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## Introduction

This section summarizes the methods used to develop the final list of natural resource (wetlands, riparian, and floodplain) restoration and/or enhancement and the results of that analysis for the Lacamas Creek Study Area of the Nisqually Watershed. The final stage of the watershed characterization analysis combines the ecological benefits of each DAU and the environmental benefits of each natural resource site to develop a list of natural resource sites that will provide the greatest functional “lift” in the Study Area.

## Part I. What are the Landscape Conditions in the Lacamas Creek Study Area?

### Current conditions

Current land-use within the Lacamas Creek Study Area was determined by processing Aerial photography and SPOT 10 meter satellite imagery captured in 2009. Approximately five percent of the Lacamas Creek Study Area is covered by the built environment (see Figure 3.0 and 3.1 Classification Percent Totals for Lacamas Creek Study Area). The Lacamas Creek Study Area includes Clear Lake which is surrounded by residential development. Long-term commercial forestry is also prominent in the Study Area.

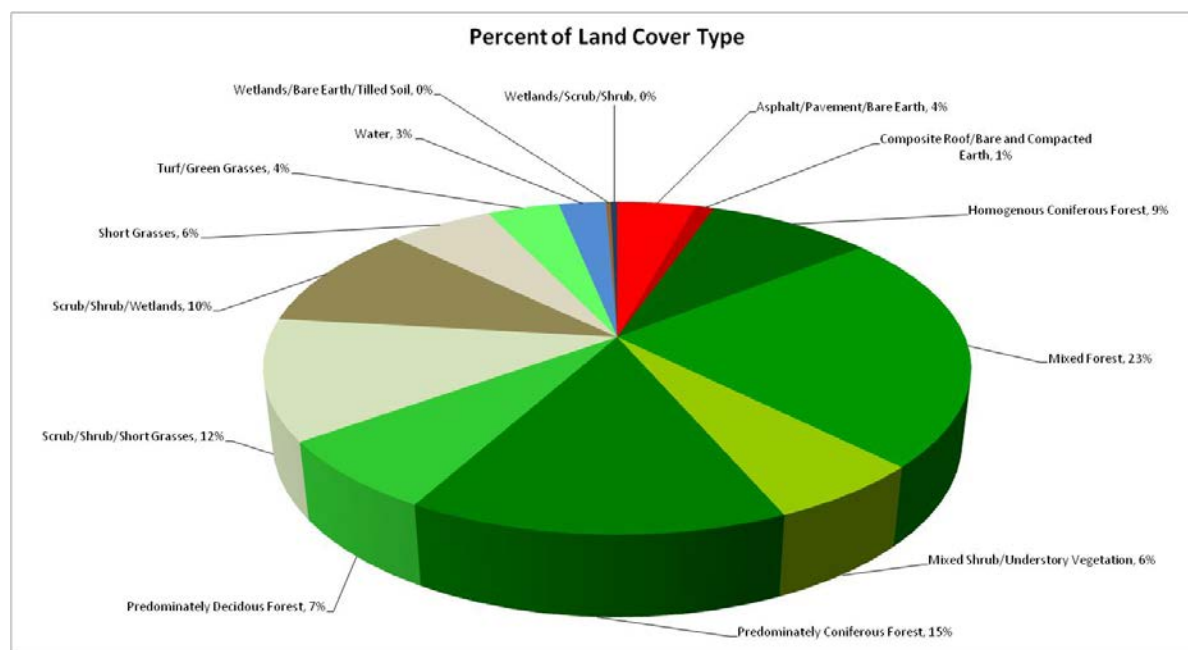


Figure 3.0 Classification Percent Totals for Lacamas Creek Study Area  
Land cover data from 2009 SPOT imagery.



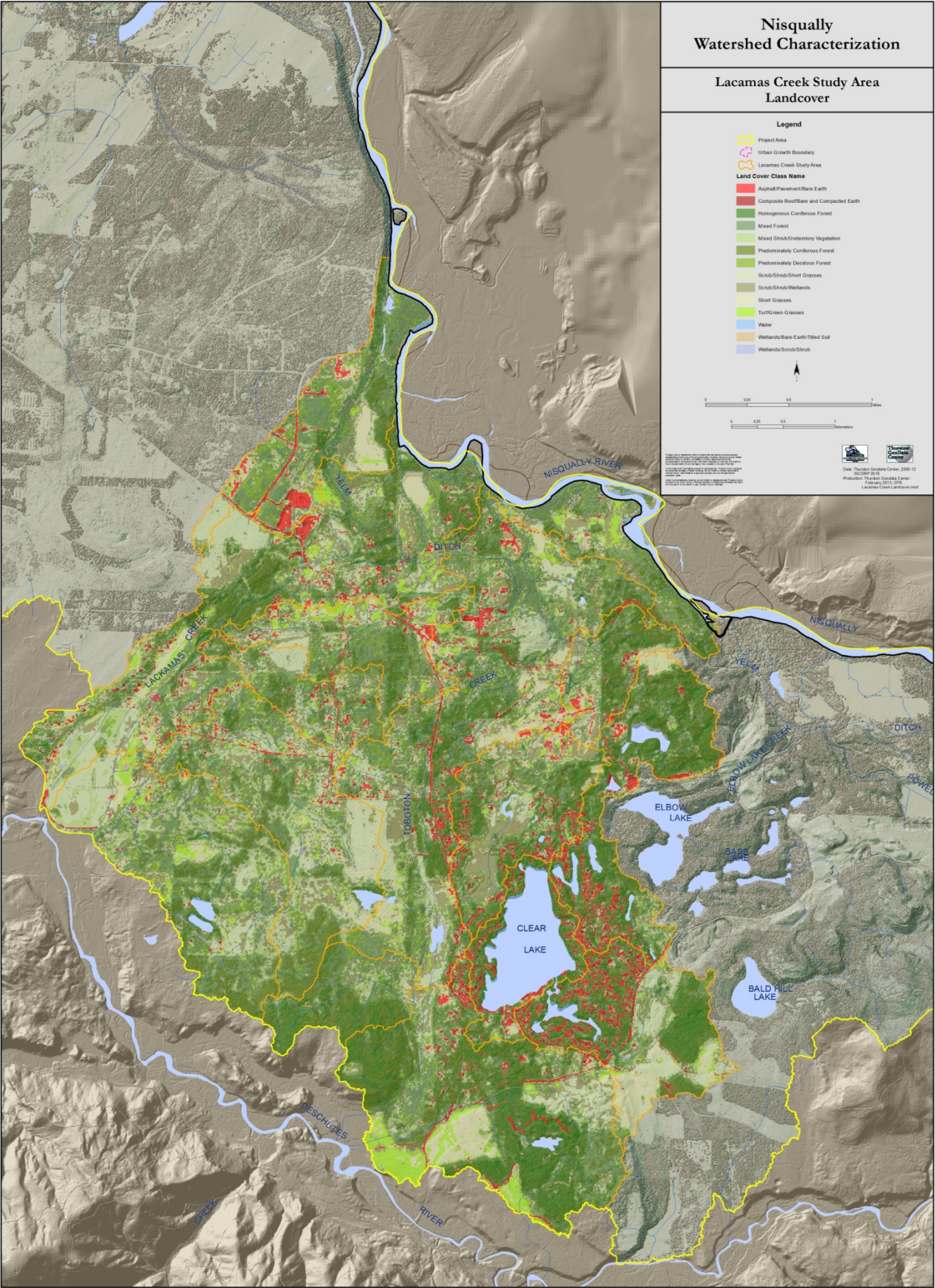


Figure 3.1 Lacamas Creek Study Area Land Cover



## Part II. Characterize Condition of Ecological Processes in Study Area

Five ecological processes and habitat connectivity were assessed. The five ecological processes include the delivery and movement of water, sediment, wood, pollutants, and heat. The biological element includes habitat connectivity. The Matrix of Pathways and Indicators (MPI) was used to determine the function of each ecological process and biological indicator at the DAU scale. Following the assessment of each individual ecological process and biological element, Rules and Assumptions (Tables 3-8 in the Methods document) were used to rank each DAU as Properly Functioning (PF), At Risk (AR), or Not Properly Functioning (NPF). For complete details of the values used in the MPI, please consult Table 2 in the Methods document. For complete details of the Rules and Assumptions, please consult Tables 3 through 8 in the Methods document.

There are 16 DAUs totaling 8,581 acres (13 sq miles) in the Lacamas Study Area.

### Determine the Ecological Benefit of the DAU

The assessment of each individual ecological process and habitat connectivity using the indicators listed in Chapter One and the Methods MPI, and the application of the Rules and describe a baseline condition of ecological health for each DAU. All DAUs are identified for further consideration. DAUs in the “At Risk” category for multiple key ecological processes are assumed to provide the greatest potential to maximize environmental benefits when natural resource sites are restored within that DAU. A N/A indicates that there is no data for that DAU.

Table 3.0 describes the function level of five ecological process and habitat connectivity as PF, AR, or NPF.

**Table 3.0 Lacamas Creek Ecological Processes and Biological Element Function**

DAU Id	Ecological Processes							Biological Element
	Acres	Sq Mi	Water	Wood	Sediment	Pollutants	Heat	Habitat Connectivity
174	520.70	0.81	AR	NPF	AR	AR	AR	AR
172	1019.34	1.59	AR	AR	AR	AR	PF	AR
159	759.27	1.19	AR	AR	AR	AR	NPF	AR
158	528.20	0.83	AR	AR	AR	AR	NPF	AR
169	437.28	0.68	AR	NPF	AR	AR	NPF	AR
168	509.85	0.80	AR	AR	NPF	AR	NPF	AR
167	201.91	0.32	AR	NPF	AR	AR	NPF	AR
166	305.06	0.48	AR	AR	AR	AR	NPF	PF
161	237.78	0.37	AR	NPF	AR	AR	N/A	AR
170	316.10	0.49	AR	AR	AR	NPF	PF	NPF
165	1288.20	2.01	AR	NPF	AR	AR	N/A	NPF
163	767.95	1.20	AR	NPF	AR	AR	NPF	PF

DAU Id	Ecological Processes						Biological Element	
	Acres	Sq Mi	Water	Wood	Sediment	Pollutants	Heat	Habitat Connectivity
162	406.87	0.64	AR	NPF	AR	AR	NPF	NPF
164	715.03	1.12	AR	NPF	PF	AR	NPF	NPF
171	228.68	0.36	PF	AR	NPF	AR	N/A	PF
160	345.65	0.54	PF	AR	AR	PF	NPF	NPF

An aggregation of the function level of these processes and habitat connectivity are then used to provide an overall function level and ranking of each DAU as described in the following Table 3.1.

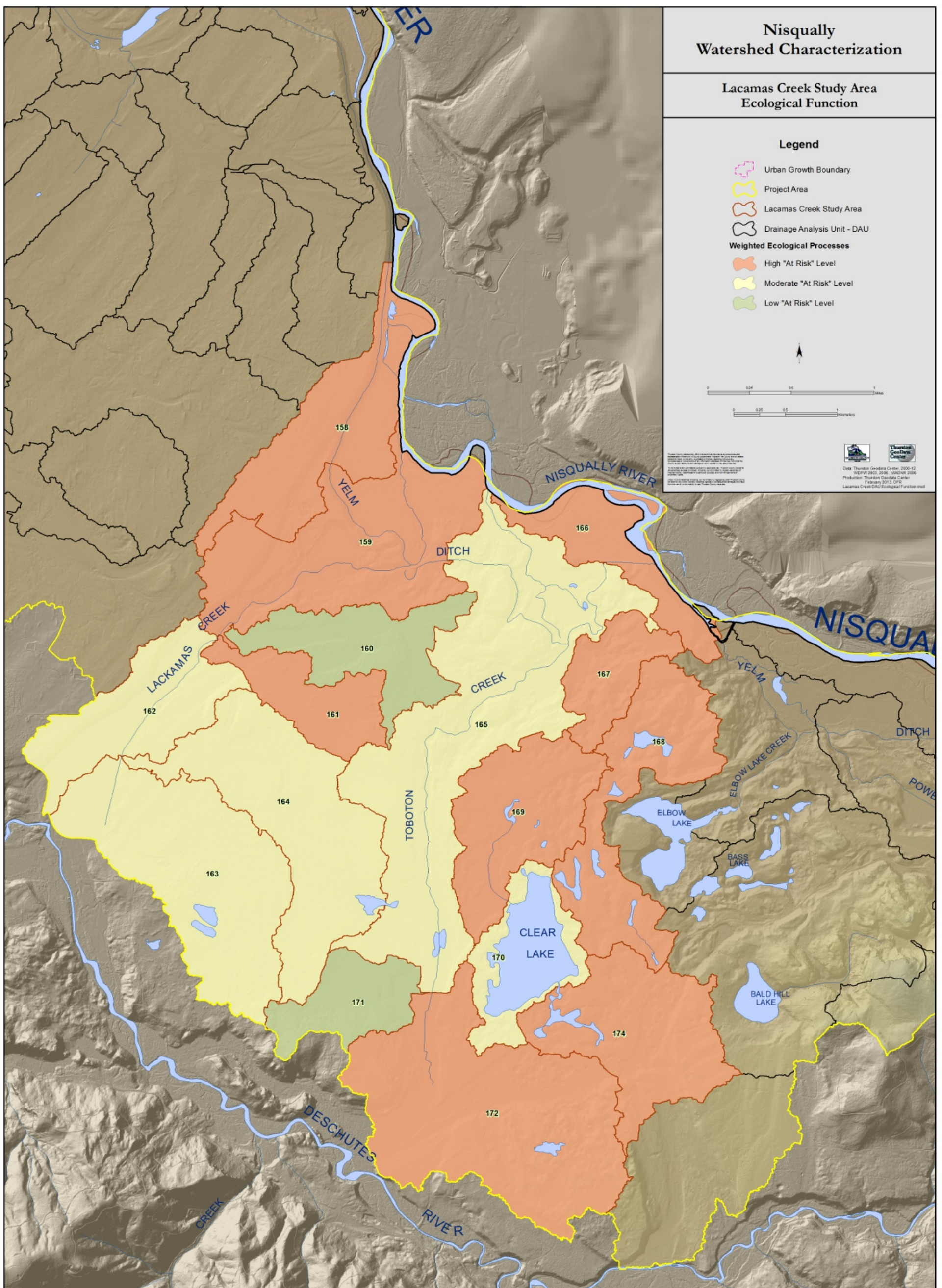
**Table 3.1 Final DAU Ecological Benefit Rank**

DAU Id	Ecological Processes					Biological Element		Total Score	Weighted Rank
	Water	Wood	Sediment	Pollutants	Heat	Habitat Connectivity			
174	3	1	1	1	0	1		7	High
172	3	1	1	0	1	1		7	High
159	3	1	1	0	1	1		7	High
158	3	1	1	0	1	1		7	High
169	3	1	1	0	0	1		6	High
168	3	0	1	0	1	1		6	High
167	3	1	1	0	0	1		6	High
166	3	1	1	0	1	0		6	High
161	3	1	1	0	0	1		6	High
170	3	1	0	0	1	0		5	Moderate
165	3	1	1	0	0	0		5	Moderate
163	3	1	1	0	0	0		5	Moderate
162	3	1	1	0	0	0		5	Moderate
164	3	0	1	0	0	0		4	Moderate

The weighted rank is used in the evaluation of potential restoration and enhancement sites when the DAUs and resource sites are combined to provide a prioritized list of natural resource sites.

As shown in Table 3.1 and Figure 3.2, the Lacamas Creek Study Area has 16 DAUs that have restoration potential (weighted rank of high or moderate). DAUs ranked Low are listed in Appendix B.







### Part III. Characterize Natural Resource Sites in Study Area

This section evaluates natural resource sites within the study area. The watershed characterization methods do not assess potential restoration sites at the parcel or jurisdictional boundary. The methods focus on the landscape only. The purpose is to determine natural resource sites that can be restored or enhanced in the surrounding landscape that will provide the greatest functional lift. The analysis is conducted concurrently with the analyses of the ecological processes and the one biological element, habitat connectivity. Upon completion of the DAU and natural resource site analysis, the sites identified are ranked within their corresponding DAU.

#### Determine the Environmental Benefit of the Resource Sites

The natural resource sites are evaluated based on the attributes during site assessment using Tables 13 to 15 in the Methods document. The sites are then assigned an environmental benefit final score.

Following the conversion of natural resource sites from a numerical score to a rank of Low, Moderate, or High rank, there were a total of 293 potential restoration or enhancement sites. Table 3.2 details the results.

**Table 3.2 Lacamas Creek Environmental Benefit Ranking of Natural Resource Sites**

<b>Lacamas Creek Potential Restoration Sites</b>				
Rank	Wetland	Riparian	Floodplain	Total
High	43	33	N/A	76
Moderate	72	5	N/A	77
Low	123	11	6	140

### Part IV. Assess Potential Sites within the DAU

This section presents the results of a ranking process for all potential natural resource restoration sites within the DAU. This ranking of a natural resource restoration site is based on a combination of each site's individual site rank combined with the ranking of the DAU within which the restoration site is located. The result of this combination is a final score from 0 to 6, with a score of 6 representing those sites with the greatest potential for environmental benefit if restored. See Chapter 1 Part III and the Methods document for a description of the methodology used.

Following evaluation, a total of 293 sites were ranked within the Lacamas Creek Study Area and their corresponding DAU. Of those 293, there were 153 sites that had high or moderate restoration value.

A site with a Low environmental benefit is a preservation site or completely degraded site that would provide a minimal environmental benefit if restored.

Results of natural resource restoration site ranking for wetlands, riparian and floodplain areas are described in the following sections.

The following wetlands, riparian and floodplain sections describe the final combined ecological benefit (DAU) and environmental benefit (site) ranking of natural resource sites.

### Wetland sites

Table 3.3 presents the results of wetland restoration site ranking taking into account the combined wetland restoration potential and the DAU ranking. There are 116 sites that ranked high or moderate.

Wetland sites ranked Low or less than one acre are not included in Table 3.3. However, they have been ranked and are listed in Appendix C. Figure 3.3 shows the location of each wetland restoration site.

**Table 3.3 Wetland Sites**

Site ID	Wetlands Rank	Combined DAU and Site Score	Acres
Wetland1670	High	6	1.81
Wetland1677	High	6	15.25
Wetland1682	High	6	2.00
Wetland1684	High	6	2.00
Wetland1751	High	6	3.76
Wetland1759	High	6	1.00
Wetland1761	High	6	6.99
Wetland1809	High	6	8.46
Wetland1810	High	6	28.73
Wetland1978	High	6	1.35
Wetland2011	High	6	15.98
Wetland2022	High	6	13.18
Wetland1683	High	4	40.86
Wetland1697	High	4	3.06
Wetland1715	High	4	4.62
Wetland1720	High	4	3.45
Wetland1721	High	4	116.52
Wetland1722	High	4	18.17
Wetland1723	High	4	1.23
Wetland1735	High	4	15.06
Wetland1737	High	4	2.65
Wetland1744	High	4	14.76
Wetland1745	High	4	1.76
Wetland1748	High	4	11.33



Site ID	Wetlands Rank	Combined DAU and Site Score	Acres
Wetland1757	High	4	3.90
Wetland1792	High	4	40.81
Wetland1793	High	4	1.11
Wetland1805	High	4	5.31
Wetland1807	High	4	105.32
Wetland1811	High	4	4.78
Wetland1875	High	4	7.93
Wetland1878	High	4	1.90
Wetland2014	High	4	8.40
Wetland2020	High	4	9.36
Wetland1693	High	2	35.26
Wetland1647	Moderate	5	2.87
Wetland1651	Moderate	5	1.79
Wetland1652	Moderate	5	1.07
Wetland1654	Moderate	5	3.39
Wetland1655	Moderate	5	1.50
Wetland1660	Moderate	5	8.86
Wetland1671	Moderate	5	4.06
Wetland1673	Moderate	5	6.13
Wetland1674	Moderate	5	6.59
Wetland1679	Moderate	5	3.80
Wetland1681	Moderate	5	4.15
Wetland1687	Moderate	5	11.66
Wetland1709	Moderate	5	3.12
Wetland1717	Moderate	5	2.92
Wetland1754	Moderate	5	1.76
Wetland1758	Moderate	5	4.16
Wetland1775	Moderate	5	10.82
Wetland1826	Moderate	5	3.86
Wetland1909	Moderate	5	4.41
Wetland1915	Moderate	5	4.91
Wetland1969	Moderate	5	1.15
Wetland1972	Moderate	5	1.06
Wetland1974	Moderate	5	3.72
Wetland1992	Moderate	5	3.45
Wetland2010	Moderate	5	9.76
Wetland1700	Moderate	3	1.81
Wetland1701	Moderate	3	1.86
Wetland1705	Moderate	3	2.00
Wetland1706	Moderate	3	1.66
Wetland1725	Moderate	3	21.64

Site ID	Wetlands Rank	Combined DAU and Site Score	Acres
Wetland1726	Moderate	3	1.40
Wetland1741	Moderate	3	1.33
Wetland1749	Moderate	3	5.76
Wetland1753	Moderate	3	1.36
Wetland1762	Moderate	3	22.45
Wetland1787	Moderate	3	3.74
Wetland1797	Moderate	3	1.56
Wetland1802	Moderate	3	5.80
Wetland1804	Moderate	3	4.02
Wetland1869	Moderate	3	1.27
Wetland1663	Moderate	1	3.32
Wetland1680	Moderate	1	1.63

The following figures appear cluttered when printed at a scale less than 33 x 44 inches (the format it was developed for). The maps are best viewed electronically where the viewing area is easily enlarged.



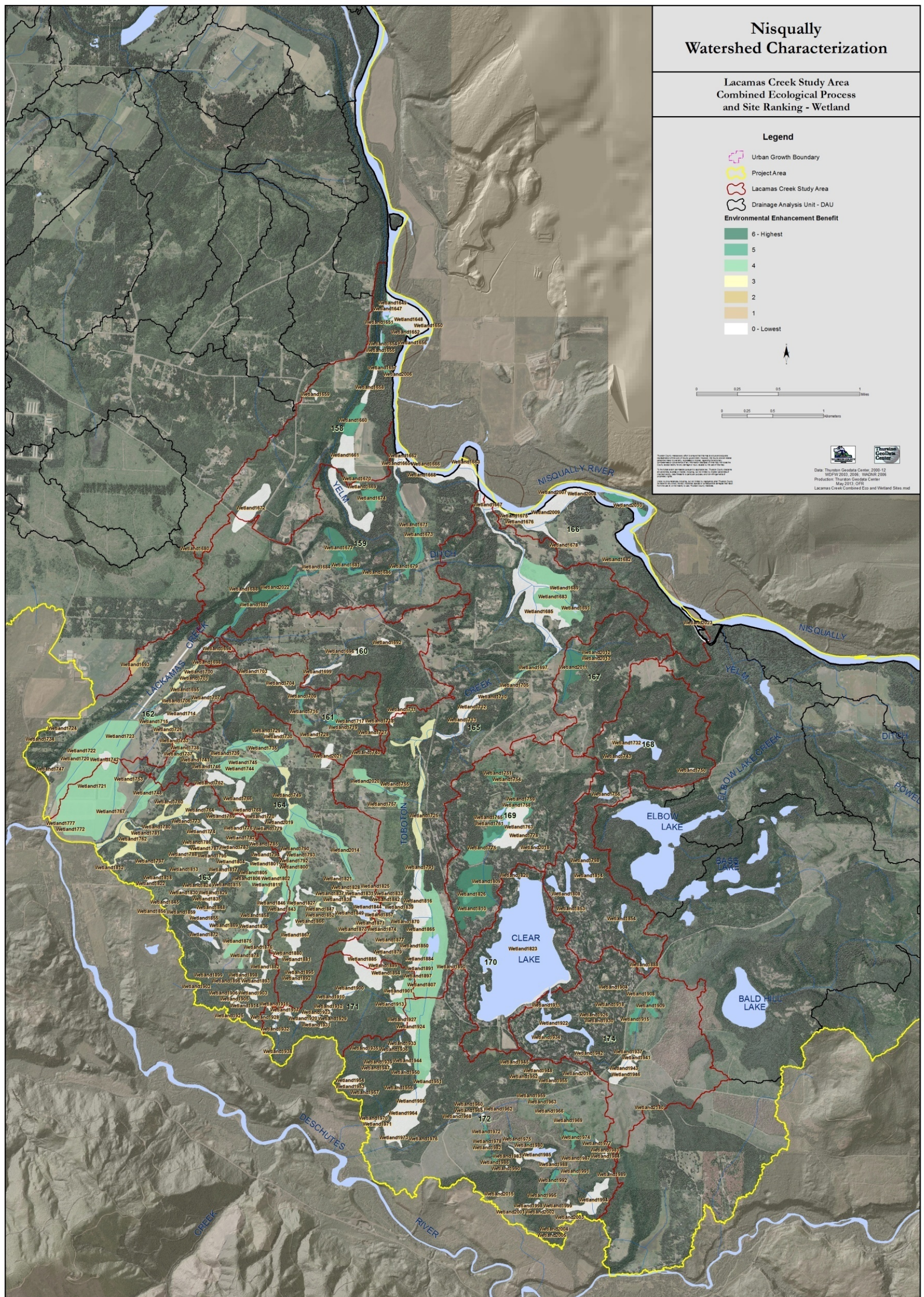


Figure 3.3 Lacamas Creek Study Area Ecological Processes and Site Ranking – Wetlands



## Riparian condition

Table 3.4 presents the results of riparian restoration site ranking taking into account the combined riparian restoration potential and the DAU ranking. There are 38 riparian sites that ranked high or moderate. The resulting combined score of the natural resource site within the context of the DAU were scored and displayed on Figure 3.4.

Riparian sites ranked Low are not included in Table 3.4. However, they have been ranked and are listed in Appendix C.

**Table 3.4      Riparian Sites**

Site ID	Riparian Rank	Combined DAU and Site Score	Acres
Riparian10	High	4	70.97
Riparian63	High	4	48.35
Riparian76	High	6	69.44
Riparian78	High	6	58.92
Riparian180	High	6	34.72
Riparian183	High	4	17.71
Riparian184	High	4	92.07
Riparian185	High	4	23.06
Riparian186	High	4	35.19
Riparian187	High	4	35.14
Riparian190	High	6	18.83
Riparian191	High	4	17.10
Riparian193	High	4	28.71
Riparian194	High	4	30.26
Riparian195	High	4	31.31
Riparian224	High	6	41.37
Riparian225	High	6	12.86
Riparian226	High	2	27.20
Riparian227	High	2	24.20
Riparian228	High	6	18.25
Riparian229	High	6	16.09
Riparian231	High	2	32.09
Riparian232	High	6	51.60
Riparian234	High	4	21.06
Riparian235	High	4	48.79
Riparian236	High	4	46.10
Riparian237	High	4	44.26
Riparian239	High	4	17.50
Riparian240	High	4	31.72



Site ID	Riparian Rank	Combined DAU and Site Score	Acres
Riparian241	High	4	41.55
Riparian242	High	4	40.22
Riparian243	High	4	37.08
Riparian318	High	6	91.10
Riparian73	Moderate	5	34.40
Riparian188	Moderate	3	22.19
Riparian189	Moderate	3	29.54
Riparian230	Moderate	5	16.70
Riparian238	Moderate	3	47.71



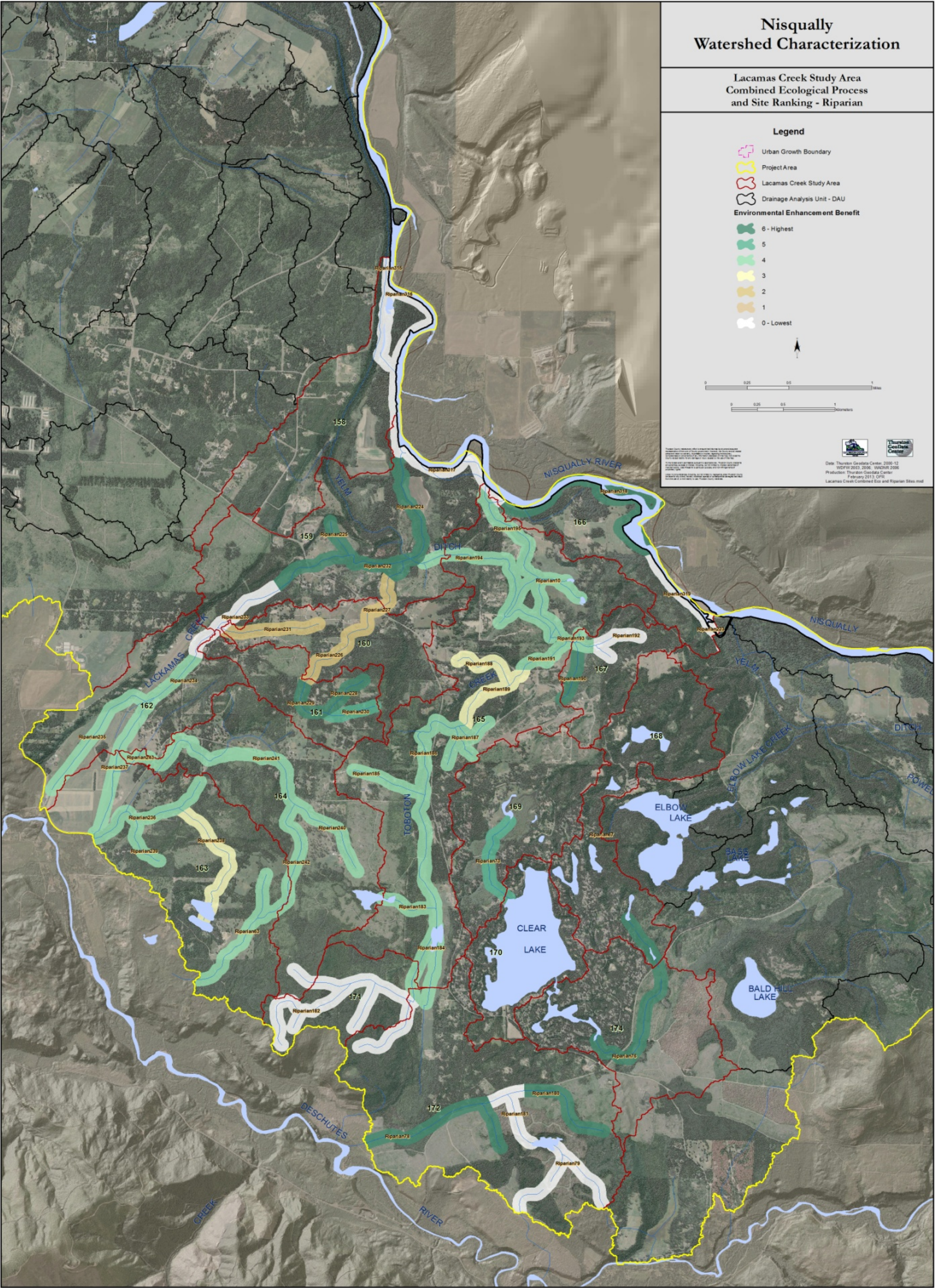


Figure 3.4 Lacamas Creek Study Area Ecological Processes and Site Ranking – Riparian



### **Floodplain Condition**

There were six floodplain sites and all of them ranked Low. They are listed in Appendix C.

See Figure 3.5 Lacamas Creek Study Area Ecological Processes and Site Ranking – Floodplain.



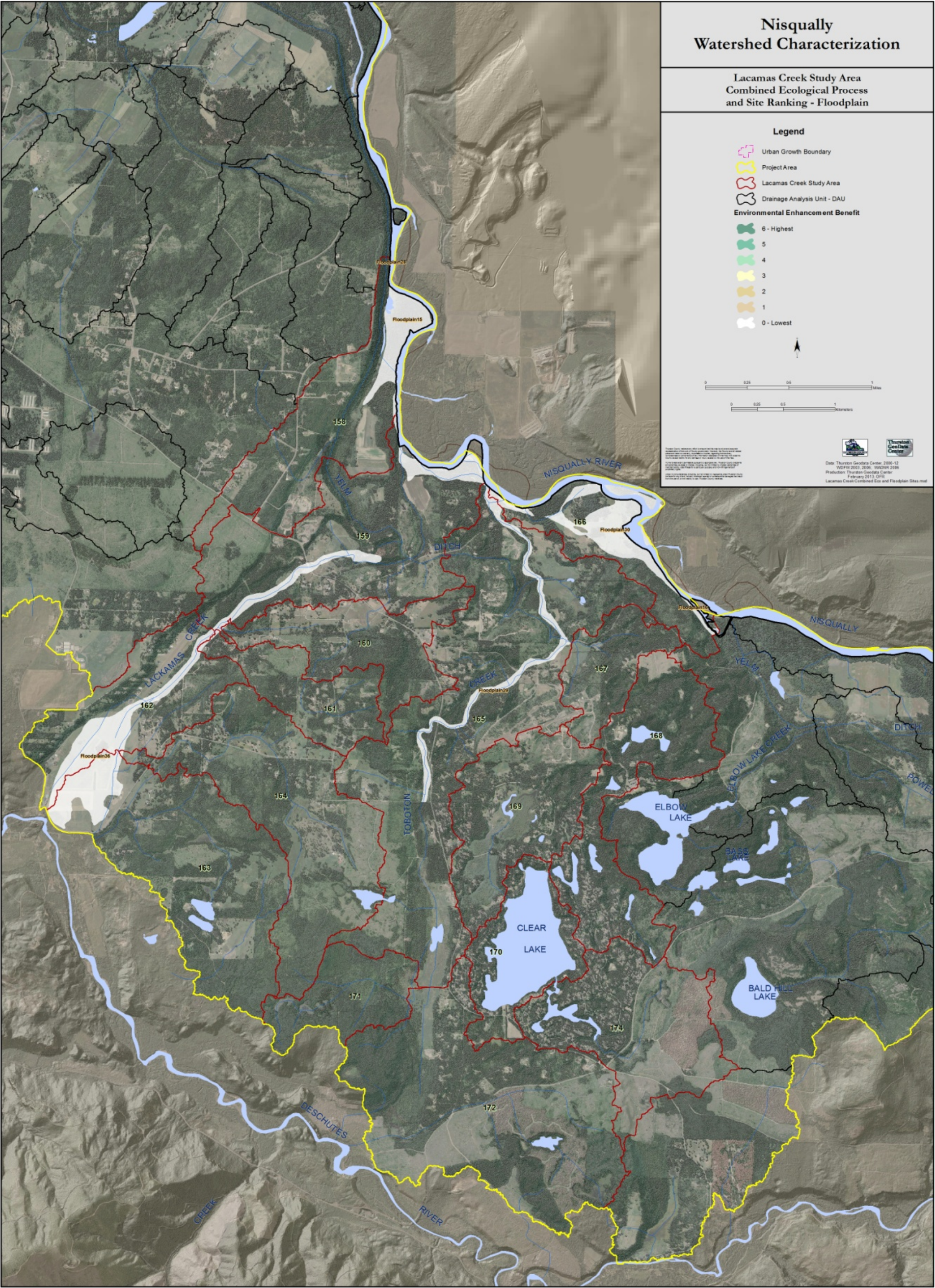


Figure 3.5 Lacamas Creek Study Area Ecological Processes and Site Ranking - Floodplain