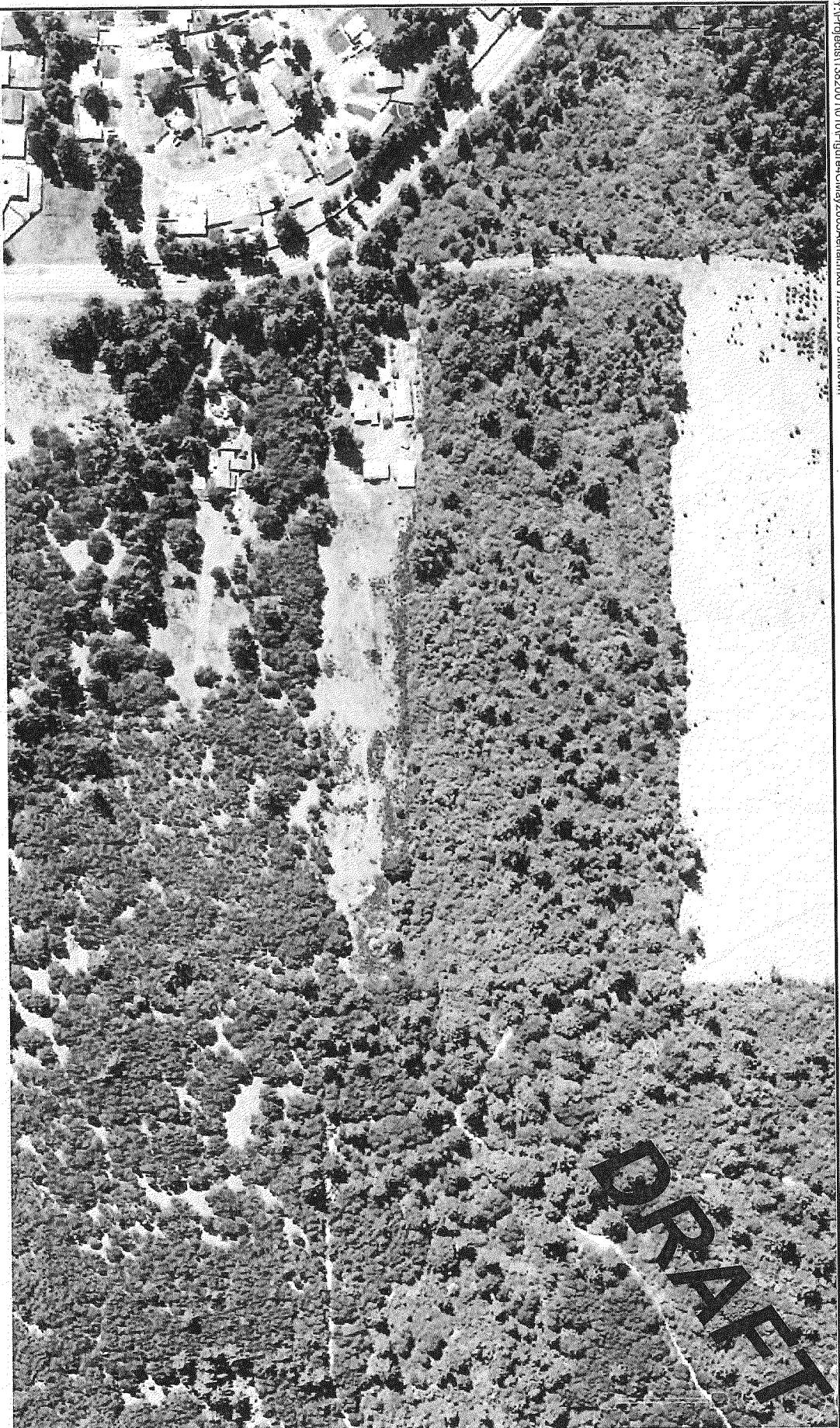


Data Source: Google Earth Pro

Conwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

Aerial Photo  
September 11, 2002

Figure  
4B



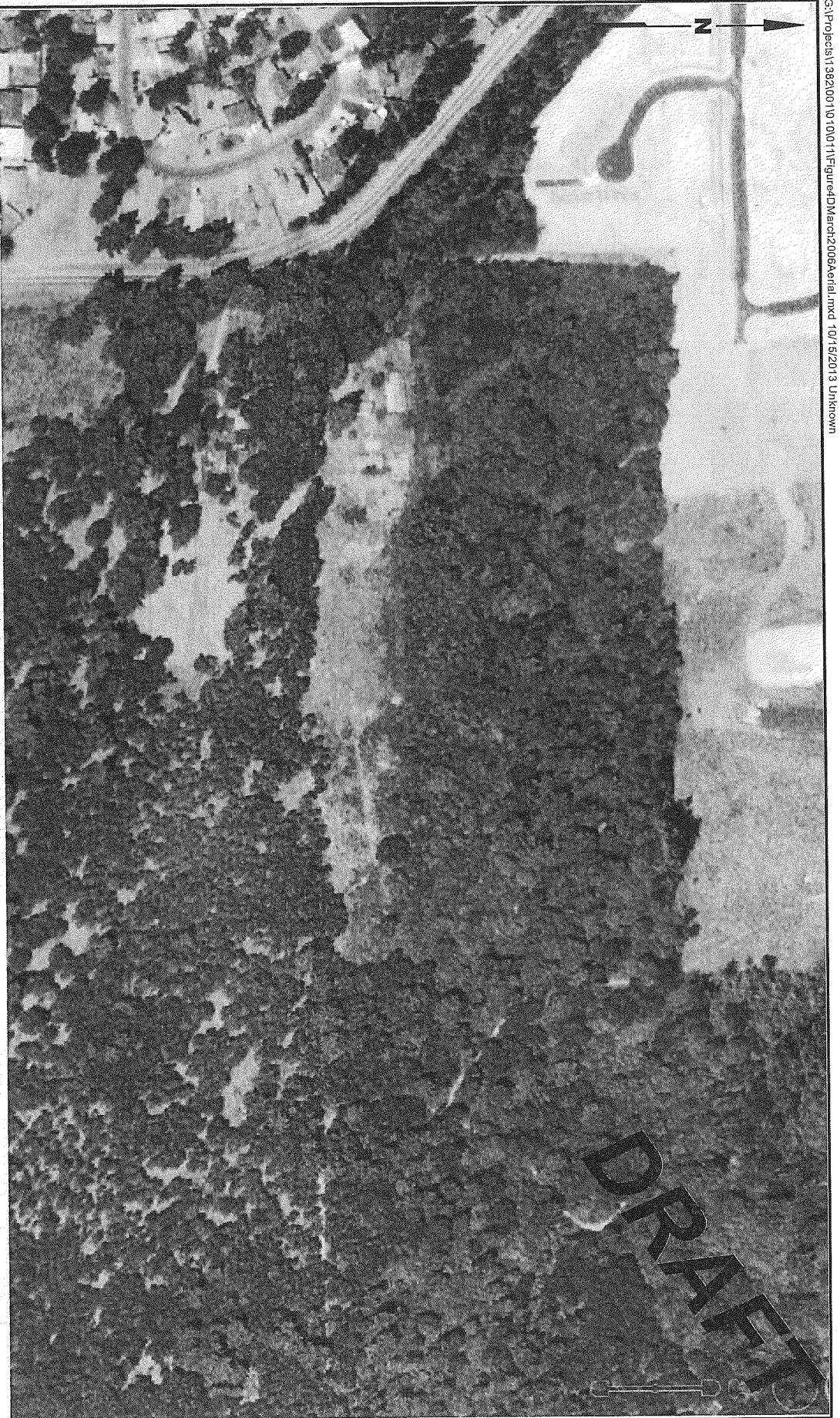
Data Source: Google Earth Pro

Conwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

Aerial Photo  
May 31, 2003

Figure  
4C



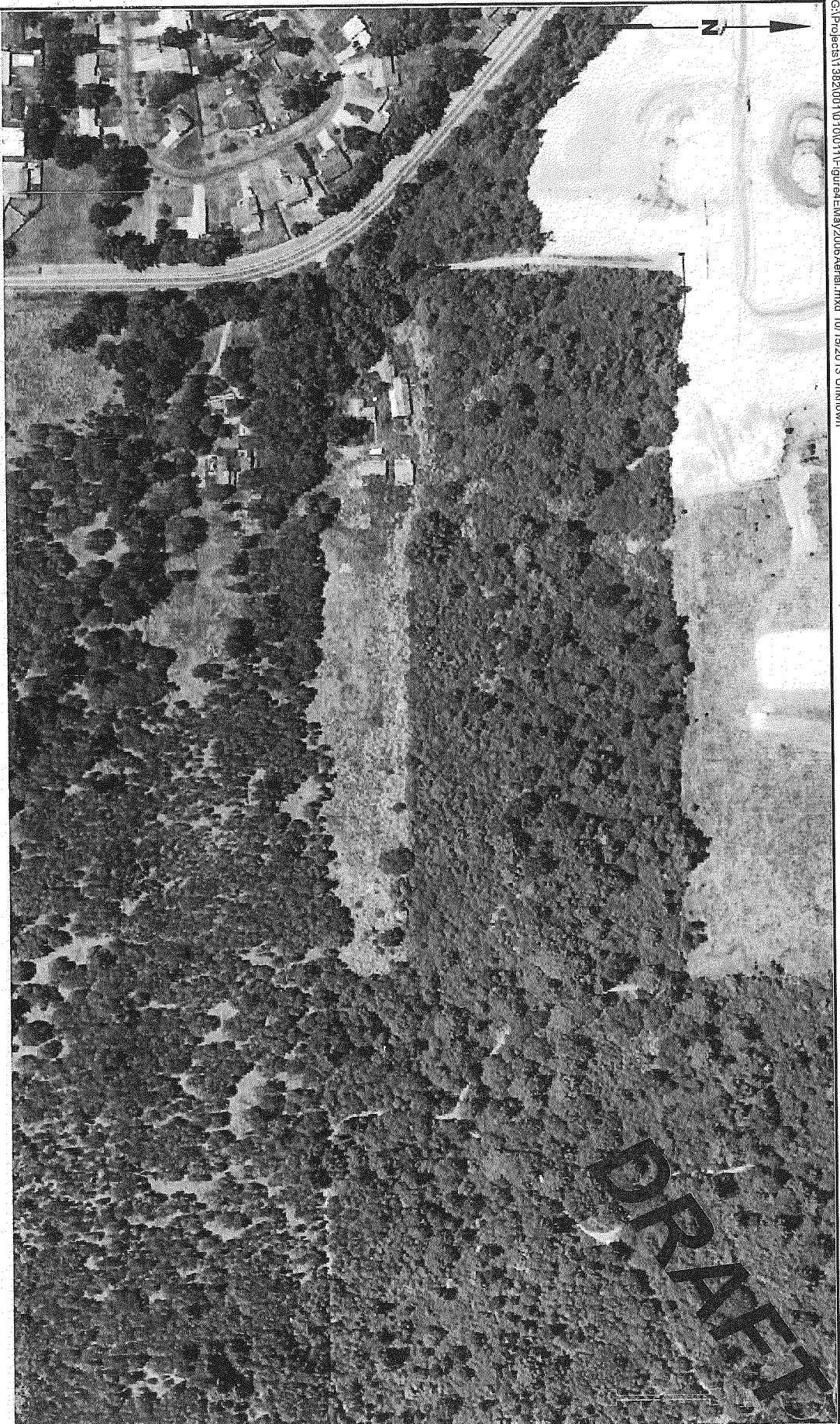


Data Source: Google Earth Pro

Conwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

Aerial Photo  
March 31, 2006

Figure  
4D



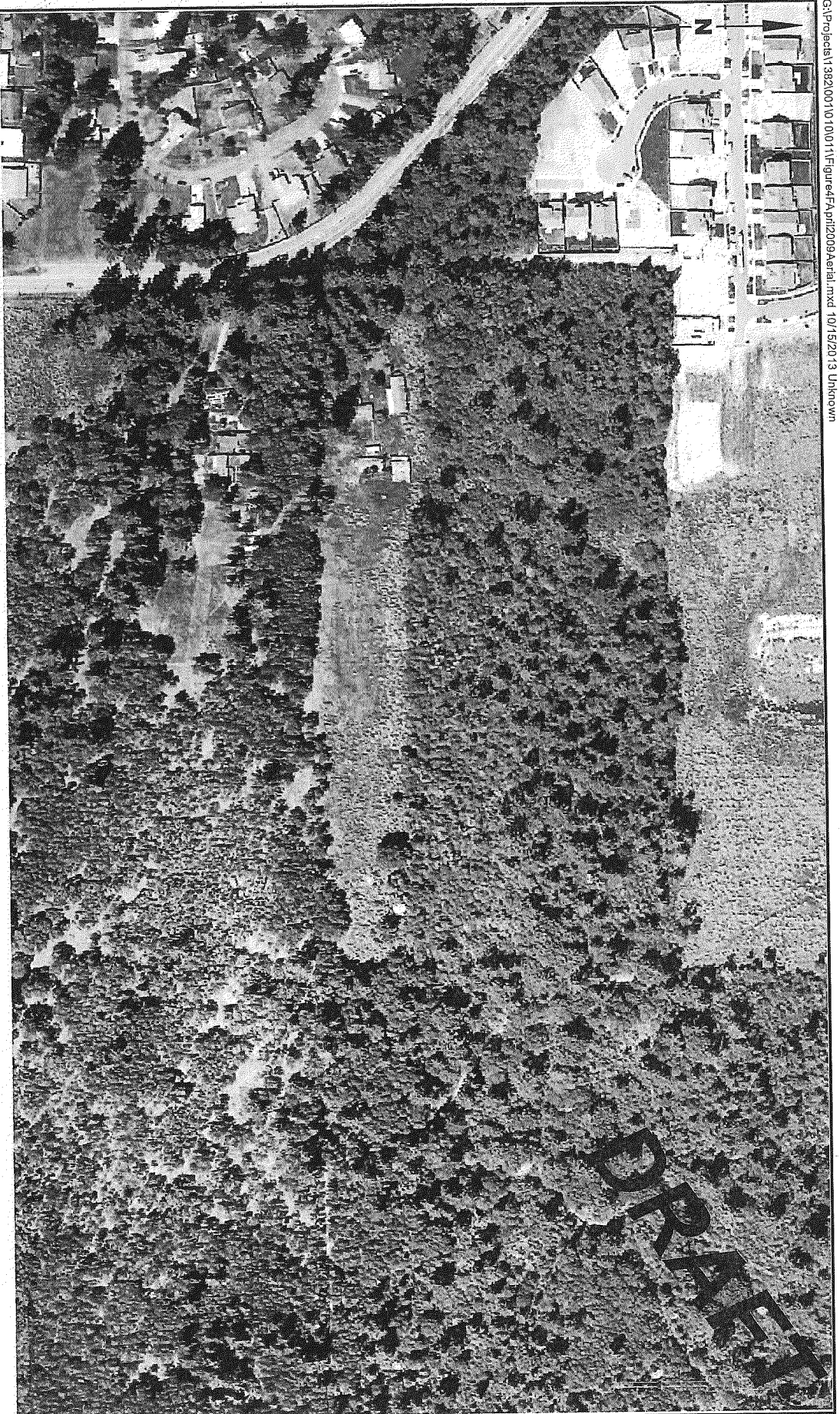
Data Source: Google Earth Pro

Conwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

Aerial Photo  
May 15, 2006

Figure  
4E





Data Source: Google Earth Pro

Conwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

Aerial Photo  
April 30, 2009

Figure  
4F

**TABLE 1**  
**ECOLOGICAL INTEGRITY ASSESSMENT SCORECARD SUMMARY - STAND A**  
**CONWELL PROPERTY, OAK TREE HABITAT ASSESSMENT**  
**THURSTON COUNTY, WASHINGTON**

**North Pacific Oak Woodland Ecological Integrity Assessment Scorecard Totals**

Conwell Property Oak Tree Habitat Assessment

Stand A

<b>Rank Factor: Landscape Context</b>	<b>Score:</b>	<b>3.4</b>	<b>Rank:</b>	<b>C</b>
<b>Key Ecological Attribute: Edge Effects</b>				
<i>Metric</i>	<i>Rank</i>	<i>Score</i>		
Edge Length	C	3		
Edge Width	A	5		
Edge Condition	D	1		
<b>Key Ecological Attribute: Landscape Structure</b>				
<i>Metric</i>	<i>Rank</i>	<i>Score</i>		
Connectivity	A	5		
Landscape Condition Model Index	C	3		
<b>Rank Factor: Condition</b>	<b>Score:</b>	<b>3.1</b>	<b>Rank:</b>	<b>C</b>
<b>Key Ecological Attribute: Vegetation Composition</b>				
<i>Metric</i>	<i>Rank</i>	<i>Points</i>		
Relative Cover	A	5		
Conifer Abundance	D	1		
Cover of Scotch broom	A	5		
Absolute Cover of Invasive Herbaceous Species	A	5		
Richness of Oak Associated Plant Species	C	3		
<b>Key Ecological Attribute: Vegetation Structure</b>				
<i>Metric</i>	<i>Rank</i>	<i>Points</i>		
Presence of Mature Oaks	C	3		
Oak Age Classes and Structure	D	1		
Total Tree Cover	D	1		
Shrub Cover	B	4		
<b>Key Ecological Attribute: Natural Disturbance Regime</b>				
<i>Metric</i>	<i>Rank</i>	<i>Points</i>		
Fire Regime Condition	D	1		
<b>Key Ecological Attribute: Physicochemical</b>				
<i>Metric</i>	<i>Rank</i>	<i>Points</i>		
Soil Surface Condition	A	5		
<b>Rank Factor: Size</b>	<b>Score:</b>	<b>1</b>	<b>Rank:</b>	<b>D</b>
<b>Key Ecological Attribute: Size</b>				
<i>Metric</i>	<i>Rank</i>	<i>Points</i>		
Relative Size	D	1		
Absolute Size	D	1		

	<b>Score</b>	<b>Weight</b>	<b>Total</b>
<b>Rank Factor: Landscape Context</b>	3.4	33%	1.12
<b>Rank Factor: Condition</b>	3.1	45%	1.39
<b>Rank Factor: Size</b>	1	22%	0.22
<b>Stand A Total Score:</b>			<b>2.73</b>
<b>Stand A Total Rank:</b>			<b>C</b>

**TABLE 2**  
**ECOLOGICAL INTEGRITY ASSESSMENT SCORECARD SUMMARY - STAND B**  
**CONWELL PROPERTY, OAK TREE HABITAT ASSESSMENT**  
**THURSTON COUNTY, WASHINGTON**

North Pacific Oak Woodland Ecological Integrity Assessment Scorecard Totals  
 Conwell Property Oak Tree Habitat Assessment

Stand B

Rank Factor: Landscape Context		Score:	3.4	Rank:	C
Key Ecological Attribute: Edge Effects					
Metric	Rank	Points			
Edge Length	B	4			
Edge Width	B	4			
Edge Condition	D	1			
Key Ecological Attribute: Landscape Structure					
Metric	Rank	Points			
Connectivity	A	5			
Landscape Condition Model Index	C	3			
Rank Factor: Condition		Score:	3.4	Rank:	C
Key Ecological Attribute: Vegetation Composition					
Metric	Rank	Points			
Relative Cover	C	3			
Conifer Abundance	A	5			
Cover of Scotch broom	C	3			
Absolute Cover of Invasive Herbacious Species	C	3			
Richness of Oak Associated Plant Species	C	3			
Key Ecological Attribute: Vegetation Structure					
Metric	Rank	Points			
Presence of Mature Oaks	C	3			
Oak Age Classes and Structure	B	4			
Total Tree Cover	A	5			
Shrub Cover	B	4			
Key Ecological Attribute: Natural Disturbance Regime					
Metric	Rank	Points			
Fire Regime Condition	D	1			
Key Ecological Attribute: Physicochemical					
Metric	Rank	Points			
Soil Surface Condition	C	3			
Rank Factor: Size		Score:	4.5	Rank:	A
Key Ecological Attribute: Size					
Metric	Rank	Points			
Relative Size	B	4			
Absolute Size	A	5			

	<b>Score</b>	<b>Weight</b>	<b>Total</b>
Rank Factor: Landscape Context	3.4	33%	1.12
Rank Factor: Condition	3.4	45%	1.53
Rank Factor: Size	4.5	22%	0.99
Stand A Total Score:			<b>3.64</b>
Stand A Total Rank:			<b>B</b>

ATTACHMENT 1

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## **Field Forms**



**Ecological Integrity Assessment: North Pacific Oak Woodland**

Project/Site: Conwell Property

City/County/State: Thurston County, Washington

Sampling Date: 7/25/2013

Sampling Plot ID: OH-1

Plot Size: 0.1 acre

Sampler's Initials: BNH/JCS

Weather: Sun, 70°

Location Description: Located at stake for HGP Control C-61, in western portion of property (identified as Stand A)

Topography (relief, approx slope %, unique features, etc.): Hillslope, ~ 30%

Soil Description: Undisturbed, light brown very gravelly fine sand with silt (moist)

Number of conifers in plot: 14

Comments: Dense concentration of oak trees. Layered canopy, Douglas-fir overtopping or suppressing most oak trees.

**Vegetation:**

Species:	Stratum	Absolute % Cover	Remarks
<i>Pseudotsuga menziesii</i>	Tree	60%	14 total trees > 6 inches DBH
<i>Quercus garryana</i>	Tree	30%	17 total oaks; oaks are tall and linear
<i>Arbutus menziesii</i>	Tree	5%	3 large mature madrone trees
<i>Acer macrophyllum</i>	Tree	1%	
<i>Pseudotsuga menziesii</i>	Sapling		
<i>Corylus cornuta</i>	Shrub		
<i>Oemleria cerasiformis</i>	Shrub		
<i>Symphoricarpos albus</i>	Shrub		
<i>Mahonia nervosa</i>	Shrub		
<i>Mahonia aquifolium</i>	Shrub		
<i>Holodiscus discolor</i>	Shrub		
<i>Rubus ursinus</i>	Shrub		
<i>Ilex aquifolium</i>	Shrub	3%	Non-native
<i>Polystichum munitum</i>	Herb		
<i>Trientalis latifolia</i>	Herb		

Total shrub cover: 40%

Total groundcover: 60%

### Oak Tree Inventory

Fill out one section for each oak tree in the plot.

Oak ID: 1	DBH: 5.5
Oak ID: 2	DBH: 6
Oak ID: 3	DBH: 5.5
Oak ID: 4	DBH: 8.5
Oak ID: 5	DBH: 11
Oak ID: 6	DBH: 11
Oak ID: 7	DBH: 8
Oak ID: 8	DBH: 9
Oak ID: 9	DBH: 5
Oak ID: 10	DBH: 16
Oak ID: 11	DBH: 6
Oak ID: 12	DBH: 8.5
Oak ID: 13	DBH: 11.5
Oak ID: 14	DBH: 8.5
Oak ID: 15	DBH: 10
Oak ID: 16	DBH: 9.5
Oak ID: 17	DBH: 7

Ecological Integrity Assessment: North Pacific Oak Woodland

Project/Site: Conwell Property

City/County/State: Thurston County, Washington

Sampling Date: 7/25/2013

Sampling Plot ID: OH-2

Plot Size: 0.1 acre

Sampler's Initials: BNH/JCS

Weather: Sun, 70°

Location Description: In western portion of property, near edge of identified oak habitat (Stand A)

Topography (relief, approx slope %, unique features, etc.): Hillslope, ~ 20%

Soil Description: Undisturbed, brown silty gravelly fine sand (moist)

Number of conifers in plot: 5

Comments: Large big leaf maple overtopping or suppressing most of the oak trees, plot lacks oak seedlings and saplings.

**Vegetation:**

Species:

Species	Stratum	Absolute % Cover	Remarks
<i>Acer macrophyllum</i>	Tree	75%	1 tree, 4 main stems. Very large and broad-canopied
<i>Pseudotsuga menziesii</i>	Tree	15%	5 total trees > 6 inches DBH
<i>Quercus garryana</i>	Tree	15%	10 total oaks; oaks are tall and linear
<i>Rosa gymnocarpa</i>	Shrub		
<i>Oemleria cerasiformis</i>	Shrub		
<i>Symphoricarpos albus</i>	Shrub		
<i>Corylus cornuta</i>	Shrub		
<i>Machonia nervosa</i>	Shrub		
<i>Machonia aquifolium</i>	Shrub		
<i>Rubus ursinus</i>	Shrub		
<i>Polystichum munitum</i>	Herb		
<i>Trientalis latifolia</i>	Herb		

Total shrub cover: 85%

Total groundcover: 5%

### Oak Tree Inventory

Fill out one section for each oak tree in the plot.

Oak ID: 1	DBH: 5
Oak ID: 2	DBH: 7
Oak ID: 3	DBH: 10.5
Oak ID: 4	DBH: 11
Oak ID: 5	DBH: 12.5
Oak ID: 6	DBH: 9
Oak ID: 7	DBH: 11
Oak ID: 8	DBH: 10
Oak ID: 9	DBH: 7.5
Oak ID: 10	DBH: 8.5

**Ecological Integrity Assessment: North Pacific Oak Woodland**

Project/Site: Conwell Property

City/County/State: Thurston County, Washington

Sampling Date: 7/25/2013

Sampling Plot ID: OH-3

Plot Size: 0.1 acre

Sampler's Initials: BNH/JCS

Weather: Sun, 70°

Location Description: In southeastern portion of property at edge of large oak stand (Identified as Stand C) which extends onto the site. Near stake for HSP Control C-58.

Topography (relief, approx slope %, unique features, etc.): Flat ~ 0%.

Soil Description: Compacted, likely disturbed brown very gravelly fine sand with silt (moist) (very dense)

Number of conifers in plot: 0

Comments: Sample plot is located at the edge of a large oak stand which extends onto adjacent properties.

**Vegetation:**

Species:

Stratum

Absolute % Cover

Remarks

*Quercus garryana*

Tree

50%

7 total oaks in plot. Oak cover is 50% in plot, but 100% to south.

*Cytisus scoparius*

Shrub

50%

Invasive, outside oak canopy-100%, inside oak canopy ~35%

*Amelanchier alnifolia*

Shrub

*Mahonia aquifolium*

Shrub

*Rhamnus purshiana*

Shrub

*Oemleria cerasiformis*

Shrub

*Symphoricarpos albus*

Shrub

*Hypochaeris radicata*

Herb

*Jacobaea vulgaris*

Herb

*Dactylis sp.*

Grass

*Agrostis sp.*

Grass

Total shrub cover: Inside oak canopy: 40% (35% Scotch broom, 5% native), outside oak canopy: 100% (Scotch broom)

Total groundcover: 100% (dominated by pasture grasses)

### Oak Tree Inventory

Fill out one section for each oak tree in the plot.

Oak ID: 1	DBH: 4.5
Oak ID: 2	DBH: 7
Oak ID: 3	DBH: 4.5
Oak ID: 4	DBH: 6
Oak ID: 5	DBH: 6.5
Oak ID: 6	DBH: 12.5
Oak ID: 7	DBH: 7.5

Ecological Integrity Assessment: North Pacific Oak Woodland

Project/Site: Conwell Property

City/County/State: Thurston County, Washington

Sampling Date: 7/25/2013

Sampling Plot ID: OH-4

Plot Size: 0.1 acre

Sampler's Initials: BNH/JCS

Weather: Sun, 80°

Location Description: In eastern portion of the property, north of cleared area.

Topography (relief, approx slope %, unique features, etc.): Flat ~ 1%.

Soil Description: Relatively undisturbed, brown sand with gravel and silt (moist)

Number of conifers in plot: 4

Comments: Single, large multi-stemmed oak tree, oak seedlings observed under canopy but not observed within surrounding Scotch broom.

**Vegetation:**

Species:

Species	Stratum	Absolute % Cover	Remarks
<i>Pseudotsuga Menziesii</i>	Tree	20%	4 total
<i>Quercus garryana</i>	Tree	80%	4 large stems clumped
<i>Cytisus scoparius</i>	Shrub	40%	Invasive, only located outside oak canopy.
<i>Symphoricarpos albus</i>	Shrub		
<i>Rhamnus purshiana</i>	Shrub		
<i>Mahonia aquifolium</i>	Shrub		
<i>Lonicera sp.</i>	Shrub		
<i>Oemleria cerasiformis</i>	Shrub		
<i>Achillea millefolium</i>	Herb		
<i>Jacobaea vulgaris</i>	Herb		
<i>Dactylis sp.</i>	Grass		
<i>Agrostis sp.</i>	Grass		

Total shrub cover: Inside oak canopy: 30% (all native), outside oak canopy: 40% (all Scotch broom)

Total groundcover: 100% (mostly grasses)

**Oak Tree Inventory**

Fill out one section for each oak tree in the plot.

Oak ID: Stem 1	DBH: 18
Oak ID: Stem 2	DBH: 21.5
Oak ID: Stem 3	DBH: 16.5
Oak ID: Stem 4	DBH: 19.5



Ecological Integrity Assessment: North Pacific Oak Woodland

Project/Site: Conwell Property

City/County/State: Thurston County, Washington

Sampling Date: 7/25/2013

Sampling Plot ID: OH-5

Plot Size: 0.1 acre

Sampler's Initials: BNH/JCS

Weather: Sun, 80°

Location Description: North part of site, mixed forest outside identified (surveyed) oak areas (Stand D)

Topography (relief, approx slope %, unique features, etc.): Flat ~ 1%.

Soil Description: Undisturbed brown fine sand with gravel and silt (moist). Shallow, recent tire tracks visible.

Number of conifers in plot: 6

Comments: Very dense, stratified native shrub layer

**Vegetation:**

Species:	Stratum	Absolute % Cover	Remarks
<i>Pseudotsuga menziesii</i>	Tree	20%	6 total
<i>Quercus garryana</i>	Tree	10%	4 trees
<i>Salix hookeriana</i>	Tree	10%	2 trees
<i>Mahonia nervosa</i>	Shrub		
<i>Corylus cornuta</i>	Shrub		
<i>Holodiscus discolor</i>	Shrub		
<i>Symphoricarpos albus</i>	Shrub		
<i>Rhamnus purshiana</i>	Shrub		
<i>Rubus ursinus</i>	Shrub		
<i>Oemleria cerasiformis</i>	Shrub		
<i>Vaccinium parvifolium</i>	Shrub		
<i>Rubus armeniacus</i>	Shrub	2%	Invasive
<i>Lonicera involucrata</i>	Vine		
<i>Polystichum munitum</i>	Herb		
<i>Pteridium aquilinum</i>	Herb		
<i>Tridentalis latifolia</i>	Herb		

Total shrub cover: >100% (native)

Total groundcover: <5%

Oak Tree Inventory

Fill out one section for each oak tree in the plot.

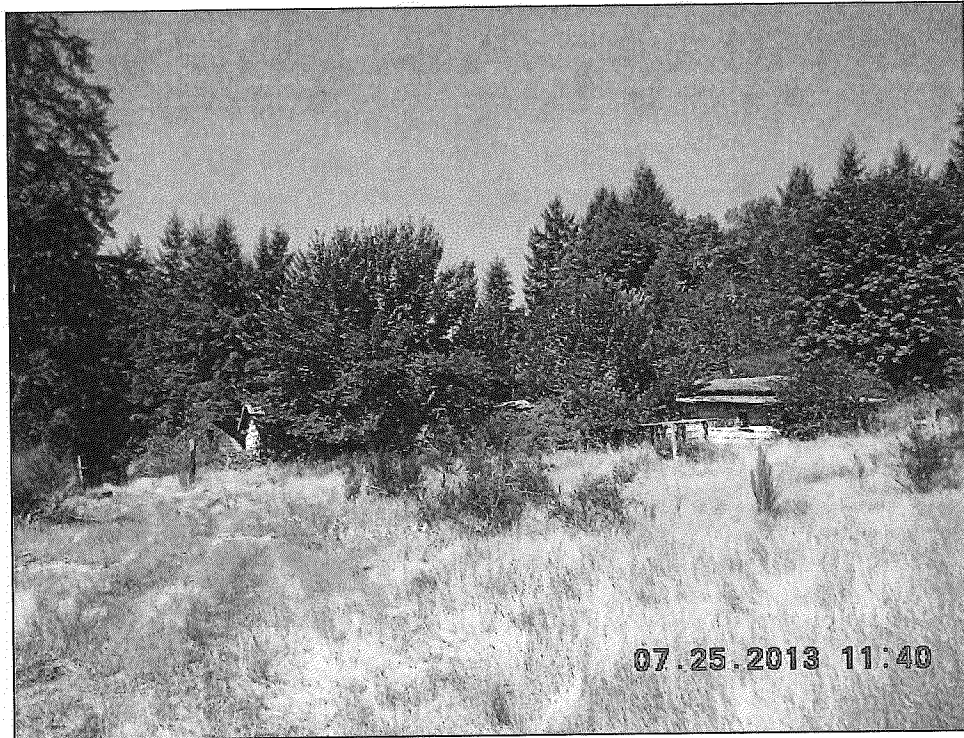
Oak ID: 1  
Oak ID: 2  
Oak ID: 3  
Oak ID: 4

DBH: 15.5  
DBH: 14.5  
DBH: 7.5  
DBH: 6

ATTACHMENT 2

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## **Site Photographs**



1. Cleared area and vacant buildings near southwest corner of the site.



2. Looking east at the cleared area located along the southern edge of the site.

10/15/13 Y:\382001.010\RA\2\_Photos\B1.docx



3. Looking north from cleared area toward the edge of woodland Stand A.



4. View of tree canopy at sample plot OH-1 within woodland Stand A.

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5. Understory vegetation at sample plot OH-1 within woodland Stand A.

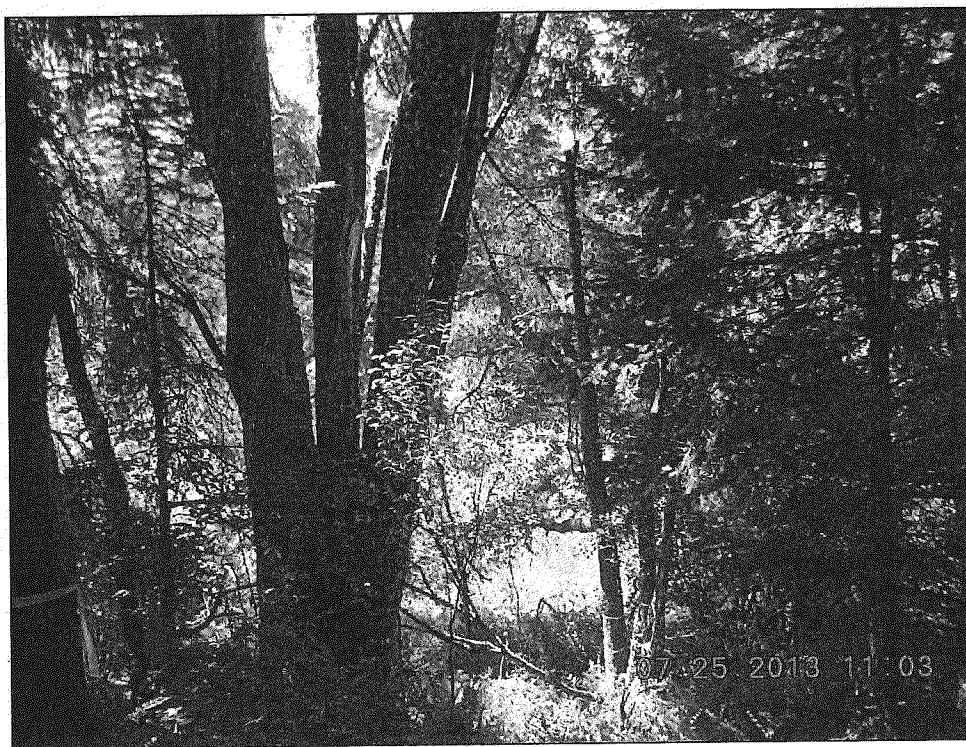


6. Understory vegetation at sample plot OH-2 within woodland Stand A.

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11. View of tree canopy at sample plot OH-2 within woodland Stand A.



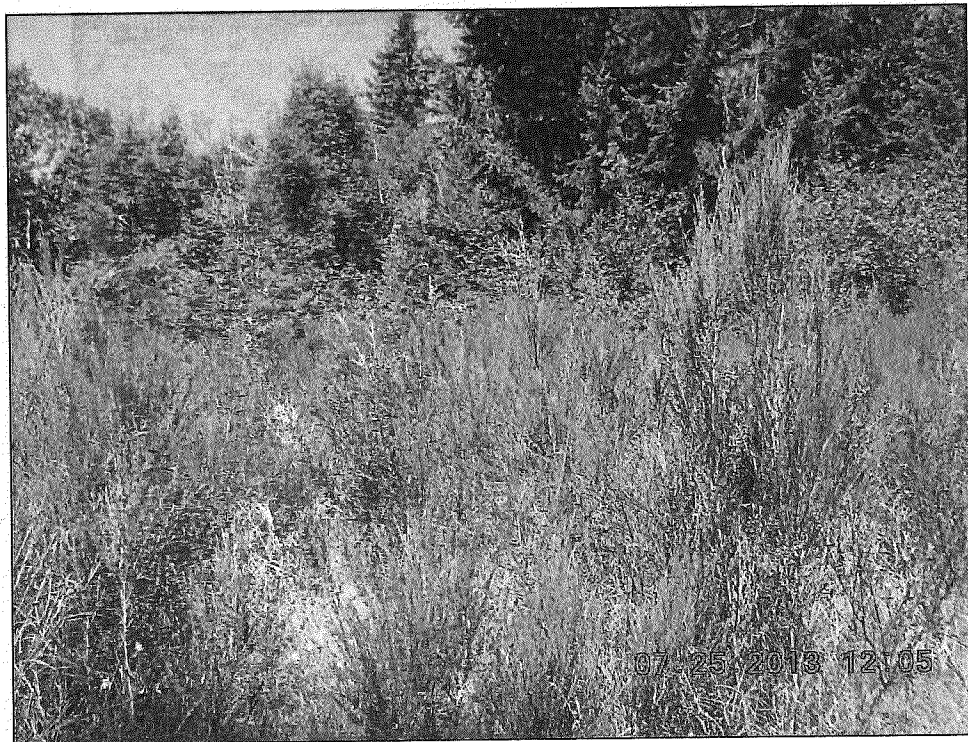
12. Looking from sample plot OH-2 toward edge of woodland Stand A.

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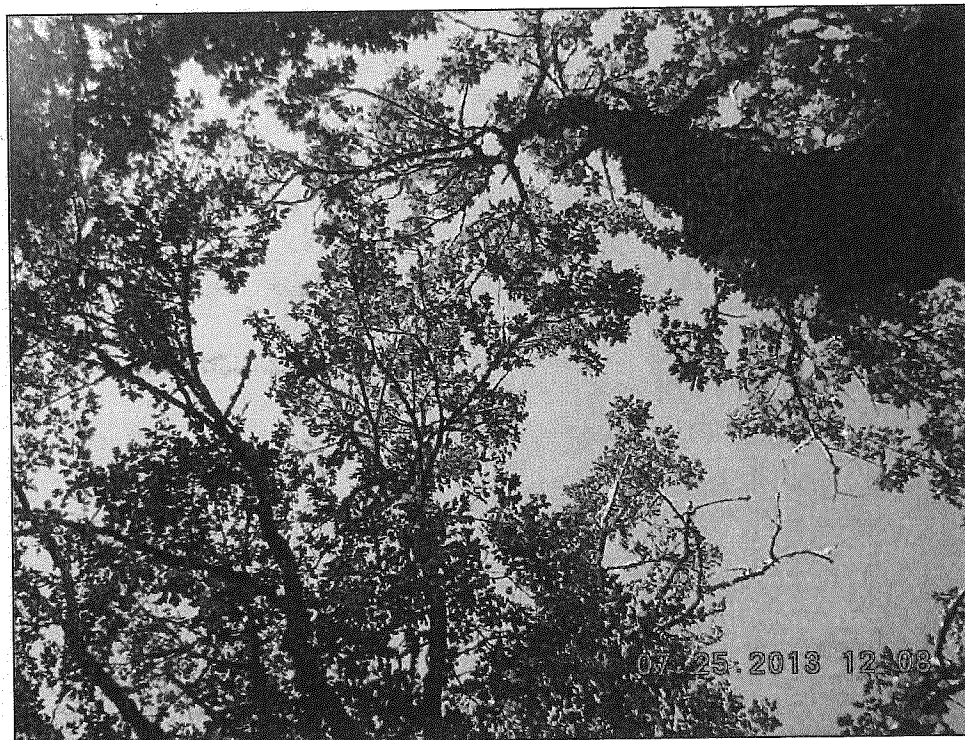


9. Southern portion of sample plot OH-3 within woodland Stand B.



10. View of northern portion of sample plot OH-3 adjacent to woodland Stand B.



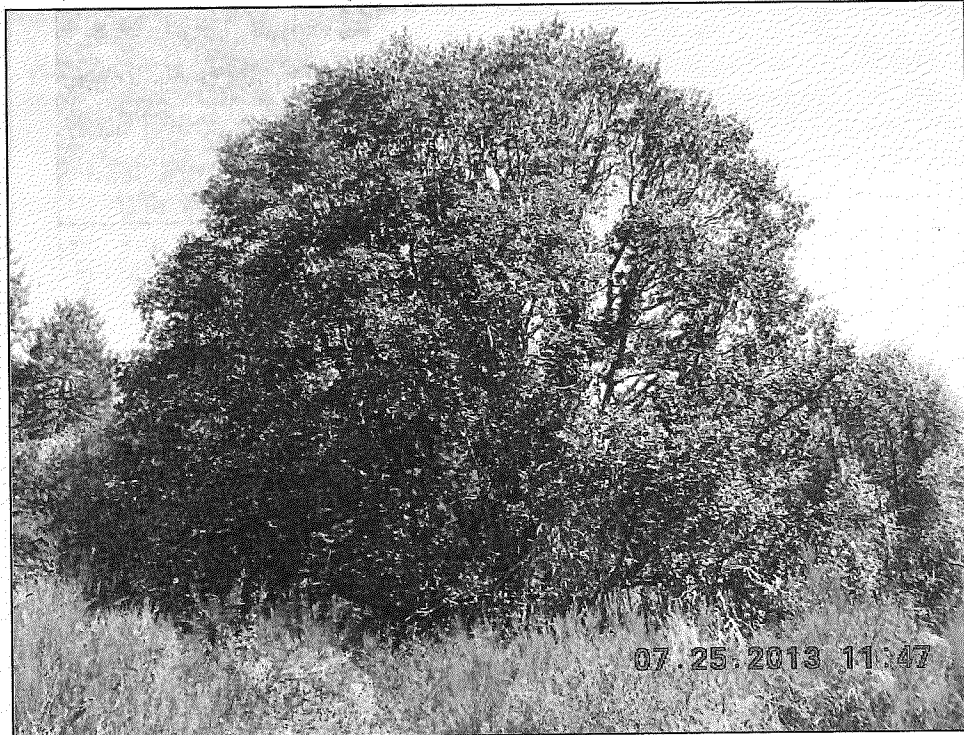


11. View of Oregon white oak canopy at sample plot OH-3 within woodland Stand B.



12. Looking south at woodland Stand B located adjacent to the south of the site.

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13. The large Oregon white oak tree consisting of woodland Stand C.



14. Douglas-fir tree canopy within sample plot OH-4 located within woodland Stand C.

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ASSOCIATES

Conwell Property  
Oak Tree Habitat Assessment  
Thurston County, Washington

**Selected Site Photographs**

Figure  
**2-7**





15. Large Oregon white oak tree consisting of four main stems at sample plot OH-4 within woodland Stand C.



16. Oregon white oak seedling at sample plot OH-4 within woodland Stand C.



17. Mixed vegetation at sample plot OH-5 within woodland Stand D.



18. Dense shrub understory at sample plot OH-5 within woodland Stand D.

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# Ecological Integrity Assessment Scorecards

Table 1. North Pacific Oak Woodland Ecological Integrity Assessment Scorecard

Metric	Justification	Rank			
		A (5 pts.)	B (4 pts.)	C (3 pts.)	D (1 pts.)
Rank Factor: LANDSCAPE CONTEXT					
Key Ecological Attribute: <i>Edge Effects</i>					
Edge Length	The intactness of the edge can be important to biotic and abiotic aspects of the site.	75 – 100% of edge is bordered by natural communities	50 – 74% of edge is bordered by natural communities	25 – 49% of edge is bordered by natural communities	< 25% of edge is bordered by natural communities
Edge Width		Average width of edge is at least 100 m.	Average width of edge is at least 75-100 m.	Average width of edge is at least 25-75 m.	Average width of edge is at least <25 m.
Edge Condition		>95% cover native vegetation, <5% cover of non-native plants, intact soils	75-95% cover of native vegetation, 5-25% cover of non-native plants, intact or moderately disrupted soils	25-50% cover of non-native plants, moderate or extensive soil disruption	>50% cover of non-native plants, barren ground, highly compacted or otherwise disrupted soils
Key Ecological Attribute: <i>Landscape Structure</i>					
Connectivity	Intact areas have a continuous corridor of natural or semi-natural vegetation	Intact: Embedded in 90-100% natural habitat, connectivity is expected to be high.	Variagated: Embedded in 60-90% natural or semi-habitat, habitat connectivity is generally high, but lower for species sensitive to habitat modification.	Fragmented: Embedded in 20-60% natural or semi-natural habitat, connectivity is generally low, but varies with mobility of species and arrangement on landscape.	Relictual: Embedded in < 20% natural or semi-natural habitat, connectivity is essentially absent
Landscape Condition Model Index	The intensity and types of land uses in the surrounding landscape can affect ecological integrity.	Landscape Condition Model Index > 0.8	Landscape Condition Model Index 0.79 – 0.65	Landscape Condition Model Index < 0.65	

Notes: Average width of edge is 349 meters; however, over 50 percent of the edge consists of a roadway or previously cleared areas dominated by Scotch broom. Landscape Condition Model not completed for this project and was estimated.



Metric	Justification	Rank			
		A (5 pts.)	B (4 pts.)	C (3 pts.)	D (1 pts.)
Rank Factor: CONDITION					
Key Ecological Attribute: <i>Vegetation Composition</i>					
Relative Cover Native Plant Species	Native species in shrub and herbaceous layers; non-natives increase with human impacts.	Total cover of native species in shrub and herbaceous layers >95% and dominate all physiognomic layers;	Total cover of native species in shrub and herbaceous layers > 90%	Total cover of native species in shrub and herbaceous layers 50 to <90%. Nonnative may be codominant with native species	Total cover of native species in shrub and herbaceous layers <50%. Nonnative species dominate understory with minor native component.
Conifer Abundance	The amount and spatial distribution of conifer encroachment (<100 yrs. old) is an indication of the integrity of disturbance regimes (Chappell 2000; Chappell 2004)	Conifers are absent, scattered, or small OR if part of the canopy then they are part of an oak/conifer association representing an ecotone between oak woodland and conifer forest and NOT due to fire suppression of previous oak woodland sites	Conifers (<100 yrs. old) present but do not pose a near-term threat to the oak canopy	Conifers (<100 yrs. old) may be numerous in the canopy and/or understory but have not overtopped and shaded the majority of the oak canopy	Conifers (<100 yrs. old) have overtopped and shaded majority of oak canopy. Conifer cover may be close to 50% of total tree cover. If >50%, then the site has crossed threshold into a conifer ecological system.
Cover of Scotch broom ( <i>Cytisus scoparius</i> )	This invasive shrub displaces native species and is very aggressive. Early detection is critical	None or minimal (<1%) present	Present, but sporadic (<5% cover).	Prevalent (5-25% cover).	Abundant > 25% cover
Absolute Cover of Invasive Herbaceous Species	Invasive species can inflict a wide range of ecological impacts. Early detection is critical. See list of species below.	None or minimal (<1%) present	Invasive species present but sporadic (<5% cover).	Invasive species prevalent (5-30% absolute cover).	Invasive species abundant (>30% absolute cover).
Richness of Oak Associated Plant Species (Alverson 2009a)	The overall composition of native species can shift when exposed to stressors. This metric measures the presence of those species with strong fidelity to oak woodlands. Refer to fidelity list below.	>10 native species (or >35% of native species) for oak-shrubland associations OR >15 species (or >70% of native species) for oak herbaceous associations with high and moderate fidelity to oak woodlands	7-10 native species (or 20-35% of native species) for oak-shrubland associations OR 9-15 species (or 45-70% of native species) for oak herbaceous associations with high and moderate fidelity to oak woodlands	4-7 native species (or 10-20% of native species) for oak-shrubland associations OR 4-9 species (or 20-45% of native species) for oak herbaceous associations with high and moderate fidelity to oak woodlands	<4 native species (or <10% of native species) for oak-shrubland associations OR <4 species (or <20% of native species) for oak herbaceous associations with high and moderate fidelity to oak woodlands

Notes:


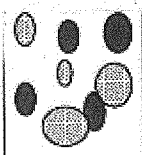


### Key Ecological Attribute: *Vegetation Structure*

<b>Presence of Mature Oaks</b>	The presence of mature oaks reflects intact ecological processes and provide unique habitat (Chappell 2000).	Large, mature (>150 yr. old or >24" dbh), widely spaced oaks with single trunks and broad spreading crowns present (savanna). Cohort of mature oaks is prominent but not necessarily dominant in the canopy (woodland); No logging of mature oak.	Logging has removed a few mature oak trees; overall logging impacts are minimal.	Moderate logging history. <del>Many mature trees have been removed but some are still present. Minimally, there are numerous trees &gt;15 cm dbh present</del>	Substantial logging has occurred; All mature trees have been removed. No trees >15 cm dbh present
<b>Oak Age Classes and Structure</b>	The distribution of age classes and structure of oak canopies are indicative of intact ecological processes and provide important habitat (Chappell 2000; Alverson 2009a).	Multiple age or size classes of oak may be present but no single class dominates; Canopy architecture represents an appropriate mix of large open grown trees and younger tree recruitment that will replace older trees when they die.	Fire suppression is allowing dense, even-aged regeneration /sprouting to occur in some areas or in clumps (along with relict open grown trees).	Dense, even-aged young cohort present (along with relict open grown trees) across much of site. Most oak trees are <100 yrs. old.	Single age class of oaks present. All oak trees <100 yrs. old.
<b>Total Tree Cover</b>	Oak savanna	Total tree cover is acceptable (10%-25%) over at least 90% of the area	Tree cover is increasing but is acceptable (10%-25%) between 70-90% of the area	Tree cover is increasing but is acceptable (10%-25%) between 50-70% of the area	Tree cover is increasing and is acceptable (10-25%) over less than 50% of the area
	Oak woodland (Alverson 2009a)	Total tree cover is acceptable (25%-60%) over at least 90% of the area being managed for oak woodland.	Tree cover is increasing but total is acceptable (25%-60%) between 70-90% of the area being managed for oak woodland.	Tree cover is increasing but total is acceptable (25%-60%) between 50-70% of the area being managed for oak woodland.	Tree cover is increasing and is acceptable (25-60%) over less than 50% of the area being managed for oak woodland.
<b>Shrub Cover</b>	Shrub cover outside of NRV can indicate past disturbance such as grazing or fire suppression (DW/SPS CAP)	<div> <div>&lt;=60% shrub cover (for oak-shrubland associations) or &lt;=10% shrub cover (for oak herbaceous associations)</div> </div>			
				>=60-75% shrub cover (for oak-shrubland associations) or >=10-25% shrub cover (for oak herbaceous associations)	>=75% shrub cover (for oak-shrubland associations) or >=25% shrub cover (for oak herbaceous associations)

Notes:



## Key Ecological Attribute: *Natural Disturbance Regime*

Fire Regime Condition (Agee 1998)	Frequent, low severity fire (~3-10 yrs.) is vital to maintaining diversity of patch types. (Keris 1986)	No departure from historic fire regime.	Slight departure from historic fire regime.	Moderate departure from historic fire regime.	Severe departure from historic fire regime.
<div><div><div></div>Low severity fire</div><div><div></div>Moderate severity fire</div><div><div></div>High severity fire</div></div>	Oak Savanna				
Oak woodland	No departure from historic fire regime.	Slight/Moderate departure from historic fire regime.	Severe departure from historic fire regime.		

## Key Ecological Attribute: *Physicochemical*

Soil Surface Condition	Soil disturbance can result in compaction, erosion thereby negatively affecting many ecological processes (Napier et al 2009)	Undisturbed	Soil-Disturbance Class 0	<ul style="list-style-type: none"><li>• No evidence of past equipment.</li><li>• No depressions or wheel tracks.</li><li>• Forest-floor layers are present and intact.</li><li>• No soil displacement evident.</li><li>• No management-generated soil erosion.</li><li>• No management-created soil compaction.</li><li>• No management-created platy soils.</li></ul>
Soil Surface Condition	Soil disturbance can result in compaction, erosion thereby negatively affecting many ecological processes (Napier et al 2009)	Undisturbed	Soil-Disturbance Class 1	<ul style="list-style-type: none"><li>• Wheel tracks or depressions evident, but faint and shallow.</li><li>• Forest-floor layers are present and intact.</li><li>• Surface soil has not been displaced.</li><li>• Soil burn severity from prescribed fires is low (slight charring of vegetation discontinuous).</li><li>• Soil compaction is shallow (0 to 4 inches).</li><li>• Soil structure is changed from undisturbed conditions to platy or massive albeit discontinuous.</li></ul>
Soil Surface Condition	Soil disturbance can result in compaction, erosion thereby negatively affecting many ecological processes (Napier et al 2009)	Undisturbed	Soil-Disturbance Class 2	<ul style="list-style-type: none"><li>• Wheel tracks or depressions are evident and moderately deep.</li><li>• Forest-floor layers are partially missing.</li><li>• Surface soil partially intact and maybe mixed with subsoil.</li><li>• Soil burn severity from prescribed fires is moderate (black ash evident and water repellency may be increased compared to preburn condition).</li><li>• Soil compaction is moderately deep (up to 12 inches).</li><li>• Soil structure is changed from undisturbed conditions and may be platy or massive.</li></ul>
Soil Surface Condition	Soil disturbance can result in compaction, erosion thereby negatively affecting many ecological processes (Napier et al 2009)	Undisturbed	Soil-Disturbance Class 3	<ul style="list-style-type: none"><li>• Wheel tracks or depressions are evident and deep.</li><li>• Forest-floor layers are missing.</li><li>• Surface soil is removed through gouging or piling.</li><li>• Surface soil is displaced.</li><li>• Soil burn severity from prescribed fires is high (white or reddish ash, all litter completely consumed, and soil structureless).</li><li>• Soil compaction is persistent and deep (greater than 12 inches).</li><li>• Soil structure is changed from undisturbed and is platy or massive throughout.</li></ul>

Notes:

Metric	Justification	Rank			
		A (5 pts.)	B (4 pts.)	C (3 pts.)	D (1 pts.)
Rank Factor: SIZE					
Key Ecological Attribute: Size					
Relative Size	Indicates the proportion lost due to stressors such as complete fire suppression (conversion to a new system), development, roads, etc.	Site is at or minimally reduced from natural extent (~95% remains)	Occurrence is only modestly reduced from its original natural extent (80-95% remains)	Occurrence is substantially reduced from its original natural extent (50-80% remains)	Occurrence is severely reduced from its original natural extent (~50% remains)
Absolute Size	Absolute size may be important for buffering impacts originating in the surrounding landscape	Very large (>100 ac/40 ha)	Large (40-100 ac/16-40 ha)	Moderate (5-40 ac/2-16 ha)	Small (<5 ac/2 ha)

Notes:

Table 1. North Pacific Oak Woodland Ecological Integrity Assessment Scorecard

Metric	Justification	Rank			
		A (5 pts.)	B (4 pts.)	C (3 pts.)	D (1 pts.)
Rank Factor: LANDSCAPE CONTEXT					
Key Ecological Attribute: <i>Edge Effects</i>					
Edge Length	The intactness of the edge can be important to biotic and abiotic aspects of the site.	75 – 100% of edge is bordered by natural communities	50 – 74% of edge is bordered by natural communities	25 – 49% of edge is bordered by natural communities	< 25% of edge is bordered by natural communities
Edge Width		Average width of edge is at least 100 m.	Average width of edge is at least 75-100 m.	Average width of edge is at least 25-75 m.	Average width of edge is at least <25 m.
Edge Condition		>95% cover native vegetation, <5% cover of non-native plants, intact soils	75-95% cover of native vegetation, 5-25% cover of non-native plants, intact or moderately disrupted soils	25-50% cover of non-native plants, moderate or extensive soil disruption	>50% cover of non-native plants, barren ground, highly compacted or otherwise disrupted soils
		Key Ecological Attribute: <i>Landscape Structure</i>			
Connectivity	Intact areas have a continuous corridor of natural or semi-natural vegetation	Intact: Embedded in 90-100% natural habitat; connectivity is expected to be high.	Variegated: Embedded in 60-90% natural or semi-habitat; habitat connectivity is generally high, but lower for species sensitive to habitat modification;	Fragmented: Embedded in 20-60% natural or semi-natural habitat; connectivity is generally low, but varies with mobility of species and arrangement on landscape.	Relictual: Embedded in < 20% natural or semi-natural habitat; connectivity is essentially absent
Landscape Condition Model Index	The intensity and types of land uses in the surrounding landscape can affect ecological integrity.	Landscape Condition Model Index > 0.8		Landscape Condition Model Index 0.79 – 0.65	Landscape Condition Model Index < 0.65

Notes: Stand B edge primarily contains developed and previously disturbed areas. Landscape Condition Model not completed for this project and was estimated.



ERROR: undefinedresource  
OFFENDING COMMAND: findresource

STACK:

/ColorSpace  
/N408  
-savelevel-