Bear Creek Watershed

Riparian Canopy Assessment

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Jane Claire Dirks-Edmunds
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BEAR CREEK
Watershed Council

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Introduction

This report describes the methods employed in, and results of, the project to estimate riparian canopy cover of Bear Creek and its major tributaries using recent-date (2001, 2003) digital aerial photography and geographic information systems (GIS) data from Jackson County, Oregon. This project was funded by the Bear Creek Watershed Authority. The GIS analysis was conducted by Terri Ayers (wildlife biologist and GIS analyst), under sub-contract to John Ward.

The presence of a vegetative canopy over riparian water courses is crucial to providing protective cover for fish and other wildlife species in these habitats, and in regulating water temperature within the stream ecosystem. The purpose of this project was to estimate riparian shade within the Bear Creek Watershed, across a variety of land uses and ownerships, in order to identify areas with suitable riparian cover where preservation of the riparian habitat may be encouraged or protected, and other areas that perhaps may be suitable for restorative actions. Using digital aerial photographs to make these shade estimates was a relatively low-cost, efficient method for quickly assessing the large area encompassed by the Bear Creek Watershed. Further analyses will identify areas where additional in-situ surveys may be best conducted.

Bear Creek bisects the Rogue Valley, beginning at the confluence of Walker Creek and Emigrant Creek in the southeast portion of the valley near the city of Ashland. It flows in a northwesterly direction, emptying into the Rogue River near the city of Central Point. Tributaries to Bear Creek drain the mountain slopes on both the east and west sides of the riparian plain (see Figure 1). In general, the slopes to the northeast of Bear Creek are drier and more scrub-like, with primarily oak riparian habitat following the drainages. The slopes to the southwest are generally steeper, and more densely vegetated by predominantly coniferous species. There is a higher degree of urbanization (residential, agricultural and industrial land uses) on the northeastern side of the valley, compared to relatively lighter residential development, agriculture and open space on the western side.

Methods

Data Collected and Created

Various digital data were collected for use in this project.

1. Aerial photography of the Rogue Valley was obtained from the Jackson County GIS Department. In 2003, Jackson County GIS contracted with David C. Smith Associates (Portland, Oregon) to fly high resolution (1 foot) color aerial photography of the valley floor. Areas outside the extent of those flown in 2003

were supplemented with older (2001), lower resolution (2 foot) color aerial photography previously used by Jackson County.

2. A GIS stream layer (WATRLINE) was downloaded from the Jackson County GIS website (www.SmartMap.org). This geometry and alignment of this line feature layer was used as the basis for the canopy cover layer described below.
3. GIS layers for tax lots (TAXLOTS) and 100'contour intervals (CONTOUR100) were also downloaded and used for spatial reference while "navigating" around the aerial photography during the analytical process.
4. Raster data of slope and aspect (HI_SOUTH_G.SID, HI_NORTH_G.SID) were used to help estimate shade provided by vegetation located beside riparian water courses, but that perhaps did not overhang the water.

Using ArcGIS v. 8.3, a duplicate of the GIS streams file (WATRLINE) was made and named CANOPY. The associated attribute table was edited to remove data fields that were unnecessary to the canopy analysis, and to add data fields for canopy cover class (Canopy) and sorting (Sort_Class) based on stream name. The CANOPY line features were edited so that only the creeks and streams of interest in this study remained in the data layer (Table 1). Each stream was represented by a single solid line by selecting the various segments comprising a stream and merging them into a single line. These solid lines were later broken into segments representing various classes of shade. The data layer had to be further edited to deal with multiple streams having the same name, duplicate stream segments, naming errors from the original streams layer, and other problems associated with topology. No attempt was made to "fit" the stream lines to the aerial photos. A metadata file was created for distribution with CANOPY.

Table 1. Creeks and Streams Included in the Study

- Anderson Creek
- Arrasta Creek
- Ashland Creek (up to Reeder Reservoir)
- Bear Creek
- Bear Gulch
- Butler Creek
- Coleman Creek
- Cove Creek
- Dean Creek
- Frog Creek
- Gaerky Creek
- Griffin Creek
- Holton Creek
- Horn Gulch
- Jackson Creek
- Kenutchen Creek
- Kitchen Creek
- Larson Creek
- Lazy Creek
- Lone Pine Creek
- Myer Creek
- Neil Creek (to Interstate 5)
- Rail Gulch
- Tolman Creek (to Interstate 5)
- Upton Creek
- Wagner Creek
- Walker Creek
- Whetstone Creek
- Willow Creek
- Yank Gulch

Determining Percent Shade

By viewing the stream line against the backdrop of the aerial photography in the GIS software, each stream was broken into a number of segments using the Split Tool in the ArcMap module of ArcGIS. These segments are analogous to Riparian Condition Units (RCUs) as described in the *Oregon Watershed Assessment Manual* (OWEB 1999), except that the segments defined here encompass both banks of the stream, whereas RCUs are separately generated for each bank of a stream.

One of three categories of stream shade was assigned for each segment of each stream. These categories, High, Medium and Low, were based on language in the *Oregon Watershed Assessment Manual*. The High category represents estimated stream shading greater than 70% The Medium category is assigned where stream shade is estimated at 40 to 70 %. The Low shade category is for shade estimates of less than 40%.

By "zooming in" on a portion of the aerial photo, an estimation of the percent shade and assignment to a shade category was made for each segment of stream. By "panning" across the scene, differences in riparian vegetation characteristics could be detected, and when these differences were significant, a break was made in the stream length and a new category was assigned. A new category would not be assigned if the discernable difference was not apparent for a linear distance of at least 200 feet. This 200 foot rule represents the functional minimum mapping unit used in this study. Where it diverged, the geometry (alignment) of the stream was not edited to fit the actual course of the stream observed in the imagery. In these cases, shade attributes of the actual stream course were assigned to the corresponding stream segment in the shape file.

For most of the water courses in this study, there were few ambiguities in determining the presence of vegetative shade due to the narrow diameters of the streams. However, Bear Creek is quite a bit wider than most of the other streams, and a higher percentage of its water surface is exposed to sunlight. Stream shade was estimated somewhat differently in this case. Where the banks of the stream are densely vegetated with canopy species, a High category was assigned. If no canopy vegetation was present along the banks of the stream, then a Low category was assigned. Other permutations of canopy presence, proximity to water's edge, and density along the bank were assessed with the following guiding principles:

1. If the stream runs in an east-west direction, and there is dense canopy vegetation on the south bank, then there is probably a higher degree of shade provided than if the vegetation only exists on the north side of the stream.

2. If the stream runs in a north-south direction and there is abundant vegetative canopy on both banks, then there likely is a high degree of shading. If there is not an abundance of vegetative canopy on either bank, then there will be significantly less potential for shading of the water.

3. The presence of shadows in the photography indicates a potential for shading the water surface.

Once all of the streams had been divided into segments and assigned a shade category, I went back through all the segments and conducted a second visual examination of the assignments.

Some adjustments were made based on modifications to the decision making process during the course of the first run-through. Some areas that were particularly problematic, due either to technical difficulties in the data or complexities in visual discrimination, were examined a third time. This process helped assure a consistent analysis across the entire study area.

Limitations of Methods

Visual estimation of the percent of shade any given stream segment receives was subjective to my judgment as the analyst, and it was sometimes difficult to decide between one category and the next when the estimate of shade was near either the upper or lower end of the Medium category. Poor resolution of the photography in some areas also hampered my ability to discern percent shade, and even the course of the stream in some cases. There are issues with the currency of the data since the aerial photography is between 2 and 4 years old; changes in riparian vegetation (especially cleared areas) have to be assessed on the ground.

One of greatest benefits of using GIS is that if, at a later date, it is determined that a stream segment requires assignment of a different shade category after field verification of the area, it is a simple update procedure and new summarized results can be generated.

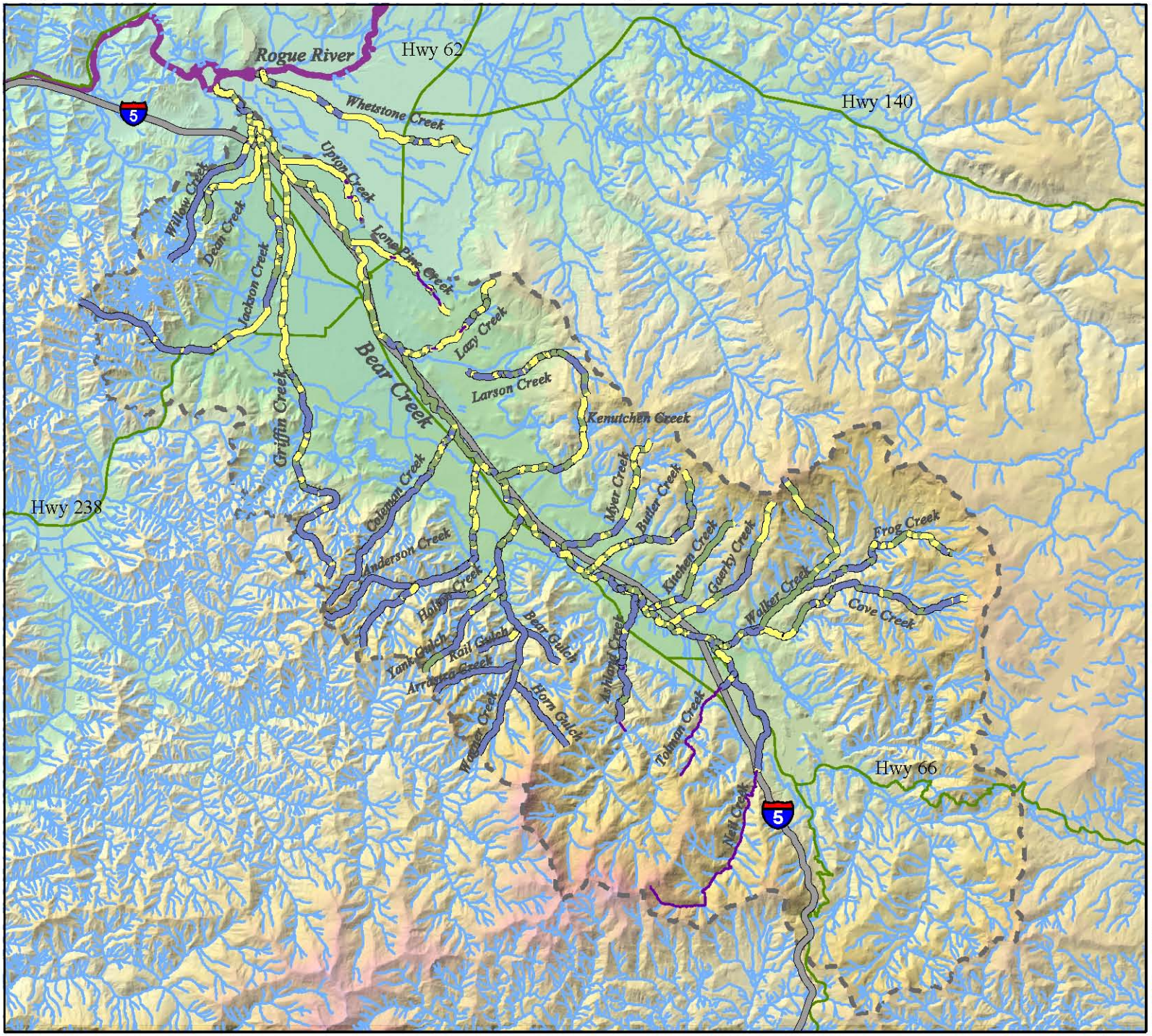
Results

The results of the Bear Creek Watershed Riparian Canopy Assessment are summarized in Table 2, which lists, for each stream or creek in the study, estimated linear feet of each of the three shade categories, and the total number of stream feet and miles. Figure 1 illustrates these results. The CD-ROM labeled “Bear Creek Watershed Riparian Canopy Assessment” contains all the data used and created in this study, as well as a digital copy of this report and the Figure 1 map. A second CD-ROM of the same title, Part 2, has the file for the poster-sized map.

Table 2. Riparian Shade Results

Stream/Creek Name	High (ft)	Medium (ft)	Low (ft)	Outside assessment area	Reservoir Crossing	Storm Drain	Grand Total (ft)	Grand Total (miles)
Anderson Creek	14,070	5,373	9,691				29,134	5.52
Arrastra Creek	15,065						15,065	2.85
Ashland Creek	24,853	2,342	1,165		2,148		30,508	5.78
Bear Creek	26,078	66,936	53,205				146,218	27.69
Bear Gulch	8,144						8,144	1.54
Butler Creek	9,666	11,920	9,296				30,882	5.85
Coleman Creek	31,982	3,562	3,189				38,732	7.34
Cove Creek	23,134	11,565	10,554				45,253	8.57
Dean Creek	1,843	3,375	13,930				19,148	3.63
Frog Creek	13,997	11,272	7,379				32,648	6.18
Gaerky Creek	9,965	5,802	13,387				29,154	5.52
Griffin Creek	34,406	13,157	35,139				82,702	15.66
Holton Creek	7,679	683	5,855				14,217	2.69
Horn Gulch	14,860						14,860	2.81
Jackson Creek	32,217	11,342	24,792				68,352	12.95
Kenutchen Creek	1,909	10,861	13,522				26,292	4.98
Kitchen Creek	2,723	15,639	5,258				23,620	4.47
Larson Creek	13,250	7,923	5,515				26,689	5.05
Lazy Creek	4,193	5,027	11,792			2,355	23,367	4.43
Lone Pine Creek		1,497	14,143			6,610	22,250	4.21
Myer Creek	8,901	10,053	10,670				29,624	5.61
Neil Creek	23,481	2,016	2,740	39,116			67,353	12.76
North Fork Anderson Creek	17,786						17,786	3.37
Rail Gulch	6,671		1,322				7,993	1.51
South Fork Anderson Creek	13,576		1,643				15,219	2.88
Tolman Creek	2,184		929	18,907			22,020	4.17
Upton Creek			17,046			2,407	19,453	3.68
Wagner Creek	36,872	6,713	2,495				46,080	8.73
Walker Creek	6,598	25,027	7,599				39,224	7.43
Whetstone Creek	6,696	4,873	32,094				43,663	8.27
Willow Creek	22,606	2,942	4,050				29,598	5.61
Yank Gulch	12,013	5,828	1,707				19,547	3.70
Grand Total	447,419	245,726	320,107	58,023	2,148	11,372	1,084,796	205.45

Figure 1. Bear Creek Watershed Riparian Canopy Assessment



Riparian Shade

- High
- Medium
- Low
- Interstate 5
- Arterial Roads
- Streams/Creeks

N

Miles

0 1.5 3 6

Shaded Relief, Roads, Streams from Jackson County SmartMap

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